

CMA-FINAL NOTES ON

STRATEGIC COST MANAGEMENT

BY CMA SUMIT RASTOGI

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D-223, 3rd FLOOR, LAXMI CHAMBER, LAXMI NAGAR, DELHI-92

STRATEGIC COST MANAGEMENT

CMA-FINAL THEORY NOTES ON

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STRATEGIC COST MANAGEMENT

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STRATEGIC COST MANAGEMENT

STRATEGIC COST MANAGEMENT

TRADITIONAL COST MANAGEMENT SYSTEM

Traditional Cost Management system involves allocation of costs and overheads to the production and focuses largely on cost control and cost reduction. The underlying assumption was that with reduced costs (direct) and overheads a firm could earn better profits. It involves comparing actual results with the standard expectations (typically budget or standard costs) and analysing the difference. This process is also known as variance analysis. A corrective action would be taken to ensure future outcomes are within the budgeted outcomes.

LIMITATIONS OF TRADITIONAL COST MANAGEMENT SYSTEM

- a) Excessive focus on Cost Reduction & it could impact the quality of product and services and alienate the customers.
- b) Traditional cost management system does not look at the external factors of competition, market growth, customer requirement etc.
- c) Traditional cost accounting systems rely on accounting data which can be misleading at times.
- d) It does not consider dynamics of marketing and economics.
- e) There is a limited focus on review and improvisation of existing processes and activities.
- f) Traditional cost management is a reactive approach to cost management.
- g) It has a short-term outlook. E.g. saving costs on an annual basis.

MEANING OF STRATEGIC COST MANAGEMENT

Strategic cost management is the application of cost management techniques so that they improve the strategic position of a business as well as control costs. It also involves integrating cost information with the decision-making framework to support the overall organisational strategy. It is not limited to controlling costs but using cost information for management decision making. The cost management techniques should be such that they improve the strategic position of a business apart from focusing on controlling costs.

The basic aim of *Strategic Cost Management is to help the organisation to achieve the sustainable competitive advantage through product differentiation and cost leadership.*

NECESSITY OF STRATEGIC COST MANAGEMENT

1. Cost data is analysed and used strategically to develop alternate measures to gaining sustainable competitive advantages
2. SCM gives a clear understanding of the company's cost structure in search of sustainable competitive advantage.
3. SCM is the managerial use of cost information explicitly directed to the four stages of Strategic Management, i.e. Formulation, Communication, Implementation and Control.
4. SCM helps in overall recognition of cost relationships among the activities in the value chain and the process of managing these relationships to the company's competitive advantage.

STRATEGIC COST MANAGEMENT

COMPONENTS OF STRATEGIC COST MANAGEMENT

- a) Value Chain Analysis
- b) Cost Driver Analysis
- c) Strategic Positioning Analysis

a) Value Chain Analysis: Value Chain Analysis is a process by which a firm identifies & analyses various activity that add value to the final product. The idea is to identify those activities which do not add value to the final product and eliminate such Non-Value Adding activities.

The analysis of value chain helps a firm obtain cost leadership to improve product differentiation.

Resources must be deployed in those activities that are capable of producing products valued by Customers.

b) Cost Driver Analysis: Cost is driven by various factors which are interrelated. Cost is not a simple function of volume or output as considered by traditional cost accounting systems.

Cost driver concept is explained in two broad ways;

- Structural cost drivers
- Executional Cost drivers

c) Strategic Positioning Analysis: It is a company's relative position within the industry matters for performance. It focuses on how that value will be created differently than rivals.

Strategic Positioning Analysis is concerned with impact of external and internal environment on the overall strategy of a company. The following factors affect the strategic position of a company: -

1. External Environment
2. Organization Values, Culture and Systems
3. Internal Environment

DIFFERENCE BETWEEN TRADITIONAL COST MANAGEMENT AND STRATEGIC COST MANAGEMENT

TRADITIONAL COST MANAGEMENT	STRATEGIC COST MANAGEMENT
Primary objective is cost reduction	Primary objective is Cost Containment - cost reduction and value improvement at the same time
Other Object is Score keeping, attention directing and problem solving	Other Object is Cost leadership or product differentiation
Cost driver is Based on volume of the product	Each value activity has a separate cost driver
Short Term Concept	Long term concept
It focuses on Internal	Both internal and external
Approach is based on Risk - averse	Risk taking and ability to adapt itself with changing environment

Cost Containment is the business practice of maintaining expense levels to prevent unnecessary spending, or thoughtfully reducing expenses to improve profitability without risking long-term damage to the company.

STRATEGIC COST MANAGEMENT

Example The following information is extracted from the financial statements of a company producing products A & B. If the company stops producing product B, the sale of A would fall down by 25%.

Particulars	₹ lacs	
	A	B
Revenue	60	35
- Cost of Sales	35	25
Gross Profit	25	10
- Overheads	5	12
Net Profit	20	-2

Analysis If the information provided above is approached *using a Traditional Cost Management Technique*, the company might decide to stop production of B because it has a heavy overhead cost and also results in a loss of ₹ 2 lacs. It thus appears to be prudent to close down the production of B.

However, with additional information that sale of *product A would fall down by 25% if B is not sold* the decision might change. The company would *lose ₹ 5 lacs* (25% of 20 lacs) because of *reduced sales of A*. The **net loss** for the company if it decides to **stop production of B is ₹ 3 lacs (2 lacs of savings from B and 5 lacs of loss of profits from A)**. Hence the decision to stop of production B is not prudent as per *Strategic Cost Management Technique*.

CASE-1

A manufacturing company does not carry out preventive maintenance of its machineries on a regular basis to save costs. Repair of machinery is carried out as and when a machinery breaks down. This is a traditional approach to cost management where the focus is on cost reduction and cost saving. This is a short- term approach to manage costs.

When machinery breaks down, the company loses more in terms of loss time production and idle labour time. Lack of regular preventive maintenance and planned shutdown time also reduces the life of the machinery and has a longer- term impact. If the loss of production is significant, the company might lose market share to its competitors. Hence, it is important to look at cost management with a strategic focus.

CASE-2

A telecom company closed down some of its customer service centres as a cost cutting measure. This led to overcrowding of customers at other centres and longer waiting time for the customers. The volume of work at other centres increased impacting the performance of employees. Both the customers and employees, two of the key stakeholders, were not happy with the company's decision. This type of business decision can impact the reputation and brand image of the company and impact the sales and profitability in the longer run.

STRATEGIC COST MANAGEMENT

LIFE CYCLE COSTING

MEANING

Life cycle costing, aims at cost ascertainment of a product, project etc. over its projected life. It is a system that tracks and accumulates the actual costs and revenues attributable to cost object from its inception to its abandonment.

PRODUCT LIFE CYCLE

Product life cycle is a pattern of expenditure, sale level, revenue and profit over the period from new idea generation to the deletion of product from product range.

Product life cycle spans the time from initial R&D on a product to when customer servicing and support is no longer offered for the product. For products like motor vehicles this time span may range from 5 to 7 years. For some basic pharmaceuticals, the time span may be 7 to 10 years. In case of cameras, photocopying machines etc. the life is more than 100 years.

PHASES IN PRODUCT LIFE CYCLE

The four identifiable phases in the Product Life Cycle are (a) Introduction (b) Growth (c) Maturity and (d) Decline. A comparative analysis of these phases is given below:

	Introduction	Growth	Maturity	Decline
Objectives	Create product awareness & trial	Maximise market share	Maximise profits while defending market share	Reduce expenditures & milk the brand
Sales	Low sales	Rapidly rising	Peak sales	Declining sales
Costs per Customer	High cost per customer	Average cost per customer	Low cost per customer	Low cost per customer
Profits	Negative	Rising profits	High profits	Declining profits
Customers	Innovators	Early adopters	Middle majority	Laggards
Competitors	Few	Growing number	Steady number beginning to decline	Declining number

STRATEGIC COST MANAGEMENT

	Introduction	Growth	Maturity	Decline
Product	Offer basic product	Offer product extensions, service & warranty	Diversify brands and models	Phase out weak items
Price	Cost plus profit	Price to penetrate market	Price to match or beat competitors	Price cutting
Advertising	Build product awareness amongst early adopters & dealers	Build awareness & interest in mass market	Stress on brand differences and benefits	Reduce level to keep hard core loyalty
Distribution	Build selective distribution	Build intensive distribution	Build more intensive distribution	Go selective: Phase out unprofitable outlets
Sales Promotion	Use heavy sales promotion to entice trial	Reduce to take advantage of heavy consumer demand	Increase to encourage brand switching	Reduce to minimal level

PRODUCT LIFE CYCLE COSTING

It is an approach used to provide a long-term picture of product line profitability, feedback on the effectiveness of life cycle planning cost data to clarify the economic impact of alternatives chose in the design, engineering phase etc. It is also considered as a way to enhance the control of manufacturing costs. The thrust of product life cycle costing is on the distribution of costs among categories changes over the life of the product, as does the potential profitability of a product. Hence it is important to track and measure costs during each stage of a product's life cycle.

FEATURES / CHARACTERISTICS OF PRODUCT LIFE CYCLE COSTING

1. Product life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their entire life cycle. Costs and revenues can be analysed by time periods, but the emphasis is on costs and revenue accumulation over the entire life cycle for each product.
2. Product life cycle costing traces research and design and development costs, incurred to individual products over their entire life cycles, so that the total magnitude of these costs for each individual product can be reported and compared with product revenues generated in later periods.
3. Life cycle costing therefore ensures that costs for each individual product can be reported and compared with product revenues generated in later periods. Hence, the costs are made more visible.

STRATEGIC COST MANAGEMENT

BENEFITS OF PRODUCT LIFE CYCLE COSTING

1. The product life cycle costing results in earlier actions to generate revenue or to lower costs than otherwise might be considered. There are a number of factors that need to be managed in order to maximize return on a product.
2. Better decisions should follow from a more accurate and realistic assessment of revenues and costs, at least within a particular life cycle stage.
3. Product life cycle thinking can promote long-term rewarding in contrast to short-term profitability rewarding.

IMPORTANCE OF PRODUCT LIFE CYCLE COSTING

1. **Time based analysis:** Life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their life cycle. Costs and revenues can be analysed by time periods. The total magnitude of costs for each individual product can be reported and compared with product revenues generated in later periods.
2. **Overall Cost Analysis:** Production costs are accounted and recognized by the routine accounting system. However non-production costs like R&D, design, marketing, distribution, customer service etc. are less visible on a product-by-product basis. Product Life Cycle Costing focuses on recognizing both production and non-production cost.
3. **Pre-production Costs analysis:** The development period for R&D and design is long and costly. A high percentage of total product costs may be incurred before commercial production begins. Hence, the company needs accurate information on such costs for deciding whether to continue with the R&D or not.
4. **Effective Pricing Decisions:** Pricing Decisions, in order to be effective, should include market consideration on the one hand and cost considerations on the other. Product Life Cycle Costing and Target Costing help in analysis both these considerations and arrive at optimal price decisions.
5. **Better Decision Making:** Better decisions should follow from a more accurate and realistic assessment of revenues and costs, at least within a particular life cycle stage.
6. **Long Run Holistic view:** Product life cycle thinking can promote long-term rewarding in contrast to short-term profitability rewarding. It provides an overall framework for considering total incremental costs over the entire life span of a product, which in turn facilitates analysis of parts of the whole where cost effectiveness might be improved.
7. **Life Cycle Budgeting:** Life Cycle Budgeting, i.e., Life Cycle Costing with Target Costing principles, facilitates scope for cost reduction at the design stage itself. The Company stands to benefit since costs are avoided before they are committed or locked in.
8. **Review:** Life Cycle Costing provides scope for analysis of long-term picture of product line profitability, feedback on the effectiveness of life cycle planning and cost data to clarify the economic impact of alternatives chosen in the design, engineering phase etc.

STRATEGIC COST MANAGEMENT

TARGET COSTING

MEANING

Target Costing is defined as “a structured approach to determine the cost at which a proposed product with specified functionality and quality must be produced, to generate a desired level of profitability at its anticipated-selling-price”

STEPS IN TARGET COSTING APPROACH TO PRICING

- 1. Setting of target selling price:** The setting of target selling price of a product which customers are prepared to pay, depend on many factors like design specifications of the product, competitive conditions, customer’s demand for increased functionality and higher quality projected production volume, sales forecasts etc. A concern can set its target selling price after taking into account all of the aforesaid factors.
- 2. Determination of target costs:** Target profit margin may be established after taking into account long-term profit objectives and projected volume of sales. On deducting target profit margin from target selling price, target cost is determined.
- 3. Estimate the actual cost of the product:** Actual cost of the product may be determined after taking into account the design specifications, material cost and other costs required to produce the product.
- 4. Comparison of estimated cost with actual cost:** In case the estimated cost of the product is higher than that of the target cost of the product then the concern should resort to cost reduction methods involving the use of **Value Engineering / Value Analysis** tools. (refer complete Value Engineering Process in Activity Based Costing)

STEPS INVOLVED IN IMPLEMENTING A TARGET COSTING SYSTEM:

- 1. Create a Project Charter:** Project Charter is a document, approved by top management that describes its goals and what it is authorized to do. This Charter is based on the corporate mission statement and related goals. Written approval of Project Charter by the top management provides the target costing effort with a strong basis of support and direction in all subsequent efforts.
- 2. Obtain a Management Sponsor:** Management Sponsor is an individual belonging to top management. His role will be to support the initiative in all respects, to obtain funding, to co-ordinate with other members of top management, to eliminate problems in a timely manner.
- 3. Obtain a Budget:** The funding should be based on a formal allocation of money through the corporate budget. The fund should be given unreservedly to the target costing effort.
- 4. Assign a Strong Team Manager:** The Target Costing Team involves the active participation of many members with diverse backgrounds. A strong Team Manager is required to bring the group together as a smooth functioning team focused on key objectives. He should be skilled in dealing with management, the use of project tools and working with a diverse group of people. This manager should be a full-time employee, so that his or her complete attention can be directed towards the welfare of the project.

STRATEGIC COST MANAGEMENT

- 5. Enroll Full-time Participants:** It is essential that the members of the team be devoted to it full-time rather than trying to fulfill other commitment elsewhere in the company at the same time. They should have a single focus on ensuring the success of the target-costing program.
- 6. Use Project Management Tools:** Target costing can be a highly complex effort especially for high-cost products with many features and components. The team should use all available project management tools, such as Microsoft Project (for tracking the completion of specific tasks), a company database containing various types of costing information and a variety of product design tools.

ADVANTAGES OF TARGET COSTING

- 1. Innovation:** It reinforces top-to-bottom commitment to process and product innovation and is aimed at identifying issues to be resolved.
- 2. Competitive Advantage:** It enables a firm to achieve competitive advantage over other firms in the industry. The firm, which achieves cost reduction targets realistically, stands to gain in the long run.
- 3. Market Driven Management:** It helps to create a company's competitive future with market-driven management for designing and manufacturing products that meet the price required for market success.
- 4. Real Cost Reduction:** It uses management control systems to support and reinforce manufacturing strategies and to identify market opportunities that can be converted into real savings to achieve the best value rather than simply the lowest cost.

FEATURES OF TARGET COSTING

Target Costing is defined as "a structured approach in determining the cost at which a proposed product with specified functionality and quality must be produced, to generate a desired level of profitability at its anticipated selling price."

The main features or practices followed in Target Costing are

- Step 1:** Identify the market requirements as regards design, utility and need for a new product or improvements of existing product.
- Step 2:** Set Target Selling Price based on customer expectations and sales forecasts.
- Step 3:** Set Target Production Volumes based on relationships between price and volume.
- Step 4:** Establish Target Profit Margin for each product, based on the company's long term profit objectives, projected volumes, and course of action, etc.
- Step 5:** Set Target Cost per unit, for each product. $TC = \text{Target selling price} - \text{Target profit margin}$
- Step 6:** Determine Current Cost of producing the new product, **based** on available resources and conditions.
- Step 7:** Set cost reduction Target in order to reduce the Current Cost to the Target Cost.
- Step 8:** Analyze the Cost Reduction Target into various components and identify cost reduction opportunities using Value Engineering (VE) and Value Analysis (VA) and Activity Based Costing.
- Step 9:** Achieve cost reduction and Target profit by Effective Implementation of Cost Reduction decisions
- Step 10:** Focus on further possibilities of cost reduction ie Continuous Improvement program.

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PROBLEMS WITH TARGET COSTING

1. The development process can be lengthened to a considerable extent since the design team may require a number of design iterations before it can devise a sufficiently low-cost product that meets the target cost and margin criteria.
2. A large amount of mandatory cost cutting can result in finger-pointing in various parts of the company, especially if employees in one area feel they are being called on to provide a disproportionately large part of the savings.
3. Representatives from number of departments on the design team can sometimes make it more difficult to reach a consensus on the proper design.

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KAIZEN COSTING

KAIZEN COSTING

KAIZEN COSTING refers to the *ongoing continuous improvement program that focuses on the reduction of waste in the production process, thereby further lowering costs below the initial targets specified during the design phase*. It is a Japanese term for a number of cost reduction steps that can be used subsequent to issuing a new product design to the factory floor.

*The initial VE review may not be complete and perfect in all costs aspects. There may be further chances of waste reduction, cost and time reduction and product improvement. Such continuous cost reduction technique is call as **KAIZEN COSTING**.*

The review of product costs under the target costing methodology is not reserved just for the period up to the completion of design work on a new product. On the contrary, there are always opportunities to control costs after the design phase is completed, though these opportunities are fewer than during the design phase.

PROCESS OF KAIZEN COSTING

Activities in Kaizen Costing include elimination of waste in production, assembly, and distribution processes, as well as the elimination of unnecessary work steps in any of these areas. Thus Kaizen Costing is intended to repeat many of the value engineering steps, continuously and constantly refining the process, thereby eliminating out extra costs at each stage.

KAIZEN COSTING VS VALUE ENGINEERING

Cost reductions resulting from Kaizen Costing are much smaller than those achieved with Value Engineering. But these are still significant since competitive pressures are likely to force down the price of a product over time, and any possible cost savings allow a Company to still attain its targeted profit margins.

MULTIPLE VERSIONS OF PRODUCTS - CONTINUOUS KAIZEN COSTING

Multiple improved versions of products can be introduced to meet the challenge of gradually reducing costs and prices. The market price of products continues to drop over time, which forces a Company to use both target and kaizen costing to reduce costs and retain its profit margin.

However, prices eventually drop to the point where margins are reduced, which forces the Company to develop a new product with lower initial costs and for which kaizen costing can again be used to further reduce costs. This pattern may be repeated many times as a Company forces its costs down through successive generations of products.

The exact timing of a switch to a new product is easy to determine well in advance since the returns from kaizen costing follow a trend line of gradually shrinking savings. Since prices also follow a predictable downward track, plotting these two trend lines into the future reveals when a new product version must be ready for production.

STRATEGIC COST MANAGEMENT

DIFFERENCE BETWEEN STANDARD COSTING AND KAIZEN COSTING

STANDARD COSTING	KAIZEN COSTING
It is used for cost control	It is used for cost reduction
It is assumed that current manufacturing conditions remain Unchanged.	It assumes continuous improvement
The cost focus is on standard costs based on static conditions	The cost focus is on actual costs assuming dynamic conditions
The aim is to meet cost performance standards	The aim is to achieve cost reduction targets
Standards are set every six or twelve months	Cost reduction targets are set and applied monthly
Costs are controlled using variance analysis based on standard and actual costs.	Costs are reduced by implementing continuous improvement (kaizen) to attain the target profit or to reduce the gap between target and estimated profit
Management should investigate and respond when standards are not met.	Management should investigate and respond when target kaizen amount are not attained
They are often viewed as the cause of problems	They are viewed as the source of, and are empowered to find, the solutions

SDR Ltd. is planning to introduce Kaizen Costing approach in its manufacturing plant. State whether and why the following are VALID or NOT in respect of Kaizen Costing

1. VP (Finance) is of the view that company has to make a huge initial investment to bring a large scale modification in production process.
2. Head (Personnel) has made a point that introduction of Kaizen Costing does not eliminate the training requirement of employees.
3. General Manager (Manufacturing) firmly believes that only shop floor employees and workers involvement is prerequisite of Kaizen Costing approach.
4. Manager (Operations) has concerns about creation of confusion among employees and workers regarding their roles and degradation in quality of production.

ANS:

1. **Invalid:** Kaizen Costing is the system of cost reduction procedures which involves making small and continuous improvements to the production processes rather than innovations or large-scale investment.
2. **Valid:** The training of employees is very much a long-term and ongoing process in the Kaizen costing approach. Training enhances the abilities of employees.
3. **Invalid:** Kaizen Costing approach involves everyone from top management level to the shop floor employees. Every employee's active participation is a must requirement.
4. **Invalid:** Though the aim of Kaizen Costing is to reduce the cost but at the same time it also aims to maintain the quality. Kaizen costing also aims to bring the clarity in roles and responsibilities for all employees.

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VALUE ANALYSIS & VALUE ENGINEERING

VALUE ANALYSIS

It entails studying the activities that are involved in producing the product to detect **Non-Value-Added Activities** that may be eliminated to save cost but without reducing the functionality or quality of the product.

In other words, it is a planned, scientific approach to cost reduction which reviews the material composition of a product and production design so that modifications and improvements can be made which do not reduce the value of the product to the customer or to the user.

VALUE ENGINEERING

Value Engineering is an organized/systematic approach directed at analyzing the function of systems, equipment, facilities, services, and supplies for the purpose of achieving their essential functions at the lowest life-cycle cost consistent with required performance, reliability, quality, and safety.

Society of Japanese Value Engineering defines VE as: *“A systematic approach to analyzing functional requirements of products or services for the purposes of achieving the essential functions at the lowest total cost”.*

Value Engineering is an effective problem solving technique. Value engineering is essentially a process which uses function analysis, team-work and creativity to improve value.

In other words, *Value Engineering is an Elimination of some existing features from the product and adding some new features in the product in such a way that the actual cost of the product comes closer to the target cost but without reducing the functionality or quality of the product.*

It is the application of value analysis to new products. Value engineering relates closely to target costing as it is cost avoidance or cost reduction before production. Value analysis is cost avoidance or cost reduction of a product already in production; both adopt the same approach i.e. a complete audit of the product.

VALUE-ADDED ACTIVITIES (VA)

1. These are activities necessary for the performance of the process.
2. These represent work that is valued by the external or internal customer.
3. They improve the quality or function of a product. Hence, the customers are usually willing to pay for the service. VA activities result in “Cost” and not in losses.

Example: A company produces mobile phones and spends ₹20,00,000 to develop technology that allows users to turn on their devices using voice commands. Since this change enhances the function of the product in question, it is considered a value-added cost, as customers are more likely to pay a premium for phones that include this feature.

STRATEGIC COST MANAGEMENT

NON-VALUE-ADDED ACTIVITIES (NVA)

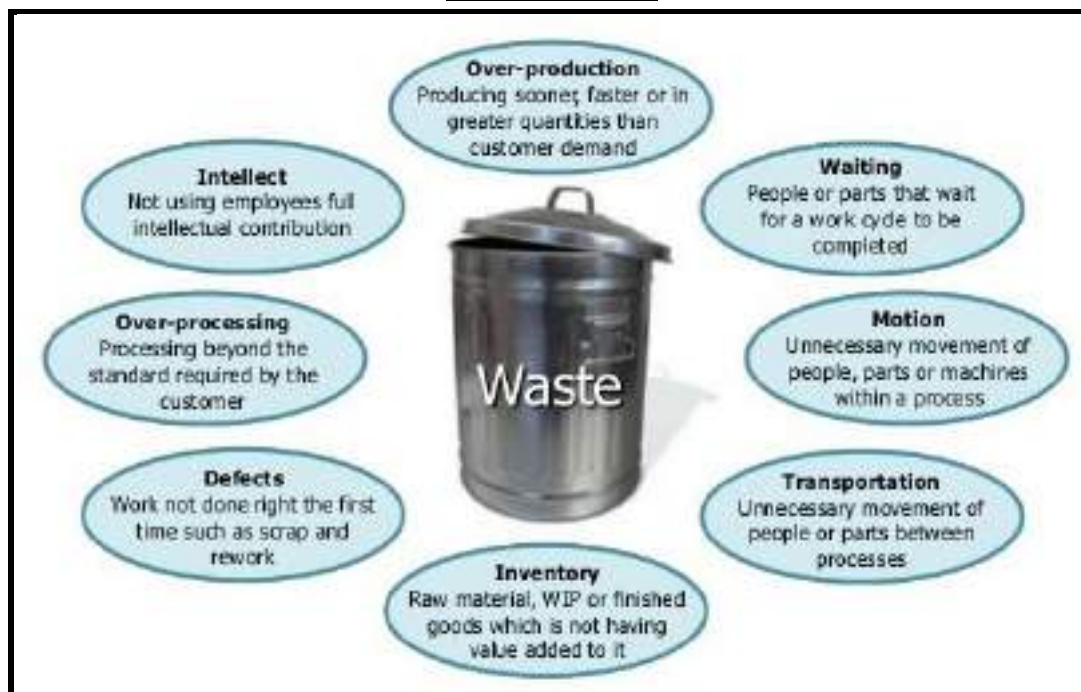
1. These are additional and extraneous activities, not fully necessary for the performance of the process.
2. These represent work that is not valued by the external or internal customer.
3. NVA activities do not improve the quality or function of a product or service but they can adversely affect costs and prices. NVA activities create waste, result in delay of some sort, add cost to the products or services for which the customer is not willing to pay.

Example: If a mobile phone company spends ₹50,00,000 on patents and legal work, that ₹50,00,000 is a **non-value-added cost** because it **doesn't increase the perceived value of the products being sold in the eyes of customers.**

NON-VALUE-ADDED ACTIVITIES INCLUDE REWORK, INSPECTION, MOVEMENT AND ANY OF THE 8 WASTES.

1. The time your employees spend moving the raw materials into your warehouse and entering each item into the inventory accounting program are non-value-added activities.
2. Returning damaged or defective raw materials are additional non-value-added activities.
3. Inspection and quality control are non-valued-added activities.
4. Inspecting the work in process or finished items do not add value to them.
5. Reworking defective items are non-value-added activities.
6. Moving defective items from the production line to the reworking station and back to the production line are non-value-added activities.

8 WASTES



STRATEGIC COST MANAGEMENT

STATE WHETHER EACH OF THE FOLLOWING INDEPENDENT ACTIVITIES IS VALUE ADDED OR NON-VALUE ADDED

S. No	Item	Nature of Activities
1.	Polishing furniture used by a Systems Engineer in a Non-value added software firm	Non- Value-added
2.	Maintenance by a software company of receivables management software for a banking company	Value-added
3.	Painting of pencils manufactured by a pencil factory	Value-added
4.	Customers' computer key board cleaning by a Computer repair centre	Value-added
5.	Providing brake adjustments in cars for repairs by a care service station.	Value-added

STRATEGIC COST MANAGEMENT

THROUGHPUT ACCOUNTING

MEANING OF THROUGHPUT ACCOUNTING

Throughput Accounting is a management accounting technique used as the performance measure in the Theory of Constraints (TOC). It is the business intelligence used for maximizing profits, however, unlike cost accounting that primarily focuses on 'cutting costs' and reducing expenses to make a profit.

As per – CIMA Terminology, Throughput Accounting is defined as follows:

"A management accounting system which focuses on ways by which the maximum return per unit of bottleneck activity can be achieved".

FACTORS AFFECTING THROUGHPUT

- Selling price
- Direct purchase price
- Usage of direct materials
- Volume of throughput

CONSTRAINTS ON THROUGHPUT MIGHT INCLUDE

- Existence of an uncompetitive selling price
- Need to deliver on time to particular customers
- Lack of product quality and reliability
- Lack of reliable material suppliers
- Existence of shortage of production resources

STEPS TO BE FOLLOWED TO INCREASE THE THROUGHPUT

1. Identification of Bottleneck
2. Exploit the Bottleneck & utilise fully
3. Subordinate & Synchronize to the bottleneck
4. Elevate the Performance of the bottleneck
5. Repeat the Process as a new bottleneck

THROUGHPUT ACCOUNTING RATIO (TA RATIO)

TA Ratio shows the relationship between Return per factory hour and Cost per factory hour.

FORMULA OF THROUGHPUT ACCOUNTING (TA) RATIO

TA Ratio = Return per factory hour / Cost per factory hour

DECISION MAKING BASED ON THROUGHPUT ACCOUNTING (TA) RATIO

TA Ratio	Decision	Reason
1. Less than 1	Not Produce	Product will lose money for the company
2. More than 1	Produce	Product will gain money for the company

STRATEGIC COST MANAGEMENT

MEANING OF THROUGHPUT

The rate at which raw materials are turned into sales is called Throughput.

TERMS USED IN THROUGHPUT ACCOUNTING

1. Throughput:

Throughput is the *excess of sales value over the totally variable cost*. That is nothing but contribution margin left after a product's price is reduced by the amount of its totally variable cost.

2. Totally Variable Cost:

This cost is incurred only if a product is produced. In many cases only direct materials are considered as totally variable cost. *Direct labour is not totally variable, unless piece rate wages are paid.*

3. Capacity Constraints:

It is a resource within a company that limits its total output. For example, it can be a machine that can produce only a specified amount of a key component in a given time period, thereby keeping overall sales from expanding beyond the maximum capacity of that machine. There may be more than one capacity constraint in a company, but rarely more than one for specified product or product line.

4. Throughput Time:

Throughput time is the average time required to convert raw materials into finished goods ready to be shipped to customer. It includes the time required for activities such as material handling, production processing, inspecting and packaging.

5. Throughput Efficiency:

Throughput efficiency is the relation of throughput achieved to resources used.

Throughput efficiency = $\frac{\text{Throughput cost}}{\text{Actual factory cost}}$

6. Operating Expenses:

This is sum total of all company expenses including totally variable expenses. It should be noted that throughput accounting does not care, if a cost is semi-variable, fixed or allocated - all costs that are not totally variable is lumped together for throughput accounting purpose. This group of expenses is considered the price that a company pays to ensure that it maintains its current level of capacity.

7. Investment:

This term is used here also, as it is used in common parlance, *i.e.* any application of funds, which is intended to provide a return by way of interest, dividend or capital appreciation.

However, there is a particular emphasis on company's investment in working capital. This is discussed subsequently in discussion about throughput model.

8. Total Factory Cost:

With the exception of material costs, in the short run, most factory costs (including direct labour) are fixed. These fixed costs can be grouped together and called total factory costs (TFC).

STRATEGIC COST MANAGEMENT

THEORY OF CONSTRAINTS

- ❖ The theory of constraint focuses its attention on constraints and bottlenecks within the organisation which hinder speedy production.
- ❖ The main concept is to maximise the rate of manufacturing output i.e. the throughput of the organisation.
- ❖ This requires to examine the bottlenecks and constraints.
- ❖ A bottleneck is an activity within the organisation where the demand for that resource is more than its capacity to supply.
- ❖ A constraint is a situational factor which makes the achievement of objectives/throughput more difficult than it would otherwise be.
- ❖ Constraints may take several forms such as lack of skilled employees, lack of customers' orders or the need to achieve a high level of quality product output.
- ❖ Therefore, "a bottleneck is always a constraint but a constraint need not be a bottleneck".
- ❖ The idea behind TOC is that raw materials are the only variable costs. Labour and variable overheads are considered as fixed cost.
- ❖ The TOC describes methods to maximise operating income under bottleneck situation.

STRATEGIC COST MANAGEMENT

BUSINESS PROCESS RE-ENGINEERING

MEANING OF BUSINESS PROCESS RE-ENGINEERING

Business Process Re-engineering (BPR) refers to the **fundamental rethinking** and **radical redesign** of business processes to achieve **dramatic improvements** in critical contemporary measures of performance, such as cost, quality, service and speed.

CHARACTERISTICS OF BUSINESS PROCESS RE-ENGINEERING

1. Several jobs are combined into one.
2. Often workers make decisions.
3. The steps in the process are performed in a logical order.
4. Work is performed, where it makes most sense.
5. Quality is built in.
6. Manager provides a single point of contact.
7. Centralized and decentralized operations are combined.

7 PRINCIPLES OF BUSINESS PROCESS RE-ENGINEERING

1. Processes should be designed to achieve a desired outcome rather than focusing on existing tasks.
2. Personnel who use the output from a process should perform the process
3. Information processing should be included in the work, which produces the information
4. Geographically dispersed resources should be treated, as if they are centralized
5. Parallel activities should be linked rather than integrated
6. Doers (Officer) should be allowed to be self-managing
7. Information should be captured once at source.

EXAMPLE OF BUSINESS PROCESS RE-ENGINEERING

CREDIT CARD APPROVAL

An applicant submits an application. The application is reviewed first to make sure that the form has been completed properly. If not, it is returned for completion. The complete form goes through a verification of information. This is done by ordering a report from a credit company and calling references. Once the information is verified, an evaluation is done. Then, a decision (yes or no) is made. If the decision is negative, an appropriate rejection letter is composed. If the decision is positive, an account is opened, and a card is issued and mailed to the customer.

The process, which may take a few weeks due to workload and waiting time for the verifications, is usually done by several individuals. Business processes are characterized by three elements:

- **The inputs**, (data such customer inquiries or materials),
- **The processing** of the data or materials (which usually go through several stages and may necessary stops that turns out to be time and money consuming), and
- **The outcome** (the delivery of the expected result).

The problematic part of the process is processing. Business process reengineering mainly intervenes in the processing part, which is reengineered in order to become less time and money consuming.

STRATEGIC COST MANAGEMENT

BACK-FLUSH ACCOUNTING SYSTEM

MEANING OF BACK-FLUSH ACCOUNTING

Backflush accounting is defined as *"a cost accounting system which focuses on the output of the organization and then work backwards to allocate costs between cost of goods sold and inventory"*. Basing on JIT system, Backflush accounting requires no data entry of any kind until a finished product is completed. Backflush accounting is a simpler book-keeping system designed to reflect key aspects of JIT system i.e. little or no work-in-progress and demand pull. **Accounting starts at the finished stage, or after the sale of goods, when standard costs are used to work backwards to flush out the manufacturing costs.** At that time the total amount finished is entered into the computer system which is multiplied by all components as per the Bill of materials (BOM) for each item produced. **It focuses on output of the firm (i.e. finished goods) and then works backwards to attribute costs between cost of goods sold and finished goods inventory and/or raw materials inventory with no separate accounting for WIP.**

BENEFITS OF BACKFLUSH ACCOUNTING

- 1) It removes the incentive for managers to produce for inventory.
- 2) It is specially attractive in organizations that have low inventories resulting from JIT.
- 3) The managers are not interested in building stock, as nothing gets recorded until the sale is made.
- 4) It eliminates a lot of material administration, record keeping and clerical costs.
- 5) This is a simpler cost accounting system designed to reduce or eliminate detailed accounting entries.
- 6) It requires no data entry of any kind until a finished product is completed.
- 7) There is no separate accounting for RM & WIP
- 8) There are few accounting entries, supporting vouchers, work flow documents and so on.
- 9) The system may discourage managers in producing for stock. Working on material does not add value if it moves into stock.

VARIANTS OF BACKFLUSH ACCOUNTING

There are a number of variants of the Backflush system, each differing as to the 'trigger points' at which costs are recognized within the cost accounts and thus associated with products.

Variant 1: This has two trigger points (TP)

TP 1 - Purchase of raw materials / components. A 'raw and in process (RIP)' account will be debited with the actual cost of materials purchased, and creditors credited.

TP 2 - Completion of good units. The finished goods (FG) account will be debited with the standard cost of unit produced and the RIP and CC account will be credited with the standard cost.

Under this variant, then, there will be two stock accounts:

- Raw materials (which may, in fact, be incorporated into WIP)
- Finished goods

Variant 2: This has only one trigger point (TP)

TP 1 - The completion of good units. The FG account is debited with the standard cost of units produced, with corresponding credits to the CC account and the creditors account.

STRATEGIC COST MANAGEMENT

POINTS TO BE NOTED IN BACKFLUSH ACCOUNTING

- There are several variants of Backflush Accounting depending on the inventory accounts maintained and the number and type of trigger points (these determine when entries are made in the accounts).
- Conversion costs (labour and Overheads) are recorded as in traditional systems and then applied to products at various trigger points. Normally any conversion costs not applied to products are written off immediately as expenses incurred in the period.
- A popular one being the replacement of separate Raw Materials and WIP accounts with a single account; Raw and in Process (RIP) account.
- When items are sold the standard cost for the materials in the finished goods would be credited (or back- flushed) to the RIP account.
- All conversion costs (labour and materials) would be applied to the cost of finished goods production, none would be applied to WIP.

JOURNAL ENTRIES UNDER BACKFLUSH ACCOUNTING SYSTEM

Particulars		Debit (₹)	Credit (₹)
RIP A/c	Dr.	xx	
To Creditors A/c			xx
<i>(Being purchase of raw materials on credit)</i>			
Conversion Cost Control A/c	Dr.	xx	
To Creditors A/c			xx
<i>(Being Conversion Cost incurred)</i>			
Finished Goods Stock A/c		(QP X SCPU)	Dr. xx
To RIP A/c		(QP X MCPU)	xx
To Conversion Cost Control A/c		(QP X CCPU)	xx
<i>(Being RM & CC Charged to cost of goods produced at Standard Cost)</i>			
Cost of Sales A/c		(QS X SCPU)	Dr. xx
To Finished Goods Stock A/c			xx
<i>(Being cost of goods sold)</i>			
At the end of the period there will be Two Separate Stock Balances:			
RIP Account	(RM Purchase – RM Charged)	=	xx
Finished goods	(QP - QS) × SCPU	=	xx

- Notes - (a) All the entries shown above are at standard cost
 (b) For simplicity the figures have been chosen so that no variance arises.

STRATEGIC COST MANAGEMENT

Q.1 In a period a company has the following transactions:

Purchase of raw materials	₹ 85,000	Production	4,900 units
Conversion Cost (LC+OH)	₹ 68,600	Sales	4,850 units

There were no opening stocks of raw materials, WIP or finished goods. The standard cost per unit is ₹31 (i.e. ₹17 Materials + ₹14 Conversion cost). There was no closing WIP at the end of the period.

Show the Journal entries for a Backflush Accounting System using a Raw material and In Process Account.

Solution

JOURNAL ENTRIES (UNDER BACK-FLUSH ACCOUNTING SYSTEM)

Particulars	Debit (₹)	Credit (₹)
RIP A/c	Dr. 85,000	
To Creditors A/c		85,000
<i>(Being purchase of raw materials on credit)</i>		
Conversion Cost Control A/c	Dr. 85,000	
To Creditors A/c		85,000
<i>(Being Conversion Cost incurred)</i>		
Finished Goods Stock A/c (4900 X 31)	Dr. 1,51,900	
To RIP A/c		83,300
To Conversion Cost Control A/c		68,600
<i>(Being cost of goods produced for 4,900 units)</i>		
Cost of Sales A/c (4850 X 31)	Dr. 1,50,350	
To Finished Goods Stock A/c		1,50,350
<i>(Being cost of goods sold for 4,850 units)</i>		

At the end of the period there will be two separate stock balances:

RIP Account	(85,000- 83,300)	=	₹1,700
Finished goods	(4900-4850) ×31	=	₹1,550

- Notes - (a) All the entries shown above are at standard cost
 (b) For simplicity the figures have been chosen so that no variance arises.

STRATEGIC COST MANAGEMENT

Q.2 In a period a company has the following transactions:

Purchase of raw materials	₹ 23,00,000	Production	50,000 units
Conversion Cost (LC+OH)	₹ 12,50,000	Sales	49,000 units

There were no opening stocks of raw materials, WIP or finished goods. The standard cost per unit is ₹70 (i.e. ₹45 Materials + ₹25 Conversion cost). There was no closing WIP at the end of the period.

Show the Journal entries for a Backflush Accounting System using a Raw material and In Process Account.

Solution

JOURNAL ENTRIES (UNDER BACK-FLUSH ACCOUNTING SYSTEM)

Particulars	Debit (₹)	Credit (₹)
RIP A/c	Dr. 23,00,000	
To Creditors A/c		23,00,000
<i>(Being purchase of raw materials on credit)</i>		
Conversion Cost Control A/c	Dr. 12,50,000	
To Creditors A/c		12,50,000
<i>(Being Conversion Cost incurred)</i>		
Finished Goods Stock A/c	(50,000 X 70) Dr. 35,00,000	
To RIP A/c	(50,000 X 45)	22,50,000
To Conversion Cost Control A/c	(50,000 X 25)	12,50,000
<i>(Being cost of goods produced for 50,000 units)</i>		
Cost of Sales A/c	(49,000 X 70) Dr. 34,30,000	
To Finished Goods Stock A/c		34,30,000
<i>(Being cost of goods sold for 49,000 units)</i>		

At the end of the period there will be two separate stock balances:

RIP Account	(23,00,000- 22,50,000)	=	₹50,000
Finished goods	(50,000 – 49,000) ×70	=	₹70,000

- Notes - (a) All the entries shown above are at standard cost
 (b) For simplicity the figures have been chosen so that no variance arises.

STRATEGIC COST MANAGEMENT

Q.3 SDR Ltd. follows JIT system. It had following transactions in May, 2014:

Raw materials were purchased	₹2,00,000
Direct labour cost incurred	₹36,000
Actual overhead costs incurred	₹3,00,000
Conversion costs applied	₹3,16,000

All materials, that were purchased, were placed into production and the production was also completed and sold during the month. The difference between actual and applied costs is computed.

You are required to pass journal entries under Backflush accounting system.

Solution

JOURNAL ENTRIES (UNDER BACK-FLUSH ACCOUNTING SYSTEM)

Particulars	Debit (₹)	Credit (₹)
RIP A/c	Dr. 2,00,000	
To Creditors A/c		2,00,000
<i>(Being purchase of raw materials on credit)</i>		
Conversion Cost Control A/c (36,000 + 3,00,000)	Dr. 3,36,000	
To Creditors A/c		3,36,000
<i>(Being Conversion Cost incurred)</i>		
Finished Goods Stock A/c (2,00,000 + 3,16,000)	Dr. 5,16,000	
To RIP A/c		2,00,000
To Conversion Cost Control A/c		3,16,000
<i>(Being cost of goods produced)</i>		
Cost of Sales A/c	Dr. 5,16,000	
To Finished Goods Stock A/c		5,16,000
<i>(Being cost of goods sold)</i>		

At the end of the period there will be two separate stock balances:

RIP Account	=	NIL
Finished goods (5,16,000 - 5,16,000)	=	NIL

STRATEGIC COST MANAGEMENT

LEAN ACCOUNTING

MEANING OF LEAN

- Lean is a **management philosophy** based on the Toyota Production System (TPS)
- Eliminate everything that does not add value (waste) in the **customer's eyes**

MEANING OF LEAN ACCOUNTING

Lean Accounting is the general term used for *the changes required to a Company's accounting, control, measurement, and management processes to support lean manufacturing and lean thinking*. Most companies embarking on lean manufacturing soon find that their accounting processes and management methods are at odds with the lean changes they are making. The reason for this is that traditional accounting and management methods were designed to support traditional manufacturing; they are based upon mass production thinking. Lean manufacturing breaks the rules of mass production, and so the traditional accounting and management methods are (at best) unsuitable and usually actively hostile to the lean changes the company is making.

NEED FOR LEAN ACCOUNTING

- Lean Accounting provides accurate, timely and understandable information that can be used by managers, sales people, operations leaders, accountants, lean improvement teams and other policy makers.
- The information gives clear insight into the company's performance both operational and financial.
- It measures the right things for a company that wants to drive forward with lean transformation.
- The Lean accounting reporting motivates people in the organization to move lean improvement forward. It is often stated that-what you measure is what will be improved.
- Lean Accounting is also itself lean.
- The information, reports and measurements can be provided quickly and easily.
- It does not require the complex systems and wasteful transactions that are usually used by manufacturing Companies.
- The simplicity of lean Accounting frees up the time of the financial people and the operational people so that they can become more actively involved in moving the Company forward towards its strategic goals.

STRATEGIC COST MANAGEMENT

SHORT NOTE ON LEAN ORGANISATION

- For years together manufacturers have created products in anticipation of having a market for them.
- Operations have traditionally been driven by sales forecasts and firms tended to stockpile inventories in case they were needed.
- A key difference in Lean Manufacturing is that it is based on the concept that production can and should be driven by real customer demand.
- Instead of producing what you hope to sell; Lean Manufacturing can produce what your customer wants with shorter lead times. Instead of pushing product to market, it's pulled there through a system that's set up to quickly respond to customer demand.
- Lean organizations are capable of producing high-quality products economically in lower volumes and bringing them to market faster than mass producers.
- A lean organization can make twice as much product with twice the quality and half the time and space. At half the cost, with a fraction of the normal work-in-progress inventory.
- Lean management is about operating the most efficient and effective organization possible, with the least cost and zero waste.

STRATEGIC COST MANAGEMENT

SOCIO ECONOMIC COSTING

MEANING OF SOCIO ECONOMICS

SOCIO ECONOMICS /SOCIAL ECONOMICS *is the social science that studies how economic activity affects and is shaped by social processes.* In general it analyzes how societies progress, stagnate, or regress because of their local or regional economy, or the global economy.

Socio Economics is sometimes used as an umbrella term with different usages. The term 'Social Economics' may refer broadly to the "use of economics in the study of society.

Companies are increasingly interested in measuring socio-economic impact as part of maintaining their license to operate, improving the business enabling environment, strengthening their value chains, and fuelling product and service innovation.

STRATEGIC COST MANAGEMENT

COST CONTROL AND COST REDUCTION

COST CONTROL

Cost Control involves continuous comparisons of actual with the standards or budgets to regulate the former. Standards or budgets once set up are not attended during the period or until some mistakes are discovered in standards.

STEPS INVOLVES IN COST CONTROL

- (a) **Planning:** First step in cost control is established plans/targets. The plan/target may be in the form of budgets, standards, estimates and even past actual may be expressed in physical as well as monetary terms. These serves as yardsticks by which the planned objective can be assessed.
- (b) **Communication:** The plan and the policy laid down by the management are made known to all those responsible for carrying them out. Communication is established in two directions; directives are issued by higher level of management to the lower level for compliance and the lower-level executives report performances to the higher level.
- (c) **Motivation:** The plan is given effect to and performances starts. The performance is evaluated, costs are ascertained and information about results achieved are collected and reported. The fact that costs are being complied for measuring performances acts as a motivating force and makes individuals endeavor to better their performances.
- (d) **Appraisal and Reporting:** The actual performance is compared with the predetermined plan and variances, i.e. deviations from the plan are analyzed as to their causes. The variances are reported to the proper level of management.
- (e) **Decision Making:** The variances are reviewed and decisions taken. Corrective actions and remedial measures or revision of the target, as required, are taken.

ADVANTAGES OF COST CONTROL SYSTEM

- (a) Achieving the expected return on capital employed by maximising profit
- (b) Increase in productivity of the available resources
- (c) Reasonable price of the customers
- (d) Continued employment and job opportunity for the workers
- (e) Economic use of limited resources of production
- (f) Increased credit worthiness
- (g) Prosperity and economic stability of the industry

COST REDUCTION

Cost reduction is the achievement of real and permanent reduction in unit cost of products manufactured. It, therefore, continuously attempts to achieve genuine savings in cost of production distributing, selling and administration. It does not accept a standard or budget as or fined. It rather challenges the standards/budgets continuously to make improvement in them. It attempts to excavate, the potential savings buried in the standards by continuous and planned efforts. Cost control relax that dynamic approach, it usually dealt with variances leaving the standards intact.

STRATEGIC COST MANAGEMENT

THREE FOLD ASSUMPTIONS IN COST REDUCTION

- (a) Savings in per unit cost
- (b) Savings is long lasting in nature
- (c) Quality and utility of the products and services remain uninfluenced

DIFFERENCE BETWEEN COST REDUCTION AND COST CONTROL

Cost Reduction	Cost Control
Cost Reduction is the achievement of real and permanent reduction in unit cost of products manufactured.	Cost Control involves a comparison of actual with the standards or budgets, to regulate the actual costs.
Realistic savings in cost.	There could be temporary savings in cost.
Product's Utility, Quality and Characteristics are retained.	Quality Maintenance is not a guarantee.
It is not concerned with maintenance of performance according to standards	The process involves setting up a target, investing variances and taking remedial measures to correct them.
Continuous process of critical examination includes analysis and challenge of standards.	Control is achieved through compliance with standards. Standards by themselves are not examined.
Fully dynamic approach.	Less dynamic than Cost Reduction.
Universally applicable to all areas of business. Does not depend upon standards, though target amounts may be set.	Limited applicability to those items of cost for which standards can be set.
Emphasis here is partly on present costs and largely on future costs.	Emphasis on present and past behaviour of costs.
The function of Cost Reduction is to find out substitute ways and new means like waste reduction, expense reduction and increased production	Cost Control does competitive analysis of actual results with established standards.
Cost reduction is a corrective measure.	Cost Control is a preventive measure.

STRATEGIC COST MANAGEMENT

MARGINAL COSTING

ABSORPTION COSTING

Absorption Costing: Under this method, the cost of the product is determined after considering the total cost i.e., both fixed and variable costs. Thus, this technique is also called traditional or total costing. The variable costs are directly charged to the products whereas the fixed costs are apportioned over different products on a suitable basis, manufactured during a period.

MARGINAL COSTING

Marginal Costing: Marginal costing is “the ascertainment of marginal costs and of the effect on profit of changes in volume or type of output by differentiating between fixed costs and variable costs.” Several other terms in use like direct costing, contributory costing, variable costing, comparative costing, differential costing and incremental costing are used more or less synonymously with marginal costing.

DIFFERENCES BETWEEN ABSORPTION COSTING AND MARGINAL COSTING

S.NO	ABSORPTION COSTING	MARGINAL COSTING
1	Both fixed and variable costs are considered for product costing and inventory valuation.	Only variable costs are considered for product costing and inventory valuation.
2	Fixed costs are charged to the cost of production. Each product bears a reasonable share of fixed cost and thus the profitability of a product is influenced by the apportionment of fixed costs.	Fixed costs are regarded as period costs. The profitability of different products is judged by their P/V ratio
3	Cost data are presented in conventional pattern. Net profit of each product is determined after subtracting fixed cost along with their variable cost.	Cost data are presented to highlight the total contribution of each product.
4	The difference in the magnitude of opening stock and closing stock affects the unit cost of production due to the impact of related fixed cost.	The difference in the magnitude of opening stock and closing stock does not affect the unit cost of production.
5	In case of absorption costing the cost per unit reduces, as the production increases as it is fixed cost which reduces, whereas, the variable cost remains the same per unit.	In case of marginal costing the cost per unit remains the same, irrespective of the production as it is valued at variable cost.

DIFFERENTIAL COST

Differential Cost is the change in the costs which results from the adoption of an alternative course of action. The alternative actions may arise due to change in sales volume, price, product mix (by increasing, reducing or stopping the production of certain items), or methods of production, sales, or sales promotion, or they may be due to ‘make or buy’ or ‘take or refuse’ decisions.

STRATEGIC COST MANAGEMENT

APPLICATIONS OF MARGINAL COSTING

1. Marginal costing system is simple to operate than absorption costing because they do not involve the problems of overhead apportionment and recovery.
2. Marginal costing avoids, the difficulties of having to explain the purpose and basis of overhead absorption to management that accompany absorption costing. Fluctuations in profit are easier to explain because they result from cost volume interactions and not from changes in inventory valuation.
3. It is easier to make decisions on the basis of marginal cost presentations, e.g., marginal costing shows which products are making a contribution and which are failing to cover their avoidable (i.e., variable) costs. Under absorption costing the relevant information is difficult to gather, and there is the added danger that management may be misled by reliance on unit costs that contain an element of fixed cost.
4. Marginal costing is essentially useful to management as a technique in cost analysis and cost presentation. It enables the presentation of data in a manner useful to different levels of management for the purpose of controlling costs. Therefore, it is an important technique in cost control.
5. Future profit planning of the business enterprises can well be carried out by marginal costing. The contribution ratio and marginal cost ratios are very useful to ascertain the changes in selling price, variable cost etc. Thus, marginal costing is greatly helpful in profit planning.
6. When a business concern consists of several units and produces several products and evaluation of performance of such components can well be made with the help of marginal costing.
7. It is helpful in forecasting.
8. When there are different products, the determination of number of units of each product, called Optimum Product Mix, is made with the help of marginal costing.
9. Similarly, optimum sales mix i.e., sales of each and every product to get maximum profit can also be determined with the help of marginal costing.
10. Apart from the above, numerous managerial decisions can be taken with the help of marginal costing, some of which, may be as follows: -
 - (a) Make or buy decisions,
 - (b) Exploring foreign markets,
 - (c) Accept an order or not,
 - (d) Determination of selling price in different conditions,
 - (e) Replace one product with some other product,
 - (f) Optimum utilisation of labour or machine hours,
 - (g) Evaluation of alternative choices,
 - (h) Subcontract some of the production processes or not,
 - (i) Expand the business or not,
 - (j) Diversification,
 - (k) Shutdown or continue

LIMITATION OF MARGINAL COSTING

- (1) Marginal costing is based on an unrealistic assumption that all costs can be segregated into fixed & variable costs.
- (2) Marginal costing does not provide any yardstick for evaluation of performance.
- (3) Marginal costing produces unrealistic profit/loss because fixed overheads are excluded from stock valuation.
- (4) Contribution in marginal costing is not a fool-proof indicator of profitability.
- (5) Marginal costing can correctly assess profitability on a short-term basis only.

STRATEGIC COST MANAGEMENT

ESSENTIAL FEATURES OF DIFFERENTIAL COSTS

1. The basis data used for differential cost analysis are costs, revenue and the investment factors which are relevant in the problem for which the analysis is undertaken.
2. Total differential costs rather than the costs per unit are considered.
3. Differential cost analysis is made outside the accounting records.
4. As the differences in the costs at two levels are considered, absolute costs at each level are not as relevant as the difference between the two. Thus, items of costs which do not change but are identical for the alternatives under consideration, are ignored.
5. The differentials are measured from a common base point or position.
6. The stage at which the difference between the revenue and the cost is the highest, measured from the common base point, determines the choice from amongst a number of alternative actions.
7. In computing differential costs, historical or standard costs may be used but they should be adjusted to the requirements of future conditions.
8. The elements and items of cost to be considered in differential cost analysis will depend upon the nature of the problem and the alternatives being considered.

PRACTICAL APPLICATION OF DIFFERENTIAL COSTS

1. Determination of most profitable levels of production and price.
2. Acceptance of offer at a lower price or offering a quotation at lower selling price in order to increase capacity.
3. It is used to decide whether it will be more profitable to sell a product as it is or to process it further into a different product to be sold at an increased price.
4. Determining the suitable price at which raw material may be purchased.
5. Decision of adding a new product or business segment.
6. Discontinuing a product or business segment in order to avoid or reduce the present loss or increase profit.
7. Changing the product mix.
8. Make or buy decisions.
9. Decision regarding alternative capital investment and plant replacement.
10. Decision regarding change in method of production.

RELEVANT COST

Relevant Cost is a managerial accounting term that describes avoidable costs that are incurred when making business decisions. The concept of relevant cost is used to eliminate unnecessary data that could complicate the decision-making process. As an example, relevant cost is used to determine whether to sell or keep a business unit.

Relevant costing is just a refined application of such basic principles to business decisions. The key to relevant costing is the ability to filter what is and isn't relevant to a business decision.

OUT OF POCKET COST

Out of Pocket costs are those which involve cash outlay as against those costs which do not require cash payment. Example: Material cost is an Out-of-Pocket Cost while depreciation is not an Out-of-Pocket Cost.

STRATEGIC COST MANAGEMENT

MAIN ELEMENTS OF RELEVANT COST

- (a) **Future:** Past costs are irrelevant, as we cannot affect them by current decisions and they are common to all alternatives that we may choose.
- (b) **Incremental:** Expenditure which will be incurred or avoided as a result of making a decision. Any costs which would be incurred whether or not the decision is made are not said to be incremental to the decision.
- (c) **Cash flow:** Expenses such as depreciation are not cash flows and are therefore not relevant. Similarly, the book value of existing equipment is irrelevant, but the disposal value is relevant.

EXAMPLES RELEVANT COST FOR MANAGERIAL DECISION MAKING

1. Marginal cost
2. Conversion cost
3. Imputed cost
4. Differential cost
5. Replacement cost
6. Out of Pocket cost
7. Opportunity cost

DIFFERENCE IN PROFIT UNDER MARGINAL AND ABSORPTION COSTING

1. No opening and closing stock: In this case, profit/loss under absorption and marginal costing will be equal.
2. When opening stock is equal to closing stock: In this case, profit/loss under two approaches will be equal provided the fixed cost element in both the stocks is same amount.
3. When closing stock is more than opening stock: In other words, when production during a period is more than sales, then profit as per absorption approach will be more than that by marginal approach. The reason behind this difference is that a part of fixed overhead included in closing stock value is carried forward to next accounting period.
4. When opening stock is more than the closing stock: In other words when production is less than the sales, profit shown by marginal costing will be more than that shown by absorption costing. This is because a part of fixed cost from the preceding period is added to the current year's cost of goods sold in the form of opening stock

SUNK COST

Sunk cost is a historical cost which was incurred in the part. It is not a relevant cost for the purpose of decision making.

Example: When a decision is to be taken for buying a new plant & Machinery in place of old plant & Machinery, then the WDV of the old plant & Machinery is not to be considered because it is not relevant for this purpose. This WDV of old plant & Machinery is a sunk cost.

STRATEGIC COST MANAGEMENT

SITUATIONS WHERE PRODUCT CAN BE SOLD BELOW THE MARGINAL COST

1. *When one has already produced and paid for the units and:*

- There is no more market for the product at any price other than the one is below the marginal cost
- Any organization cannot keep the business open to clear the rest of the inventory because any profit you may see is not enough to cover the cost to stay open.
- As a loss leader to attract customers that can be up sold. Works only if the customer margin - sum of contribution margins from the basket of products and services customers buy is more than other available options.

2. *When one has produced each unit on demand (truly marginal):*

- Only case is as a loss leader
- Any other reason not only generates a loss in the short term but also sets really bad reference price in the minds of customers. It is not going to be easy to improve prices when the seller gives it away at very low price.
- The seller has to make sure that the cost is truly marginal cost and does not include overheads and COGS (Cost of Goods Sold) is not MC (Marginal Cost).

PRICE SENSITIVITY

Price sensitivity is the degree to which the price of a product affects consumers' purchasing behaviors. It may also be said that through price sensitivity analysis, any organization measure how it's demand changes with the change in the cost of its products. Price sensitivity is commonly to measure of the change in demand based on its price change. For example, some consumers are not willing to pay a few extra cents per gallon for gasoline, especially if a lower-priced station is nearby. When they study and analyze price sensitivity, companies and product manufacturers can make sound decisions about products and services. Price sensitivity can basically be defined as being the extent to which demand changes when the cost of a product or service changes. The price sensitivity of a product varies with the level of importance consumers place on price relative to other purchasing criteria. Some people may value quality over price, making them less susceptible to price sensitivity. For example, customers seeking top-quality goods are typically less price sensitive than bargain hunters, so they're willing to pay more for a high-quality product. By contrast, people who are more sensitive to price may be willing to sacrifice quality. These individuals will not spend more for something like a brand name, even if it has a higher quality over a generic store brand product. Price sensitivity also varies from person to person, or from one consumer to the next. Some people are able and willing to pay more for goods and services than others. Companies and governments are also able to pay more compared to individuals. Consumers are less sensitive to price when the total cost is low compared to their total income. Likewise, the total expenditure compared to the total cost of the end product affects price sensitivity.

ENGINEERED COST

Engineered Cost relates to an item where the input has an explicit physical relationship with the output. For instance, in the manufacture of a product, there is a definite relationship between the units of raw material and labour time consumed and the amount of variable manufacturing overhead on the one hand and units of the products produced on the other. The input-output relationship can be established the form of standards by engineering analysis or by an analysis of the historical data. It should be noted that the variable costs are not engineered cost but some administration and selling expenses may be categorized as engineered cost.

STRATEGIC COST MANAGEMENT

OPPORTUNITY COST

Opportunity cost is the value of alternatives foregone by adopting a particular strategy or employing resources in specific manner. It is the return expected from an investment other than the present one.

These refer to costs which result from the use or application of material, labour or other facilities in a particular manner which has been foregone due to not using the facilities in the manner originally planned. Resources (or input) like men, materials, plant and machinery, finance etc., when utilized in one particular way, yield a particular return (or output). If the same input is utilized in another way, yielding the same or a different return, the original return on the forsaken alternative that is no longer obtainable is the opportunity cost.

For example, if fixed deposits in the bank are proposed to be withdrawn for financing project, the opportunity cost would be the loss of interest on the deposits.

IMPUTED COSTS

Imputed costs are hypothetical or notional costs, not involving cash outlay computed only for the purpose of decision making. In this respect, imputed costs are similar to opportunity costs.

Interest on funds generated internally, payment for which is not actually made is an example of imputed cost. When alternative capital investment projects are being considered out of which one or more are to be financed from internal funds, it is necessary to take into account the imputed interest on own funds before a decision is arrived at.

SIGNIFICANCE OF MARGIN OF SAFETY IN MANAGEMENT DECISIONS

Margin of Safety (MOS) is the excess sales over and above the break-even sales. It is generally expressed in % form. The size of margin of safety is a very important indicator of the soundness of a business. It shows how much sales may decrease before the firms will suffer a loss. If the size of margin of safety is high, chances of incurring loss by the business will be remote but if it is low, a small reduction in sales may lead to loss. The common cause of lower margin of safety is higher fixed costs. In such a business, a high level of activity is required.

A low margin of safety is a matter of concern and so the following steps may be taken to improve an unsatisfactory margin of Safety:

- a. Increase the selling price.
- b. Reduce the fixed or variable costs or the both.
- c. Increase the volume of output by utilizing the unutilized production Capacity.

RELEVANT COSTS AND RELEVANT REVENUES

Relevant costs are costs appropriate to aiding the making of specific management decisions (CIMA). They are estimated future costs that differ among alternatives. Similarly, relevant revenues and expected future revenues that differ among alternatives.

The two key aspects of relevance are:

1. The costs and revenue must occur in future.
2. They must differ among alternatives.

STRATEGIC COST MANAGEMENT

A company is producing and selling three products. How would you determine relative profitability of products in each of the following independent situation?

1. Total sales potential in unit is limited,
2. Total sales potential in value is limited.
3. Raw materials are in short supply.
4. Production capacity (machine hours) is limited.

Answer: The Selection process will be based on optimization of contribution in relation to constraint.

1. Unit Contribution
2. P/V Ratio
3. Contribution per Kg of RM
4. Contribution per Machine hrs.

STRATEGIC COST MANAGEMENT

TRANSFER PRICING

MEANING OF TRANSFER PRICING

A '**Transfer Price**' is that notional value at which goods and services are transferred between divisions in a decentralized organisation. Transfer prices are normally set for intermediate products, which are goods, and services that are supplied by the selling division to the buying division. In large organisations, each division is treated as a 'profit center' as a part and parcel of decentralization. Their profitability is measured by fixation of 'transfer price' for inter divisional transfers.

The transfer price can have impact on the division's performance and hence lot of care is to be taken in fixation of the same.

The following factors should be taken into consideration before fixing the transfer prices.

1. Transfer price should help in the accurate measurement of divisional performance.
2. It should motivate the divisional managers to maximize the profitability of their divisions.
3. Autonomy and authority of a division should be ensured.
4. Transfer Price should allow 'Goal Congruence' which means that the objectives of divisional management match with those of the organisation.

FOUR METHODS OF TRANSFER PRICING

1. Pricing based on Cost: In these methods, 'cost' is the base and the following methods fall under this category.

- (a) Actual Cost:** Under this method the actual cost of production is taken as transfer price for inter divisional transfers. Such actual cost may consist of variable cost or sometimes total costs including fixed costs.
- (b) Cost Plus:** Under this method, transfer price is fixed by adding a reasonable return on capital employed to the total cost. Thereby the measurement of profit becomes easy.
- (c) Standard Cost:** Under this method, transfer price is fixed on the basis of standard cost. The difference between the standard cost and the actual cost being variance is absorbed by transferring division. This method is simple and easy to follow, but the constant revision of standards is necessary at regular intervals.
- (d) Marginal Cost:** Under this method, the transfer price is determined on the basis of marginal cost. The reason being fixed cost is in any case unavoidable and hence should not be charged to the buying division. That is why only marginal cost will be taken as transfer price.

2. Market Price as Transfer Price: Under this method, the transfer price will be determined according to the market price prevailing in the market. It acts as a good incentive for efficient production to the selling division and any inefficiency in production and abnormal costs will not be borne by the buying division. The logic used in this method is that if the buying division would have purchased the goods/services from the open market, they would have paid the market price and hence the same price should be paid to the selling division. One of the variations of this method is that from the market price, selling and distribution overheads should be deducted and price thus arrived should be charged as transfer price. The reason behind this is that no selling efforts are required to sell the goods/services to the buying division and therefore these costs should not be charged to the buying division.

STRATEGIC COST MANAGEMENT

3. Negotiated Pricing: Under this method, the transfer prices may be fixed through negotiations between the selling and the buying division. Sometimes it may happen that the concerned product may be available in the market at a cheaper price than charged by the selling division. In this situation the buying division may be tempted to purchase the product from outside sellers rather than the selling division. Alternatively, the selling division may notice that in the outside market, the product is sold at a higher price but the buying division is not ready to pay the market price. Here, the selling division may be reluctant to sell the product to the buying division at a price, which is less than the market price. In all these conflicts, the overall profitability of the firm may be affected adversely. Therefore, it becomes beneficial for both the divisions to negotiate the prices and arrive at a price, which is mutually beneficial to both the divisions. Such prices are called as 'Negotiated Prices'. In order to make these prices effective care should be taken that both, the buyers and sellers should have access to the available data including about the alternatives available if any. Similarly, buyers and sellers should be free to deal outside the company, but care should be taken that the overall interest of the organisation is not affected.

- **The main limitation of this method** is that lot of time is spent by both the negotiating parties in fixation of the negotiated prices.
- Negotiating skills are required for the managers for arriving at a mutually acceptable price, otherwise there is a possibility of conflicts between the divisions.

4. Pricing based on opportunity cost: This pricing recognizes the minimum price that the selling division is ready to accept and the maximum price that the buying division is ready to pay. The final transfer price may be based on these minimum expectations of both the divisions. The most ideal situation will be when the minimum price expected by the selling division is less than the maximum price accepted by the buying division. However, in practice, it may happen very rarely and there is possibility of conflicts over the opportunity cost.

LIMITATIONS OF MARKET BASED TRANSFER PRICE

1. There may be resistance from the buying division. They may question buying from the selling division if in any way they have to pay the market prices.
2. Like cost-based prices, market prices may also be fluctuating and hence there may be difficulties in fixation of these prices.
3. Market price is a rather vague term as such prices may be ex-factory price, wholesale price, retail price, etc.
4. Market prices may not be available for intermediate products, as these products may not have any market.
5. This method may be difficult to operate if the intermediate product is for captive consumption.
6. Market price may change frequently.
7. Market prices may not be ascertained easily.

ADVANTAGES OF MARKET BASED TRANSFER PRICE

1. Actual costs are fluctuating and hence difficult to ascertain. On the other hand, market prices can be easily ascertained.
2. It avoids extensive arbitration system in fixing the transfer prices between the divisions.

STRATEGIC COST MANAGEMENT

OBJECTIVES OF TRANSFER PRICE

- 1) Profitability:** The transfer pricing should pay close attention to the profitability of both the divisions of the organizations. Since both, the divisions belong to the same firm. Thus, the items, goods, and services can be configured at any arbitrary price. But, if you want to the profit margins of both the divisions to stay unaffected, it would be a great idea to keep the prices as close to the market prices as possible.
- 2) Taxation:** The transfer price will also have a bearing on taxation. A proper transfer pricing will help you offset the tax liability of one division with an equivalent one on the other. One of the major objectives of the transfer pricing is to maximize the overall tax profits of your organization. The transactions are not governed by open market considerations. This helps you improve upon the taxation options.
- 3) Goal Congruence:** The transfer pricing should be configured in such a manner that the divisional earnings of each of the divisions are quite consistent with the goals of the parent company. The focus should be such that the profit margins of the subdivisions increase while it will not affect the total profitability of the parent organization. Transfer pricing needs to be configured in a way where the company profits as a whole also improve.
- 4) Performance evaluation of individual units:** Transfer pricing can be one of the best options to arrive at the best possible appraisal of the individual divisions. This can help guide efficient decision making. Some of the areas that transfer pricing can assist the performance appraisal, and performance management includes appraising the managerial performance of the divisions, evaluation of the contributions of the individual entities for the overall profits of the company, and assessment of the worth of each division as an individual unit.
- 5) Taking a good look at international trade:** Another prime objective that transfer pricing aims to achieve is to measure the international trade scenario. The pricing should be in tune with the import and export standards and should be accurately measured. Too low a price can distort the international trade figures to a greater extent. The transfer pricing prices should be such that they will not distort the international trade figures.
- 6) Shifting of profits:** Profit shifting is aimed at reducing the tax liabilities in a particular country can be reduced. This can be achieved by reducing profits artificially. It is also aimed at decentralization of the production so that the profits are concentrated enough in the region where the production of the goods is undertaken.

STRATEGIC COST MANAGEMENT

BENEFITS OF TRANSFER PRICING POLICY

1. Divisional performance evaluation is made easier.
2. It will develop healthy inter-divisional competitive spirit
3. Management by exception is possible.
4. It helps in co-ordination of divisional objectives in achieving organizational goals.
5. It provides useful information to the top management in making policy decisions like expansion, sub-contracting, closing down of a division, make or buy decisions, etc,
6. Transfer Price will act as a check on supplier's prices.
7. It fosters economic entity and free enterprise system.
8. It optimizes the allocation of company's financial resources based on the relative performance of various profit centres, which in turn, are influenced by transfer pricing policies.

METHODS OF 'TRANSFER PRICING' & ONE DEMERIT OF EACH METHOD

Transfer Pricing Method		Demerit
A	Cost Based Pricing	
	(1) Actual Cost of Production	Inefficiency of transferor borne by receiving centre.
	(2) Standard Cost	Standards may be unrealistic or out dated creating an unfair price for any of the divisions.
	(3) Marginal Cost	While fixed costs have to be incurred by transferring division, the receiving division does not pay for it.
B	Market Based Pricing	Market price may not be available if product is made to the specification of the receiving division. Market price may be fluctuating.
C	Negotiated Pricing	If the negotiating range is not mutually beneficial to both the divisions, there is clash of interest and management intervention may become necessary. The more powerful division may have its way. Goal congruence may be sacrificed, adversely affecting the overall Company profits.
D	Opportunity Cost Pricing	Since this method sets the minimum price for the selling division and the minimum price for the buying division, clash of interest may arise. The more powerful division may exercise heavier bargaining power. Company's overall interest may be sacrificed or the divisional managers may be demotivated.

STRATEGIC COST MANAGEMENT

Why is Transfer Pricing (TP) necessary in the organization? Show the impact of transfer prices to the 'selling' and 'buying' profit centers.

1. 'Transfer Pricing (TP)' is needed to monitor the flow of goods and services among the divisions of a company and to facilitate the divisional performance measurement.
2. The main use of transfer pricing is to measure the notional sales of one division to another division.
3. Thus, the transfer prices used in the organization will have a significant effect on the performance evaluation of the various divisions.
4. It becomes necessary when there is internal transfer of goods or services and it is required to appraise the separate performances of the divisions departments involved.
5. If profit centers are to be used, transfer prices become necessary in order to determine the separate performances of both the 'buying' and 'Selling' profit centers.
6. If transfer prices are set too high, the 'selling center' will be favoured.
7. On the other hand, if transfer prices are set too low, the 'buying center will receive an unwarranted proportion of the profits.

STRATEGIC COST MANAGEMENT

STANDARD COSTING

SIGNIFICANCE OF STANDARD COSTING AS A TECHNIQUE OF COST CONTROL

- (1) Standard costing is an effective technique to control the cash.
- (2) Standard costing helps in formulation of production policies.
- (3) Standard costing helps in price quotation of the products or services & for filing tenders.
- (4) Standard act as motivation to the staff to achieve better performance.
- (5) Standards provide a yardstick against which one can measure performance & decide whether it is efficient or inefficient.
- (6) Standard costing helps in the application of the "Principle of Management by Exception".
- (7) Standard costing helps in fast preparation of business reports to be presented to management so that quick action can be taken.
- (8) Standard costing helps in delegation of authority & in responsibility accounting.
- (9) Stock valuation in standard costing becomes comparatively a ten tedious job.

EXPLAIN THE CONCEPTS OF STANDARD COST & STANDARD COSTING

Standard Cost

Standard cost is a predetermined cost which is computed in advance on the basis of a specification of all the factors affecting Costs & used in standard costing".

Thus, standard cost is a pre-determined cost that should be attained under a given set of operating conditions.

Standard Costing

- (1) Predetermination of appropriate standard costs under each element of cost i.e., Material, Labour & overhead.
- (2) Comparison of actual performance with standard cost & performance, the difference between the two is referred to as Variance.
- (3) Presentation of information to the management in order so that suitable corrective measures may be taken.

EXPLAIN THE TERM VARIANCE

Variance is the difference between standard or planned cost & the actual cost, when actual cost is more than standard cost, the variance is known as unfavorable or adverse variance & when actual cost is less than standard cost, variance is called as favourable variance.

DISTINGUISH BETWEEN CONTROLLABLE & UNCONTROLLABLE VARIANCES

Controllable Variance is those which arise due to Controllable Causes. Ex: Variance due to defective workmanship or inefficiency of workers is a controllable variance.

Uncontrollable Variance is those on which control cannot be exercised. Ex. When rates of materials in the market increases or decrease, it gives rise to a variance which is uncontrollable because management cannot exercise control on such external factors.

STRATEGIC COST MANAGEMENT

DIFFERENCE BETWEEN BUDGETARY CONTROL AND STANDARD COSTING

BUDGETARY CONTROL	STANDARD COSTING
<ol style="list-style-type: none">1. Budgetary control is concerned with the operation of the business as a whole and hence it is more extensive.2. Budget is a projection of financial accounts3. It does not necessarily involve standardization4. Budget control can be adopted in part also.5. Budget can be operated without standards.	<ol style="list-style-type: none">1. Standard costing is related with the control of expenses and hence it is more intensive.2. Standard cost is the projection of cost accounts.3. It requires standardization of products.4. It is not possible to operate this system in parts.5. Standard costing cannot exist without budgets.

MANAGERIAL USES OF VARIANCE ANALYSIS

1. It tells about controllable & uncontrollable variances
2. It tells about the exact cause of variance
3. it helps in control of cost

DISTINGUISH BETWEEN STANDARD COST & ESTIMATED COST

1. Standard cost is what the cost should be while estimated cost is what the cost will be.
2. Standard cost is set for the purpose of cost control whereas estimated costs are set for the purpose of quoting prices of products or services or for filling tenders.
3. Standard costs are scientifically fixed but estimated costs are fixed on the basis of average cost of the past periods.
4. Standard cost is used in those companies which use standing costing system whereas estimated costing is used in those companies which use historical costing system.

LIMITATIONS OF STANDARD COSTING

1. Establishment of standard costs is difficult in practice.
2. In course of time, sometimes even in a short period the standards become rigid.
3. Inaccurate, unreliable and out of date standards do more harm than benefit.
4. Sometimes, standards create adverse psychological effects. If the standard is set at high level, its non achievement would result in frustration and build-up of resistance.
5. Due to the play of random factors, variances cannot sometimes be properly explained, and it is difficult to distinguish between controllable and non-controllable expenses.
6. Standard costing may not sometimes be suitable for some small concerns. Where production cannot be carefully scheduled, frequent changes in production conditions result in variances. Detailed analysis of all of which would be meaningless, superfluous and costly.
7. Standard costing may not, sometimes, be suitable and costly in the case of industries dealing with nonstandardized products and for repair jobs which keep on changing in accordance with customer's specifications.
8. Lack of interest in standard costing on the part of the management makes the system practically ineffective.

STRATEGIC COST MANAGEMENT

ADVANTAGES OF STANDARD COSTING

1. **Effective cost control:** -The important advantage of standard costing is that it facilitates the control of costs.
2. **Help in planning:** - Establishing standards is a very useful exercise in planning which instills in the management a habit of thinking in advance.
3. **Provides incentives:** -The standards provide incentives and motivate to work with greater efforts. Schemes may be formulated to reward those who achieve or surpass the standards.
4. **Fixing prices and formulating policies:** -Standard costs are a valuable aid to management in determining prices and formulating production policies.
5. **Facilitates delegation of authority:** - In order that responsibility for off-standard performance may be identified directly with the persons concerned, an organisation chart is prepared which shows delegated authority and establishes responsibility of each executive.
6. **Facilitates co-ordination:** - While establishing standards, the performance of departments such as productions, sales, purchases etc., is taken into account. Thus, through the working of standard cost system, co-ordination of various functions is achieved.
7. **Eliminates wastes:** By fixing standards, certain wastes such as material wastages, idle time, lost machine hours, etc are reduced.
8. **Valuation of stocks:** -Standard costing simplifies the valuation of stock because the stock is valued at standard costing.
9. **Management by exception:** -Reporting of variances is based on the principle of management by exception. Only variances beyond a predetermined limit may be considered by the management for corrective action. This also reduces the cost of preparing reports.
10. **Economical and simple:** -Standard costing is an economical and simple means of cost accounting and generally results in saving the cost of costing system.

THREE METHODS OF DISPOSAL OF VARIANCES

1. Transfer to Profit and Loss Account.
2. Allocation of Variances to Finished Stock, Work-in-Progress and Cost of Sales Account.
3. Transfer of Variances to the Reserve Account

TREATMENT OF VARIANCES IN COST ACCOUNTS

When the actual cost differs from the standard cost, it is called **variance**. If the actual cost is less than the standard cost or the actual profit is higher than the standard profit, it is called **favorable variance**. On the contrary, if the actual cost is higher than the standard cost or profit is low, then it is called **adverse variance**.

Each element of cost and sales requires variance analysis. Variance is Classified as follows:

- Direct Material Variance
- Direct Labor Variance
- Overhead Variance
- Sales Variance

STRATEGIC COST MANAGEMENT

STEPS INVOLVES STANDARD COSTING

1. The setting of standard costs for different elements of cost, i.e. Material, labour and overheads.
2. Ascertaining actual costs.
3. Comparing standards with actual costs to determine the differences, known as “variances”.
4. Analysing variances for ascertaining reasons thereof.
5. Reporting of these variances and analysis thereof to management for appropriate action, where necessary.

FEATURES OF STANDARD COST

- (a) It is a pre-determined cost which is computed before the cost is incurred (i.e., in advance of production).
- (b) It is based on engineering specification of all the factors affecting cost.
- (c) It is computed for a specific period of time.
- (d) It is to be attained under a given set of efficient operating conditions.

REASONS WHICH GIVE RISE TO VARIANCES BETWEEN ACTUAL AND STANDARD IN STANDARD COSTING

- (a) Inefficient operations due to inadequate machine usage/faulty machinery;
- (b) Departure from laid down procedure;
- (c) Human error;
- (d) Inappropriate setting of standards;
- (e) Frequent changes in market prices of various inputs in an instable condition;
- (f) Errors in recording actual results.

TREATMENT OF IDLE TIME IN COMPUTING IDLE TIME VARIANCE

In standard costing, standard labour time is fixed after taking into account the normal idle time. However, if the actual idle time is more than this normal level, it is considered as abnormal idle time and is therefore shown as variance which is always adverse. It indicates the loss caused due to abnormal idle time. Since we need to exclude the influence of the actual rate, we have **idle time variance = Abnormal idle time x standard rate.**

STRATEGIC COST MANAGEMENT

UNIFORM COSTING

MEANING OF UNIFORM COSTING

Uniform Costing is neither a Costing method like Job or Process Costing nor it is a Costing technique like Standard Costing or Marginal Costing but in this system any of the Costing methods and one or more techniques of costing may be combined.

Under this system, all the companies in any industry may use the same type of Costing Principles and Methods so that their cost figures may be comparable.

SCOPE OF UNIFORM COSTING

- In a single enterprise having a number of branches or units, each of which may be a separate manufacturing unit.
- In a number of concerns in the same industry bound together through a trade association or otherwise, and
- In industries which are similar in nature such as gas and electricity, various types of transport, and cotton, jute and woolen textiles.

REQUISITES FOR INSTALLATION OF A UNIFORM COSTING SYSTEM:

- (a) There should be a spirit of mutual trust, co-operation and a policy of give and take amongst the participating members.
- (b) There should be a free exchange of ideas and methods.
- (c) The bigger units should be prepared to share with the smaller ones, improvements, achievements of efficiency, benefits of research and know-how.
- (d) There should not be any hiding or withholding of information.
- (e) There should be no rivalry or sense of jealousy amongst the members.

OBJECTIVES OF UNIFORM COSTING SYSTEM

1. **To avoid competition:** It eliminates cut-throat competition by fixing common prices on the basis of uniform costing procedures. It thus also aims at bringing stability in prices of the products.
2. **Cost comparison:** It enables different firms to compare the costs because the costs are based on same principles. Thus, their profitability can also be compared.
3. **Measurement of efficiency:** Comparison of costs and profitability helps in measurement of efficiency.
4. **Reliable prices:** The confidence is reposed in the public where the prices fixed are based on uniform costing principles. This will result in better and cordial relations between members adopting this system and their customers.
5. **Cost control:** The uniform cost serves as the standard cost and helps in controlling the off-standard performances.
6. **Better exchange of information:** Members having technical knowledge provide the benefit of their experience to others. Free exchange of information leads to reduction in costs and improvement in the quality of the product.

STRATEGIC COST MANAGEMENT

ADVANTAGES OF UNIFORM COSTING

1. It provides comparative information to the members of the organisation to reduce or eliminate the evil effects of competition and unnecessary expenses arising from competition.
2. It enables the industry to submit the statutory bodies reliable and accurate data which might be required to regulate pricing policy or for other purposes.
3. It enables the member concerns to compare their own cost data with that of the others detect the weakness and to take corrective steps for improvement in efficiency.
4. The benefits of research and development can be passed on the smaller members of the association lead to economy of the industry as a whole.
5. It provides all valuable features of sound cost accounting such as valued and efficiency of the workers, machines, methods, etc., current reports of comparing major cost items with the predetermined standards, etc.
6. It serves as a prerequisite to Cost Audit and inter firm comparison.
7. It is a useful tool for management control. Performance of individual units can be measured against norms set for the industry as a whole.
8. It avoids cut-throat completion by ensuring that competition among member units proceeds on healthy lines.
9. The process of pricing policy becomes easier when Uniform Costing is adopted.
10. It creates cost consciousness and provides the best system of cost control and cost presentation in the entire industry.
11. It simplifies the work of wage boards set up to fix minimum wages and fair wages for an industry.

LIMITATIONS OF UNIFORM COSTING

1. Uniformity in standards and methods of costing by all the firms in the same industry is difficult.
2. Firms may not have the trust/wish to share such information with their competitors in the same industry.
3. There is an illusion that the uniform costing is meant for big size firms and small firms cannot afford to install this system.
4. It creates monopolistic trend in the business.
5. It may create artificial shortage in supply.
6. It may lead to artificial increases in prices.

STRATEGIC COST MANAGEMENT

INTER-FIRM COMPARISON

MEANING OF INTER-FIRM COMPARISON

It denotes the techniques of evaluating the performances, efficiencies, deficiencies, costs and profits of similar nature of firms engaged in the same industry or business. It consists of exchange of information, voluntarily of course, concerning production, sales cost with various types of break-up, prices, profits, etc., among the firms who are interested of willing to make the device a success. The basic purposes of such comparison are to find out the work points in an organisation and to improve the efficiency by taking appropriate measures to wipe out the weakness gradually over a period of time.

BENEFITS DERIVED FROM INTER-FIRM COMPARISON

- (a) It helps the management of the organisation to know strengths and weakness organisations.
- (b) As only the significant items are reported to the Management time and efforts are not unnecessary wasted.
- (c) It develops cost consciousness among the members of the industry.
- (d) Information about the organisation is made available freely without the fear of disclosure of confidential data to outside market or public.
- (e) It helps to increasing productivity, standardization of products, elimination of unfair comparison and the trade practices.
- (f) Reliable and collective data enhance the organising power in deal in with various authorities and Government bodies.
- (g) It assists in a big way in identifying industry sickness and gives a timely warning so that effective remedial steps can be taken to save the organisation.

LIMITATIONS OF INTER-FIRM COMPARISON

- (a) The top management may not be convinced of the utility of inter-firm comparison.
- (b) Reluctance to disclose data which a concern considers to be confidential.
- (c) A sense of complacency on the part of the management who may be satisfied with the present level of profits.
- (d) In the Absence of a proper Cost Accounting system, the costing figures supplied may not be reliable for the purpose of comparison.
- (e) Non-availability of a suitable base for comparison.

STRATEGIC COST MANAGEMENT

ACTIVITY BASED COSTING

MEANING OF ACTIVITY BASED COSTING

Activity Based Costing (ABC) is a technique of charging overheads to cost objects (i.e., products, services, jobs, customers etc.) under which overheads are first calculated separately for each activity and then are charged to various cost objects on the basis of activities consumed by these cost objects.

According to Cooper and Kalpan, "ABC system calculate the costs of individual activities and assign costs to cost objects such as products and services on the basis of activities undertaken to produce each product or service."

CIMA, London, defines Activity Based Costing as "Cost attribution to cost units on the basis of benefits received from indirect activities, i.e., ordering, setting up, assuring quality etc."

NEED OF ACTIVITY BASED COSTING

The main objective of any costing system is to determine scientifically the cost of a product or service. For facilitating the calculation, costs are divided into direct and indirect.

- **Direct costs** are the costs which are traceable to the products/ services offered.
- **Indirect Costs** which are also called as 'overheads' are not traceable to the products / services. Hence these costs are first identified, classified, allocated, apportioned wherever allocation is not possible, reapportioned and finally absorbed in the products/services.

The Indirect Costs present problems in charging them to the products and there is a possibility of distortion of costs though the basis of charging them is quite logical. This is one of the limitations of traditional costing system.

Distortions in the costs resulting into incorrect cost calculations may lead to following wrong decisions.

- Errors in fixation of selling prices.
- Wrong decisions regarding deciding of product mix.
- Ignoring customer orientation.
- Missing of profitable opportunities.

In order to overcome the limitations of traditional costing systems Activity Based Costing has been introduced

OBJECTIVES OF ACTIVITY BASED COSTING

- To remove the distortions of computation of total costs as seen in the traditional costing system and bring more accuracy in the computation of costs of products and services.
- To help in decision making by accurately computing the costs of products and services.
- To identify various activities in the production process and further identify the value adding activities.
- To distribute overheads on the basis of activities.
- To identify the opportunities for improvement and reduction of costs. To eliminate non value adding activities.

STRATEGIC COST MANAGEMENT

LIMITATIONS OF ACTIVITY BASED COSTING

- Activity Based Costing is a complex system and requires lot of records and tedious calculations.
- For small organizations, traditional cost accounting system may be more beneficial than Activity Based Costing due to the simplicity of operation of the former:
- Sometimes it is difficult to attribute costs to single activities as some costs support several activities.
- There is a need of trained professionals who are limited in number.
- This system will be successful if there is a total support from the top management.
- Substantial investment of time and money is required for the implementation of this system.

IMPORTANT TERMS USED IN ACTIVITY BASED COSTING

Activity: An activity means an aggregate of closely related tasks having some specific functions which are used for completion of goal or objectives. For example, customer order processing is an activity. It includes receiving order from customers, interacting with production department regarding capacity to produce and giving commitment to the customer regarding delivery time. Other activities may be assembling, packaging, advertising, etc.

Resources: Resources are elements that are used for performing the activities or factors helping in the activities. For example, order receiver, telephone, computers, etc. are resources in customer order processing activity. It may include material, labour, equipment, office supplies, etc.

Cost: Cost is amount paid for resource consumed by the activity. For example, salaries, printing stationary, telephone bill, etc. are cost of customer order processing activity. It is also known as activity cost pool.

Cost Object: It refers to an item for which cost measurement is required, e.g., a product, a service, or a customer.

Cost Pool: A cost pool is a term used to indicate grouping of costs incurred on a particular activity which drives them.

Cost Driver: Any element that would cause a change in the cost of activity is cost driver. Actually, Cost Drivers are basis of charging cost of activity to cost object. Cost drivers are used to trace cost to product by using a measure of resources consumed by each activity. For example, frequency of order, number of orders, etc. may be cost driver of customer order processing activity. Cost driver may be involved two parts:

- **Resource Cost Driver:** It is a measure of the quantity of resources consumed by an activity. It is used to assign the cost of a resource to an activity or cost pool.
- **Activity Cost Driver:** It is measure of the Frequency and intensity of demand, placed on activities by cost objects. It is used to assign activity costs to cost objects.

STRATEGIC COST MANAGEMENT

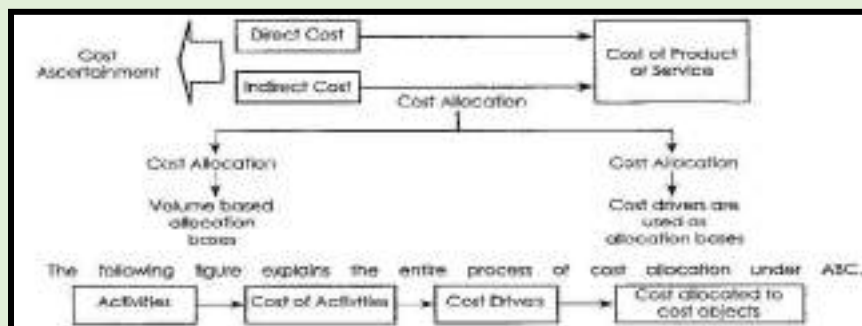
EXAMPLE OF COST POOL AND COST DRIVER

Activities	Resources	Cost Pools	Cost Driver
Consulting	Consultant, computer	Employee cost, Maintenance cost	Level of consultant, time spent
Laser printing	Printing staff, printer	Colour cost, maintenance cost, printing stationery	No. of pages printed, fond
Accounting administration	Administration staff	Salaries	No. of times account produced
Customer service	Telephone, staff	Telephone bill, salaries	Frequency of order, no. of order, time spent in servicing, no. of service calls.
Research development	Staff, equipment, material	Salaries, maintenance cost, material cost	No. of research projects, time spent on a project, technical complexities of project.

ACTIVITY BASED COSTING SYSTEM IS BETTER THAN TRADITIONAL COSTING SYSTEM

1. In the traditional system cost analysis is done by product. In ABC managers focus attention on activities rather than products because activities in various departments may be combined and costs of similar activities ascertained, e.g. quality control, handling of materials, repairs to machines, etc. If detailed costs are kept by activities, the total company costs for each activity can be obtained, analysed, planned and controlled.
2. Managers under ABC, manage activities and not products. Changes in activities lead to changes in costs. Therefore, if the activities are managed well, costs will fall and resulting products will be more competitive.
3. Allocating overhead cost to production based on a single cost driver (allocation base, such as unit basis, percentage of material, percentage of prime cost, labour hour rate, machine hour rate, etc.) can result in an unrealistic product cost because the traditional system fails to capture cause-and-effect relationships. To manage activities better and to make wiser economic decisions, managers need to identify the relationships of causes (activities) and effects (costs) in a more detailed and accurate manner.
4. ABC highlights problem areas that deserve management's attention and more detailed analysis. Many actions are possible, on pricing, on process technology, on product design, on operational movements and on product mix.

Overhead costs are linked to the cost objects based on activities. This is shown in the following figures



STRATEGIC COST MANAGEMENT

STAGES OF ACTIVITY BASED COSTING

1. Identify the chosen cost objects
2. Identify the different activities within the organization
3. Identifying the direct cost of products
4. Relating the overhead to the activities
5. Spreading the support activities across the primary activities
6. Determining the activity cost drivers
7. Calculating the activity cost driver rates
8. Computing the total cost of products or cost objects

MEANING OF ACTIVITY BASED MANAGEMENT

Activity Based Management (ABM): is a discipline that focuses on the management of activities as a way to improve customer value and profit. ABM includes cost driver analysis, activity analysis, and performance measurement.

- Increasing competition, both globally and locally, make it clear that businesses know accurately and understand the source of process, product and service costs within their organization.
- Activity Based Costing (ABC), with its focus on deconstructing overhead pools and assigning costs to products and services in a more meaningful manner, has been a giant leap forward from traditional costing models where a high percentage of cost is arbitrarily allocated to products.
- However, ABC Models often look at cost from a financial point of view, making sure only that all costs are assigned to some product accounting "box" without a thorough understanding of the business process that underlines and defines the resource utilization that creates the cost.
- The methodology that combines business process analysis with ABC to create a tool that translates Activity Based Costing into Activity Based Management (ABM).

ABM UTILIZES COST INFORMATION GATHERED THROUGH ABC

Through various different types of analysis, ABM manages activities rather than resources. It determines what drives the activities of the organization and how these activities can be improved to increase the profitability.

ABC information can be used in an ABM system to assist in business strategic decision. Such as:

- a) Whether to continue with a particular activity?
- b) The effect on cost structure of a change in strategy, (e.g., from mass production to smaller lot).
- c) How changes in activities and components affect the suppliers and the value chain?

APPLICATIONS OF ABM IN BUSINESS

- ✓ Cost reduction or elimination of entire activity, specially there is no value-added item/activity.
- ✓ Activity based budgeting or cost-effective budgeting.
- ✓ Business Process Re-engineering (BPR).
- ✓ Bench-marking.
- ✓ Activity performance measurement.

STRATEGIC COST MANAGEMENT

ADVANTAGES OF ACTIVITY BASED COSTING

1. It provides more accurate product costing information by reducing arbitrary cost allocations.
2. It improves the quality of information available for decision making by answering the questions such as what activities and events are driving cost and where efforts should be made to control cost?
3. It is easiest way to allocate overhead in the product.
4. It helps to identify the activities that can be eliminated.
5. It links up cause and effect relationship.
6. It helps to identify the value-added activities (that increase the customer's satisfaction) and non- value-added activities (that creates the problems in customer's satisfaction)
7. It translates cost in to a language that people can understand and that can be linked up to business activities.

STRATEGIC COST MANAGEMENT

JUST IN TIME (JIT)

MEANING OF JUST IN TIME

A Just-in-time (JIT) approach is a collection of ideas that streamline a company's production process activities to such an extent that wastage of all kinds viz., of time, material, and labour is systematically driven out of the process.

OBJECTIVES OF JUST IN TIME PRODUCTION METHODS

1. Produce only the products services that customer wants
2. Produce products only as quickly as possible as customers want to use them
3. Produce products with perfect quality
4. Produce in minimum possible time
5. Produce products with features only what customer want
6. Produce with no waste of labour, materials and equipment

JIT SYSTEM AIMS

- Meeting customer demand in a timely manner,
- Providing high quality products
- Providing products at the lowest possible total cost.

ADVANTAGES OF JUST IN TIME SYSTEM

1. Inventory levels are drastically reduced
2. Product quality is improved and cost of scrap is reduced
3. The causes of Production problems, manufacturing operations are streamlined and problem free
4. With less WIP, less space is occupied.
5. Multi skilled, flexible work force bring benefits such as Reduce worker idle time, reduced overheads and increased responsiveness.
6. Elimination of unnecessary suppliers
7. Reduction in customer related problems
8. Improvements in communication quality

DISADVANTAGES OF JUST IN TIME SYSTEM

1. Danger of disrupted production due to nonarrival of supplies
2. Danger of lost sales
3. High dependence on suppliers
4. Less time for quality control on arrival of materials
5. Ordering/Transaction costs would be relatively high, as frequent transactions would be made
6. May lose bulk-buying discounts

STRATEGIC COST MANAGEMENT

ROLE OF JIT TO ELIMINATE WASTAGES OF RESOURCES

- a) **Reduction in Inventory Levels:** Unnecessary piling up of Raw Materials, WIP and Finished Goods is avoided. The focus is on production and purchase as per the firm's requirements.
- b) **Reduction in Wastage of Time:** Wastage of time in various ways like Inspection Time, Machinery Setup Time, Storage Time, Queue Time, Defectives Rework Time etc are reduced.
- c) **Reduction in Scrap Rates:** There will be sharp reductions in the rate of defectives or scrapped units. The workers themselves identify defects and take prompt action to avoid their recurrence.
- d) **Reduction in OH Costs:** By reducing Non-Value Added activities and the associated time and cost drivers, OH can be greatly reduced e. g. material handling costs, rework costs, facility costs etc Since all costs associated with the warehouse are assigned to the overhead cost pool, the amount of overheads is reduced when the costs of staff, equipment, fixed assets, facilities, and rent associated with the warehouse are sharply cut back. In short, overhead costs decline as some costs are eliminated, while other costs shift between" products as more costs are charged directly to products and the remaining overhead costs are charged out using different allocation methods.

STRATEGIC COST MANAGEMENT

ENTERPRISE RESOURCE PLANNING (ERP)

MEANING OF ERP

Enterprise resource planning software or ERP attempts to integrate all departments and functions across a company into a single computer system that can serve all those different departments particular needs. In fact, ERP combines all computerised departments together with the help of a single integrate software program that runs off as single database so that various department can more easily share information and commission with each other.

FEATURES OF ENTERPRISE RESOURCE PLANNING

1. ERP facilities company—wide Integrated Information System covering all functional areas like manufacturing, selling and distribution, payables, receivables, inventory, accounts, human resources, purchases etc.
2. ERP perform core activities and increases customers service, thereby augmenting the corporate image.
3. ERP bridge the information gap across organisations.
4. ERP provides complete integration of system not only across departments but also across companies under the same management.
5. ERP is the solution for better project management.
6. ERP allows automatic introduction of the latest technologies like Electronic Fund Transfer (EFT). Electronic Data Interchange (EDI), Internet, Intranet, Video conferencing, E-Commerce etc.
7. ERP eliminates most business problems like materials shortages, productivity enhancements, customer service, cash management, inventory problems, quality problems, prompt delivery etc.
8. ERP not only addresses the current requirement of the company but also provide the opportunity of continually improving and refining business Processes.

BENEFITS OF ENTERPRISE RESOURCE PLANNING

1. **Product Costing:** helps in determination of cost of products correctly
2. **Inventory Management:** It supports all reporting of specific and general types of stock transaction such as various types of stock transfers, re-classification, ID changes and physical inventory results.
3. **Distribution & Delivery:** to deliver the right product from the right warehouse to the right customer at the right time –every time.
4. **E-Commerce:** Internet enables ERP offers Internet, Intranet and extranet solutions for business, business to consumer, employee self-service and more.
5. **Automatic Control:** It ensure automatic quality control procedure.
6. **After Sales Service:** It ensures better after sales service.
7. **Improvement in Production Planning:** It improved production planning.
8. **Quick response:** It enables quick response to change in business operations & market conditions.
9. **Cumulative Edge's:** It helps to achieve competitive advantages by improving business process.

STRATEGIC COST MANAGEMENT

REASONS FOR THE IMPLEMENTATION OF ERP BY COMPANIES

1. Improve a company's business performance
2. Standardize manufacturing processes
3. Integrate Financial data
4. To standardise HR information
5. Reduction in cycle time
6. Improved Resource Utilization
7. Better Customer Satisfaction
8. Improved Supplier

STRATEGIC COST MANAGEMENT

BENCHMARKING

MEANING OF BENCHMARKING

Benchmarking is the process of identifying and learning from the best practices anywhere in the world. It is a powerful tool for continuous improvement in performance. It involves comparing firm's products, services or activities against other best performing organization, either internal or external to the firm. The objective is to find out how the product, service or activity can be improved and ensure that the improvements are implemented. It attempts to identify an activity that needs to be improved and finding a non-rival organization that is considered to represent world-class best practice and studying how it performs the activity.

TYPES OF BENCHMARKING

- 1. Product Benchmarking (Reverse Engineering):** In this Benchmarking every organization buys its rival's products and tears down to find out how the features and performances etc., compare with its products. This could be the starting point for improvement.
- 2. Competitive Benchmarking:** It involves the comparison of own products, processes and business results with that of competitors.
- 3. Process benchmarking:** It involves the comparison of an organisation's critical business processes and operations against best practice organization that performs similar work or deliver similar services.
- 4. Strategic Benchmarking:** It involves a systematic process by which a company seeks to improve its overall performance by examining the long-term strategies. It involves comparing high-level aspects such as developing new products and services, core competencies etc. It is similar to process benchmarking in nature but differs in its scope and depth.
- 5. Global benchmarking:** It is a benchmarking through which distinction in international culture, business processes and trade practices across companies are bridged and their ramification for business process improvement are understood and utilized.
- 6. Internal Benchmarking:** It involves seeking partners from within the same organization, for example from business units located in different areas. The main advantages are (a) Easy access to sensitive data and information (b) Availability of standardized data; and (c) Lesser requirement of time and resources. However, real innovation may be lacking.
- 7. External Benchmarking:** It involves seeking help of outside organization that are known to be best in class. It provides opportunities of learning from those who are at leading edge.

STRATEGIC COST MANAGEMENT

PRE-REQUISITES OF BENCHMARKING

1. **Commitment:** Senior Managers should support benchmarking fully and must be omitted to continuous improvements.
2. **Clarity of Objectives:** The objectives should be clearly defined at the preliminary stage. Benchmarking teams have a clear picture of their Firm's performance before approaching others for comparisons.
3. **Appropriate Scope:** The scope of the work should be appropriate in the light of the objectives, resources, time available and the experience level of those involved.
4. **Resources:** Sufficient resources must be available to complete projects within the required time scale.
5. **Skills:** Benchmarking teams should have appropriate skills and competencies.
6. **Communication:** Stakeholders, and also staff and their representatives, are to be kept informed of the reasons for benchmarking.

DEFINE DIFFICULTIES IN IMPLEMENTATION OF BENCHMARKING

1. **Time consuming:** Benchmarking is time consuming and at times difficult. It has significant requirement of staff time and Company resources. Companies may waste time in benchmarking non-critical functions.
2. **Lack of management Support:** Benchmarking implementation requires the direct involvement of all managers. The drive to be best in the industry or world cannot be delegated.
3. **Resistance from employees:** It is likely that their maybe resistance from employees.
4. **Paper Goals:** Companies can become pre-occupied with the measures. The goal becomes not to improve process, but to match the best practices at any cost.
5. **Copy-paste attitude:** The key element in benchmarking is the adaptation of a best practice to tailor it to a company's needs and culture. Without that step, a company merely adopts another company's process.

STEPS INVOLVED IN THE PROCESS OF BENCHMARKING

1. Planning –
 - a) Determination of Benchmarking goal statement
 - b) Identification of best performance
 - c) Establishment of the benchmarking or process improvement team
 - d) Defining the relevant benchmarking measures
2. Collection of Data and Information
3. Analysis of the findings based on the data collected in Step 2
4. Formulation and Implementation of Recommendations
5. Constant Monitoring and Reviewing

STRATEGIC COST MANAGEMENT

TOTAL QUALITY MANAGEMENT

DEFINE TQM

Total Quality Management is a philosophy of continuously improving the quality of all the products and processes in response to continuous feedback for meeting the customers' requirements. It aims to do things right the first time, rather than need to fix problems after they emerge.

As Per CIMA, TQM is the integrated and comprehensive system of planning and controlling all business functions so that products or services are produced which meet or exceed customer expectations.

TQM seeks to increase customer satisfaction by finding the factors that limit current performance. The TQM approach highlights the need for a **customer-oriented approach** to management reporting, eliminating some or more of traditional reporting practices.

ELEMENTS OF TQM

Total	Involves everyone and all activities in the company
Quality	Providing products or services as per specifications
Management	Quality can and must be managed (Avoid defects rather than correct them)

THREE CORE CONCEPTS OF TQM

- (a) **Quality Control (QC):** It is concerned with the **past**, and deals with data obtained from previous production, which allow action to be taken to stop the production of defective units.
- (b) **Quality Assurance (QA):** It deals with the **present** and focuses to create and operate appropriate systems to prevent defects from occurring.
- (c) **Quality Management (QM):** It is concerned with the **future**, and manages people in a process of continuous improvement to the products and services offered by the Firm.

STAGES IN THE IMPLEMENTATION OF TQM

Stage	Description
1	Identification of Customers / Customer Groups
2	Identification of Customer expectations
3	Identification of Customer decision-making requirements and product utilities.
4	Identification of perceived problems in decision-making process and product utilities.
5	Comparison with other Firms and Benchmarking.
6	Customer Feedback.
7	Identification of improvement opportunities.
8	Quality Improvement Process through – (a) Determination of new strategies (b) Elimination of deficiencies (c) Identifying solutions

STRATEGIC COST MANAGEMENT

PRINCIPLES OF TQM

1. Clear exposition of the benefits of a project.
2. Total Employee involvement (TEI).
3. Process measurement.
4. Involvement of all customers and contributors.
5. Elimination of irrelevant data.
6. Understanding the needs of the whole process.
7. Use of graphical and pictorial techniques to achieve understanding.
8. Establishment of performance specifications and targets.
9. Use of errors to prompt continuous improvement.
10. Use of statistics to tell people how well they are doing

THE “Essential requirements” for successful implementation are described as the Six C’s of TQM. These are –

The Six C’s	
Commitment	If a TQM culture is to be developed, total commitment must come from Top Management. It is not sufficient to delegate ‘quality’ issues to a single person. Quality expectations must be made clear by the Top Management, together with the support and training required for its achievement.
Culture	Training lies at the centre of effecting a change in culture and attitudes. Negative perceptions must be changed to encourage individual contributions and to make ‘quality’ a normal part of everyone’s job.
Continuous Improvement	TQM should be recognized as a ‘continuous process’. It is not a ‘one-time programme’. There will always be room for improvement, however small it may be.
Co-operation	TQM visualizes total Employee Involvement (TEI). Employee involvement and co-operation should be sought in the development of improvement strategies and associated performance measures.
Customer Focus	The needs of external customers (in receipt of the final product or service) and also the internal customers (colleagues who receive and supply goods, services or information), should be the prime focus in TQM.
Control	Documentation, procedures and awareness of current best practice are essential, if TQM implementations are to function appropriately. Unless control procedures are in place, improvements cannot be monitored and measured nor deficiencies corrected.

STRATEGIC COST MANAGEMENT

4 P'S OF QUALITY IMPROVEMENT PRINCIPLES

- 1. People:** To avoid misdirection, TQM teams should consist of team spirited individuals who have a flair for accepting and meeting challenges. Individuals who are not ideally suited to the participatory process of TQM, should not be involved at all, *e.g.*, lack of enthusiasm, non-attendance at TQM meetings, failure to complete delegated work, remaining a “Mute Spectator” at TQM Meetings, *etc.*
- 2. Process:** It is essential to approach problem-solving practically and to regard the formal process as a system designed to prevent participants from jumping to conclusions. As such, it will provide a means to facilitate the generation of alternatives, while ensuring that important discussion stages are not omitted.
- 3. Problem:** Problems need to be approached in a systematic manner, with teams tackling solvable problems with a direct economic impact, allowing for immediate feedback together with a recognition of the contribution made by individual participants.
- 4. Preparation:** Additional training on creative thinking and statistical processes are needed in order to give participants a greater appreciation of the diversity of the process. Training must be given to all concerned employees and supervisory level staff.

STRATEGIC COST MANAGEMENT

QUALITY COSTS

EXPLAIN THE CONCEPT OF 'QUALITY' AND ENUMERATE 'COST OF QUALITY' UNDER DIFFERENT GROUPS

The term quality is a perception which is personal to an individual. In plain terms, quality is "features" or "worth" or "value".

COST OF QUALITY' UNDER DIFFERENT GROUPS

- ✓ **Conformance to specifications** measures how well the product or service meets the targets and tolerances determined by its designers.
- ✓ **Fitness for use** focuses on how well the product performs its intended function or use.
- ✓ **Value for price paid** is a definition of quality that consumers often use for product or service usefulness.
- ✓ **Support services** provided are often how the quality of a product or service is judged. Quality does not apply only to the product or service itself; it also applies to the people, processes, and organizational environment associated with it.
- ✓ **Psychological criteria** is a subjective definition that focuses on the judgmental evaluation of what constitutes product or service quality. Quality has many other costs, which can be divided into two categories. The first category consists of costs necessary for achieving high quality, which are called quality control costs. These are of two types:

QUALITY COST

It is the cost of performing the activities to check failure in meeting the quality specification. The "cost of quality" isn't the price of creating a quality product or service. It's the cost of not creating a quality product or service.

Examples:

1. The reworking of a manufactured item.
2. The retesting of an assembly.
3. The rebuilding of a tool.
4. The correction of a bank statement.
5. The reworking of a service, such as the reprocessing of a loan operation or the replacement of a food order in a restaurant.

LITERATURE ON QUALITY

- ✓ **"Quality is not an act. It is a habit"**: This is true and applicable to any act of a human being.
- ✓ **"Quality is conformance to requirements"**: This in line with the concept that quality is decided by the customer.
- ✓ **"Quality is zero defects"**: No customer wants defects in the products or services he or she pays for. This is a totally different idea on quality and is true when you make quality a habit.
- ✓ **"Quality is free"**: This is the utopian situation. When there are no defects then there is no wastage and thus quality becomes free.
- ✓ **"Quality is the degree to which a set of inherent characteristics fulfils requirements"**: This is an attempt to give universality to the term quality.

STRATEGIC COST MANAGEMENT

CLASSIFICATION OF COST OF QUALITY

The First Category consists of COSTS NECESSARY FOR ACHIEVING HIGH QUALITY, which are called a **Quality Control Costs**.

These are of two types:

- (a) **Prevention Costs:** These are incurred in preventing the production of products that do not be conventional to specification.
- (b) **Appraisal Costs:** These are incurred to ensure that materials and products meet quality conformance (according) standards.

The Second Category consists of THE COST CONSEQUENCES OF POOR QUALITY, which are called **Quality Failure Costs**.

These are of two types:

- (a) **Internal Failure Costs:** These are associated with materials and products that fail to meet quality standards. They include costs incurred before the product is dispatched to the customer.
- (b) **External Failure Costs:** These are incurred when inferior products are delivered to customers.

EXAMPLES OF COST OF QUALITY

PREVENTION COSTS	APPRAISAL COSTS
<ul style="list-style-type: none"> • Quality Engineering • Quality Planning and Training • Quality Circles • Design Review • Preventive/Planned Maintenance • Higher Quality Raw Materials • Quality Audits 	<ul style="list-style-type: none"> • Material, WIP & FG testing and inspecting • Package inspection • Equipment testing / Accuracy check. • Continuing/Ongoing Supplier Verification. • Packaging Inspection • Field Testing • Product Acceptance
INTERNAL FAILURE COSTS	EXTERNAL FAILURE COSTS
<ul style="list-style-type: none"> • Scrap • Re-work • Re-inspection • Re-testing • Repair • Down time due to testing equipment • Work Stoppages due to defects 	<ul style="list-style-type: none"> • Contribution Lost due to loss of Goodwill and Reputation. • Product Liability Warranties and Claims. • Costs for Handling Customer Complaints • Replacement of Parts in warranty • Price Discounts and Second Sales at lower prices due to defects

STRATEGIC COST MANAGEMENT

PRAISE ANALYSIS

SIX STEPS QUALITY IMPROVEMENT PROCESS - "THE PRAISE" ELEMENTS, DIFFICULTIES EXPERIENCED AT EACH STEP & ITS REMEDIAL ACTION

Step	Activity	Elements	Difficulties	Remedies
1	Problem Identification	<ul style="list-style-type: none"> • Areas of customer dissatisfaction • Absence of competitive advantage 	<ul style="list-style-type: none"> ❖ Effects of a problem are apparent, but the problems themselves are difficult to identify. ❖ Problem may be identifiable, but it is difficult to identify a measurable improvement opportunity 	<ul style="list-style-type: none"> ❖ Participative approach like Brainstorming, Multi-Voting, Panel Discussion ❖ Quantification and precise definition of problems
2	Ranking	<ul style="list-style-type: none"> • Priorities problems by importance 	<ul style="list-style-type: none"> ❖ Difference in perception of individuals in ranking. ❖ Difference in preferences based on functions, e.g. production, finance, marketing, etc. 	<ul style="list-style-type: none"> ❖ Participative Approach ❖ Sub-ordination of individual to group interest
3	Analysis	<ul style="list-style-type: none"> • Identification of possible causes 	<ul style="list-style-type: none"> ❖ Adoption of <i>ad hoc</i> approaches and quick-fix solutions 	<ul style="list-style-type: none"> ❖ Lateral Thinking ❖ Brainstorming
4	Innovation	<ul style="list-style-type: none"> • Use creative thinking to generate potential solutions 	<ul style="list-style-type: none"> ❖ Lack of creativity or expertise ❖ Inability to operationalise ideas, i.e. convert thoughts into action points 	<ul style="list-style-type: none"> ❖ Systematic evaluation of all aspects of each strategy.
5	Solution	<ul style="list-style-type: none"> • Implement the preferred solution • Take appropriate action to bring about the required changes 	<ul style="list-style-type: none"> ❖ Resistance from Middle Level Managers 	<ul style="list-style-type: none"> ❖ Effective internal communication ❖ Training of Personnel and Managers. ❖ Participative Approach.
6	Evaluation	<ul style="list-style-type: none"> • Monitor the effectiveness of actions 	<ul style="list-style-type: none"> ❖ Problems in implementation ❖ Lack of measurable data for comparison of expectations with actual. 	<ul style="list-style-type: none"> ❖ Effective Control System to track actual. ❖ Feedback System.

STRATEGIC COST MANAGEMENT

IMPLEMENTATION OF PRAISE PROCESS

6. **Small to Big Issues:** Big improvement opportunities are generally complex and require extensive interdepartmental co-operation. The choice of a relatively small problem in the first instance provides a greater chance of success. Therefore, the TQM team has to proceed from small to big issues gradually.
7. **Solvable problem:** The problem selected should not be trivial, but it should be one with a potential impact and a clear improvement opportunity. Measurable progress towards implementation should be accomplished within a reasonable time in order to maintain the motivation of participants and advertise the success of the improvement itself.
8. **Recognition of participants:** The successful projects and team members should receive appropriate recognition. Prominent individuals should be rewarded for their efforts through monetary / non-monetary prizes as a measure of personal recognition and as encouragement to others

STRATEGIC COST MANAGEMENT

SIX SIGMA

MEANING OF SIX SIGMA

- ❖ **Six Sigma (6σ)** is a set of techniques and tools for process improvement.
- ❖ It was introduced by **American engineer Bill Smith** while working at **Motorola in 1986**.
- ❖ Six-sigma accuracy means '**the process is 99.999998% accurate**'.
- ❖ That is the process will produce **only 0.002% defects per million**.
- ❖ In quality practice, **Six Sigma means 3.4 parts per million**.
- ❖ Company engaged in six-sigma can expect to see:
 - a) Saving in Material and labour
 - b) Improved customer satisfaction
 - c) Reduction in cycle time
 - d) Increased productivity and process flow
 - e) Reduction in total defect
- ❖ **Six Sigma** strategies seek to improve manufacturing quality by identifying and removing the causes of defects and minimizing variability in manufacturing and business processes.
- ❖ Each Six Sigma project follows a defined methodology and has specific value targets, such as reducing pollution or increasing customer satisfaction.

TWO METHODOLOGIES FOR IMPLEMENTATION OF SIX SIGMA

1. **DMAIC (Define, Measure, Analyse, Improve & Control)** is used for projects aimed at improving an existing business process
2. **DMADV (Define, Measure, Analyse, Design & Verify)** is used for projects aimed at creating new product or process designs

DMAIC: This method is very robust. It is used to improve existing business process. To produce dramatic improvement in business process, many entities have used it successfully. **It has five phases:**

1. **Define** the problem, the project goals and customer requirements.
2. **Measure** the process to determine current performance.
3. **Analyse** the process to determine root causes of variation and poor performance (defects)
4. **Improve** the process by addressing and eliminating the root causes.
5. **Control** means maintaining the improved process and future process performance.

DMADV: The application of these methods is aimed at creating a high-quality product keeping in mind customer requirements at every stage of the product. It is an improvement system which is used to develop new processes or products at Six Sigma quality levels. **It has five phases:**

1. **Define** the project goals and customer deliverables.
2. **Measure** and determine customer needs and specifications.
3. **Analyse** the process options to meet the customer needs.
4. **Design** (detailed) the process to meet customer needs.
5. **Verify** the design performance and ability to meet customer needs.

STRATEGIC COST MANAGEMENT

DIFFERENCE BETWEEN DMAIC AND DMADV

DMAIC	DMADV
Review the existing processes and fixes problem	Emphases on the design of the product and processes
More reactive process	Proactive process
Increase the capability	Increase the capacity
Rupee benefits quantified rather quickly	Rupee benefits more difficult to quantify and tend to be much more long term
Examples of DMAIC problem-solving methods. <ul style="list-style-type: none"> ❖ Reduce the cycle time to process a Patent ❖ Reduce the number of errors in sales list ❖ Improve search time for critical information 	Examples of procedures that the DMADV development method is designed to address: <ul style="list-style-type: none"> ❖ Add a new service e Create a real-time system ❖ Create a multiple-source lead tracking system

LIMITATIONS OF SIX SIGMA

- a) It focuses on quality only.
- b) It does not work well with intangible results. Substantial infrastructure investment is required.
- c) It is complicated for some tasks.
- d) Not all products need to meet Six Sigma standards.
- e) Six Sigma focuses on specific type of process only.
- f) There are lot to real time barriers which needs to be resolved while translating the theoretical concepts into practical applications.

KEY ROLES REQUIRED FOR SUCCESSFUL IMPLEMENTATION OF SIX SIGMA

1. **Executive Leadership** includes CEO and other key top management team members. They are responsible for setting up a vision for Six Sigma implementation. They also empower the other role holders with the freedom and resources to explore new ideas for breakthrough improvements.
2. **Champions** are responsible for the Six Sigma implementation across the organization in an integrated manner. The Executive Leadership draws them from the upper management. Champions also act as mentors to Black Belts. At GE this level of certification is now called "Quality Leader"
3. **Master Black Belts**, identified by champions, act as in-house expert coaches for the organization on Six Sigma. They devote 100% of their time to Six Sigma. They assist champions and guide Black Belts and Green Belts.
4. **Experts** this level of skill is used primarily within Aerospace and Defense Business Sectors. Experts work across company boundaries, improving services, processes, and products for their suppliers, their entire campuses, and for their customers.
5. **Black Belts** operate under Master Black Belts to apply Six Sigma methodology to specific projects. They devote 100% of their time to Six Sigma. They primarily focus on Six Sigma project execution, whereas Champions and Master Black Belts focus on identifying projects/functions for Six Sigma.
6. **Green Belts** are the employees who take up Six Sigma implementation along with their other job responsibilities. They operate under the guidance of Black Belts and support them in achieving the overall results.
7. **Yellow Belts** are employees who have been trained in Six Sigma techniques as part of a corporate-wide initiative, but have not completed a Six Sigma project and are not expected to actively engage in quality improvement activities.

STRATEGIC COST MANAGEMENT

PARETO ANALYSIS

PARETO ANALYSIS

- Pareto Analysis is a rule that recommends focus on the most important aspects of the decision making in order to simplify the process of decision making.
- It is based on the 80:20 rule that was a phenomenon first observed by Vilfredo Pareto, an Italian economist.
- He noticed that 80% of the wealth of Milan was owned by 20% of its citizens. This pattern of 80:20 or approximation like 70:30 can be observed in many different business situations.
- The management can use this 80:20 relationship in a number of business situations to direct management attention to the key control mechanism or planning aspects.
- It helps to clearly establish top priorities and to identify both profitable and unprofitable targets.

USEFULNESS OF PARETO ANALYSIS

1. Prioritize problems, goals, and objectives to Identify root causes.
2. Select and define key quality improvement programs.
3. Select key customer relations and service programs.
4. Select key employee relations improvement programs.
5. Select and define key performance improvement programs.
6. Maximize research and product development time.
7. Verify operating procedures and manufacturing processes.
8. Product or Services sales and distribution.
9. Allocate physical, financial and human resources.

APPLICATION OF PARETO ANALYSIS

1. Pricing of a product
2. Customer Profitability analysis
3. ABC analysis- Stock Control
4. Application in Activity Based Costing
5. Quality Control

STRATEGIC COST MANAGEMENT

LEARNING CURVE

MEANING OF LEARNING CURVE THEORY

Learning Curve Theory is concerned with the idea that when a new job, process or activity commences for the first time it is likely that the workforce involved will not achieve maximum efficiency immediately. Repetition of the task is likely to make the people more confident and knowledgeable and will eventually result in a more efficient and rapid operation. Eventually the learning process will stop after continually repeating the job. As a consequence, the time to complete a task will initially decline and then stabilise once efficient working is achieved. The cumulative average time per unit is assumed to decrease by a constant percentage every time that output doubles. Cumulative average time refers to the average time per unit for all units produced so far, from and including the first one made.

PHASES IN LEARNING CURVE

In the First phase, there will be gradual increase in production rate until the maximum expected rate is reached and this phase is generally steep.

In the Second phase, the learning rate will gradually deteriorate because of the limitations of equipment.

In the Third phase, the production rate begins to decrease due to a reduction in customer requirements and increase in costs.

Learning curve is a Geometrical Progression, it reveals the steadily decreasing cost of accomplishment of a given repetitive operation as it is increasing repeated.

LEARNING CURVE RATIO

The learning effect can also be expressed in the form of ratio called learning curve ratio. It may be calculated with the help of the following formula:

$$\text{Learning Curve Ratio} = \frac{\text{Average Labour Cost per unit of Second Batch Units}}{\text{Average Labour Cost per unit of First Batch Units}}$$

For example, if the first batch of a product consists of 500 units and the cost of labour per unit is `40, while if the second batch consists of 1000 units and the cost per unit comes to `30; The Learning Curve Ratio can be obtained as follow:

$$\text{Learning Curve Ratio} = 30 / 40 \times 100 = 75\%$$

This means that every time when the output doubles the average cost per unit will decline to 75% of the previous cost per unit.

STRATEGIC COST MANAGEMENT

LIMITATIONS TO THE USEFULNESS OF THE LEARNING CURVE

1. The learning curve is useful only for new operations where machines do not constitute a major part of the production process. It is not applicable to all productions. E.g. new and experienced workmen.
2. The learning curve assumes that the production will continue without any major interruptions.
3. Charges other than learning may effect the learning curve. For example, improvement in facilities, arrangements.
4. The characteristic 80 percent learning curve as originally obtaining in the air force industry in U.S. A. has been usually accepted as the percentage applicable to all industries.

FACTORS AFFECTING LEARNING CURVE

- (a) While pricing for bids, general tendency is to set up a very high initial labour cost so as to show a high learning curve. This should the learning curve useless and sometimes misleading.
- (b) The method of production i.e. whether it is labour oriented or machine-oriented influences the slop of the learning.
- (c) When labour turnover rate is high management has to train new workers frequently. In such situations the company may never reach its maximum efficiency potential. One of the important requisites of the learning curve concept is that there should be uninterrupted flow of work. The fewer the interruptions, the grater will be the improvement in efficiency.
- (d) Changes in a product or in the methods of production, designs, machinery, or the tools/used affect the slope of the learning curve. All these have the effect of starting learning a fresh because of new conditions If the changes are frequent, there may be no learning at all.
- (e) Other factors influencing the learning curve are labour strikes, lock outs and shut downs due to other cause also/affect the learning curve. In each such case there is interruption in the progress of learning.

DISTINCTIVE FEATURES OF LEARNING CURVE THEORY

The production quantity of a given item doubled the cost of that item decrease at a fixed rate. This phenomenon is the basic premise on which the theory of learning curve has been formulated.

The distinctive features of a learning curve are:

1. Better tooling methods are developed and used.
2. More productive equipments are designed and used to make the product.
3. Design bugs are detected and corrected.
4. Better design engineering reduces material and labour costs.
5. Early teething problems are overcome. As production progresses management is prompted to achieve better planning and better management.
6. Rejections and rework tend to diminish over time.

STRATEGIC COST MANAGEMENT

LIMITATIONS OF LEARNING CURVE

1. Unplanned changes in production techniques or labour turnover will cause problems and affect the learning rate.
2. The employees need to be motivated, agree to the plan and keep to the learning schedule – these assumptions may not hold.
3. Accurate and appropriate learning curve data may be difficult to estimate.
4. Inaccuracy in estimating the initial labour requirement for the first unit.
5. All the activities of a firm are not to subject to learning curve.

AREAS IN WHICH THE APPLICATION OF LEARNING CURVE THEORY CAN HELP A MANUFACTURING ORGANISATION

1. **Product Designing:** Learning curve theory helps in product designing where the design engineers can take decisions based on expected predictable from past experience.
2. **Work Scheduling:** Learning curve helps in preparation of accurate delivery schedules by predicting the input requirement.
3. **Improving the Productivity:** Learning Curve when applied improves the performance of workers which in turn improves the productivity of the enterprise.
4. **Cost Prediction:** Learning curve enables better cost prediction to enable price quotations to be preferred for potential orders.
5. **Controlling:** Learning curve is useful in setting standards in learning phase. If budgets and standards are set without considering learning curve. It is meaningless because variance will arise.

USES OF KNOWLEDGE OF LEARNING CURVE IN BUSINESS

1. It can be used as a tool for forecasting
2. Helps in developing budgets and profit planning of the project.
3. Helps in development of advantageous pricing policy.
4. It helps design engineers in making decisions based upon expected (predictable from past experience) rates of improvement.
5. It is very useful to the Government in negotiations about the Contracts.
6. It is quite helpful in setting standards in learning phase.

INDUSTRIES WHERE LEARNING CURVE CAN BE APPLIED

1. Aircraft industry
2. Non-production activities like marketing
3. Labour-oriented industries
4. It can be effective with the job which is repetitive in nature particularly with same machinery and tools.

IMPACT OF LEARNING CURVE MODEL ON LABOUR VARIANCES

1. The initial standard time taken to produce the item will become rapidly out of date
2. Variances calculated use using out of date standards will quickly become meaningless for planning and control.

STRATEGIC COST MANAGEMENT

AREAS WHERE LEARNING CURVE TECHNIQUES IS USEFUL IN BUSINESS

1. It is useful in exercising control.
2. It is used for make-or-buy decisions especially if the outside manufacturer has reached the maximum on the Learning curve.
3. A knowledge of learning curve techniques assists in planning the inventories of materials, WIP and finished goods.
4. It is frequently used in conjunction with establishing bid price for contracts.
5. It suggests a basis for correct staffing in continuously expanding production.

STRATEGIC COST MANAGEMENT

LINEAR PROGRAMMING

MEANING OF LINEAR PROGRAMMING PROBLEM

Linear programming problem (LPP) is *a mathematical technique for determining the optimal allocation of resources and obtaining a particular objective when there are alternative uses of the resources: money, man power, materials, machines and other facilities.*

LPP is a mathematical method of solving practical problems by means of linear functions where the variables involved are subject to constraints.

LPP was first formulated by a Russian mathematician L.V. Kantorovich but it was developed later in 1947 by George B. Dantzig (known as father of LP) for the purpose of scheduling the complicated procurement activities in US Air-force.

In reality, there may be a number of constraints on production e.g., Labour hours and Machine hours, Material shortage, Market constraints, etc. Under such circumstances, LP technique is used to solve the problem.

LIMITATIONS OF LINEAR PROGRAMMING

1. Firstly, the linear programming models can be applied only in those situations where the constraints and the objective function can be stated in terms of linear expressions.
2. In linear programming problems, coefficients in the objective function and the constraint equations must be completely known and they should not change during the period of study.
3. Yet another important limitation of linear programming is that it may give fractional valued answers.
4. Linear programming will fail to give a solution if management have conflicting multiple goals.
5. Does not take into consideration the effect of time and uncertainty.

METHODS USED TO FIND OPTIMAL SOLUTION OF LINEAR PROGRAMMING PROBLEM

1. **Graphic Method:** Graphical method is applicable only for solving an LPP having two variables in its constraints. The graphical method is the more popular method to use because they are easy to use and understand. Working with only a few variables at a time they allow operations managers to compare projected demand to existing capacity.
2. **Simplex Method:** When decision variables are more than 2, it is always advisable to use Simplex Method to avoid lengthy graphical procedure. The simplex method is not used to examine all the feasible solutions. It deals only with a small and unique set of feasible solutions, the set of vertex points (i.e., extreme points) of the convex feasible space that contains the optimal solution.
3. **Transportation Method:** The transportation problem deal with a special class of linear programming problems in which the objective is to 'transport' a single commodity from various 'origins' to different "destinations" at a minimum total cost.

STRATEGIC COST MANAGEMENT

APPLICATION AREAS OF LINEAR PROGRAMMING

1. Industrial Applications

- (a) Product Mix-Problem
- (b) Production Scheduling
- (c) Production Smoothing Problem
- (d) Blending Problems
- (e) Transportation Problems
- (f) Production distribution problems
- (g) Oil Refineries Industry
- (h) Communication Industry
- (i) Rail Road Industry

2. Management Applications

- (a) Portfolio Selection
- (b) Financial Mix Strategy
- (c) Profit Planning
- (d) Media Selection
- (e) Travelling Salesmen Problem
- (f) Determination of equitable salaries
- (g) Staffing problem

3. Miscellaneous Applications

- (a) Farm planning
- (b) Airline routine
- (c) Administration, Education and Politics
- (d) Diet Problems

4. Non-Industrial Applications

- (a) Agriculture.
- (b) Environmental Protection.
- (c) Urban Department.
- (d) Facilities Location.

5. Further Applications

- (a) In structural design for maximum product.
- (b) In balancing assembly lines.
- (c) In scheduling of a military tanker fleet.
- (d) In determining which parts to make and which to buy to obtain maximum profit margin.
- (e) In selecting equipment and evaluating methods improvements that maximize profit margin.
- (f) In design of optimal purchasing policies

6. Administrative Applications

Administrative applications of Linear Programming are concerned with optimal usage of resources like men, machine and material.

STRATEGIC COST MANAGEMENT

DEGENERACY IN LPP AND ITS RESOLVED PROCEDURE

Degeneracy: Sometimes, it happens that during the course of simplex procedure, we get two or more entries in the ratio column of any tableau to be identical and minimum. Now, the question arises which row should be taken as key row? The selection of key row determines the variable to be deleted. This is known as degeneracy. The problem of degeneracy may also occur when one of the constraints on the right-hand side of the equation is zero.

The degeneracy is resolved by the following procedure:

1. Each element of the row which have identical entries in the ratio column is divided by the key column number of the respective row.
2. The values so obtained are compared step by step from left to right. Priority is to be given to identify columns corresponding to slack and artificial variables. The remaining columns are considered from left to right.
3. The comparison is stopped as soon as the rows yield unequal ratios. The row having algebraically smaller ratio is taken to be the key row.

After selecting the key row, regular simplex procedure is resumed.

SLACK VARIABLE AND ARTIFICIAL VARIABLE

1. **Slack Variable:** In solving an LP by simplex method, we convert the constraints of the type \leq into equations. In order to convert the constraints into equations we add a suitable non-negative variable to the LHS of the constraints. Those variables are called '**Slack Variable**'. A slack variable is always non-negative.

Subject to Constraints

$$2x_1 + 3x_2 < 600 \text{ can be written as } 2x_1 + 3x_2 + S_1 = 600$$

Where S_1 is a slack variable and is positive.

2. **Artificial Variable:** In order to convert constraints of the type '**greater than equal to**' to equality for finding the solution of the LP problem, we first subtract a surplus variable and then add a variable. This variable is also added in the constraints of the type 'equal to' to start with the initial feasible solution. The variable added in the constraints as explained above is known as Artificial Variable.

Artificial variables are always positive.

Subject to Constraints

$$2x_1 + 5C_2 \geq 400 \text{ and } 8x_1 + 7x_2 = 300$$

$$\text{Can be written as } 2x_1 + 5C_2 - S_1 + A_1 = 400 \text{ and } 8x_1 + 7x_2 + A_2 = 300$$

Where, A_1 and A_2 are artificial variables and S_1 is a surplus variable. A_1 , A_2 and S_1 are positive.

In order to solve an LP by penalty method and in order to obtain an Initial Basic Feasible Solution we add a suitable non-negative variable to the L.H.S. of the constraints of the type \geq or $=$. Those variables are called Artificial Variables. However, the addition of these artificial variables causes violation in the corresponding constraints so we assign a large penalty $-M$ to these artificial variables in the converted objective function.

STRATEGIC COST MANAGEMENT

ASSIGNMENT

MEANING OF ASSIGNMENT

Assignment is a special linear programming problem. There are many situations where the assignment of people or machines etc. may be called for. Assignment of workers to machines, clerks to various check-out counters, salesmen to different sales areas are typical examples of these. The Assignment is a problem because people possess varying abilities for performing different jobs and therefore the costs of performing jobs by different people are different. Thus, in an assignment problem, the question is how the assignments should be made in order that the total cost involved is minimized.

FOUR METHODS OF SOLVING AN ASSIGNMENT PROBLEM

- (1) Complete Enumeration Method
- (2) Simplex Method
- (3) Transportation Method
- (4) Hungarian Method

HUNGARIAN METHOD

Step 1: Row Operation Locate the smallest cost element in each row of the cost table. Now subtract this smallest element from each element in that row. As a result, there shall be at least one zero in each row of this new table, called the reduced cost table.

Step 2: Column Operation In the reduced cost table obtained, consider each column and locate the smallest element in it. Subtract the smallest value from every other entry in the column.

As a consequence of this action, there would be at least one zero in each of the rows and columns of the second reduced cost table.

Step 3: Optimality Draw the minimum no. of horizontal and vertical lines (not the diagonal ones) that are required to cover all the zero elements. If the no. of lines drawn is equal to 'n' (the no. of rows/columns) the solution is optimal and proceeds to step 6. If the no. of lines drawn is smaller than 'n' go to step 4.

Step 4: Improved Matrix Select the smallest uncovered (by the lines) cost element. Subtract this element from all uncovered elements including itself and add this element to each value located at the intersection of any two lines. The cost elements through which only one line passes remain unaltered.

Step 5: Repeat step 3 and 4 until an optimal solution is obtained.

Step 6: Given the optimal solution, make the job assignments as indicated by the 'zero' elements. This is done as follows:

- (a) Locate a row which contains only one zero element. Assign the job corresponding to this element to its corresponding person. Cross out the zero's if any in the column corresponding to the element, which is indicative of the fact that the particular job and person are no more available.
- (b) Repeat (a) for each of such rows which contain only one zero. Similarly, perform the same operation in respect of each column containing only one 'zero' element, crossing out the zero(s), if any, in the row in which the elements lies.

STRATEGIC COST MANAGEMENT

TRANSPORTATION

TRANSPORTATION

Transportation models deal with the transportation of a product manufactured at different plants or factories (supply origins) to a number of different warehouses (demand destinations). The objective is to satisfy the destination requirements within the plant's capacity constraints at the minimum transportation cost. Transportation models thus typically arise in situations involving physical movement of goods from plants to warehouses, warehouses to wholesalers, wholesalers to retailers and retailers to customers.

DEGENERACY OF A TRANSPORTATION PROBLEM

When the quantities are allocated to cost cells within the matrix and if such allocations are less than $m + n - 1$ allocations (*where 'm' stands for no. of rows and 'n' stands for no. of columns*), such a situation is said to be Degeneracy at a Transportation Problem.

METHODS OF SOLVING TRANSPORTATION PROBLEM :

1. THE NORTH-WEST CORNER RULE
2. LEAST COST METHOD
3. VOGEL'S APPROXIMATION METHOD

NORTH WEST CORNER RULE (NWCR)

The simplest of the procedures used to generate an initial feasible solution is NWCR. It is so called because we begin with the north west or upper left corner cell of our transportation table. Various steps of this method can be summarized as under:

Step 1	Select the north west (upper left-hand) corner cell of the transportation table and allocate as many units as possible equal to the minimum between available supply and demand requirement, <i>i.e.</i> , $\min (s_1, d_1)$.
Step 2	Adjust the supply and demand numbers in the respective rows and columns allocation.
Step 3	(a) If the supply for the first row is exhausted, then move down to the first cell in the second row and first column and go to step 2. (b) If the demand for the first column is satisfied, then move horizontally to the next cell in the second column and first row and go to step 2.
Step 4	If for any cell, supply equals demand, then the next allocation can be made in cell either in the next row or column.
Step 5	Continue the procedure until the total available quantity is fully allocated to the cells required.

STRATEGIC COST MANAGEMENT

LEAST COST METHOD (LCM)

The allocation according to this method is very useful as it takes into consideration the lowest cost and therefore, reduces the computation as well as the amount of time necessary to arrive at the optimum solution. Various steps of this method can be summarized as under:

Step 1	(a) Select the cell with the lowest transportation cost among all the rows or columns of the transportation table. (b) If the minimum cost is not unique then select arbitrarily any cell with this minimum cost.
Step 2	Allocate as many units as possible to the cell determined in step 1 and eliminate that row (column) in which either supply is exhausted or demand is satisfied.
Step 3	Repeat steps 1 and 2 for the reduced table until the entire supply at different factories is exhausted to satisfy the demand at different warehouses.

VOGEL'S APPROXIMATION METHOD (VAM)

This method is preferred over the other two methods because the initial basic feasible solution obtained is either optimum or very close to the optimum solution. Therefore, the amount of time required to arrive at the optimum solution is greatly reduced. Various steps of this method are summarized as under:

Step 1	Compute a penalty for each row and column in the transportation table. The penalty for a given row and column is merely the difference between the smallest cost and the next smallest cost in that particular row or column.
Step 2	Identify the row or column with the largest penalty. In this identified row or column, choose the cell which has the smallest cost and allocate the maximum possible quantity to the lowest cost cell in that row or column so as to exhaust either the supply at a particular source or satisfy demand at a warehouse.
Step 3	Reduce the row supply or the column demand by the amount assigned to the cell.
Step 4	If the row supply is now zero, eliminate the row. If the column demand is now zero, eliminate the column, if both the row supply and the column demand are zero, eliminate both the row and column.
Step 5	Re-compute the row and column difference for the reduced transportation table omitting rows or columns crossed out in the preceding step.
Step 6	Repeat the above procedure until the entire supply at factories are exhausted to satisfy demand at different warehouses.

OPTIMALITY TEST CONDITIONS IN CASE OF TRANSPORTATION PROBLEM

Once an initial solution is obtained, the next step is to check its optimality. The 'optimality test can be applied if it satisfies the following two conditions:

1. It contains exactly $m + n - 1$ allocation where m and n represent the number of rows and column of the table respectively.
2. These allocations are independent i.e., a loop cannot be performed by them.

STRATEGIC COST MANAGEMENT

SIMULATION

MEANING OF SIMULATION

Simulation is a modeling and analysis tool widely used for the purpose of designing, planning, and control of manufacturing systems. Simulation in general is to pretend that one deals with a real thing while really working with an imitation. In operations research, the imitation is a computer model of the simulated reality. The task of executing simulations provides insight and a deep understanding of physical processes that are being modeled.

Simulation is generally referred to as computer simulation, which simulates the operation of a manufacturing system. A computer simulation or a computer model is a computer program which attempts to simulate an abstract model of a particular system.

Example of a simulation involves the tossing of a ball into the air. The ball can be said to “simulate” a missile, for instance. That is, by experimenting with throwing balls starting at different initial heights and initial velocity vectors, it can be said that we are simulating the trajectory of a missile.

APPLICATION OF SIMULATION

1. Scheduling aircraft,
2. Job-ship scheduling and personnel scheduling,
3. Manpower-hiring decisions,
4. Traffic light-timing,
5. Transport scheduling
6. Investment Analysis
7. Inventory problems
8. Design of parking lots
9. Maintenance problems
10. Production scheduling
11. Design of communication systems

ADVANTAGES OF SIMULATION

- (a) Enables to experiment and study complex interactions of a system (e.g., company operations, economic policies).
- (b) Possible to study the effects of organizational environment informational changes in the operations of a system (e.g., number of stocking points, industrial policies).
- (c) Better insight and understanding of a complex system to indication for improvement.
- (d) Assists in teaching and training (management games).
- (e) New situations policies can be protested.
- (f) Probabilistic features can be easily incorporated.
- (g) A process can be studies in extended or compressed time.
- (h) Risks involved in experimenting with real problems can be eliminated.

STRATEGIC COST MANAGEMENT

LIMITATIONS OF SIMULATION

- (a) Simulated results are not precise. Unlike mathematical models, it does not give optimum solutions. At times one may not be able to assess the extent of error in a simulated result.
- (b) Some situations are not amenable to simulation.
- (c) Simulation may be expensive needing advanced computer supports
- (d) Simulation by itself does not generate solutions, but only indicates a way of evaluating solutions.
- (e) It is often a long, complicated process to develop a model.

STEPS INVOLVED IN SIMULATION PROCESS

1. Define the problem
2. Data collection
3. Problem analysis
4. Simulation model specification
5. Model programming
6. Model validation
7. Simulation experimentation
8. Evaluation and interpretation of simulation results
9. Report generation and plans for implementation of the

DESIGN OF SIMULATION MODEL

1. Static and Dynamic Simulation Models
2. Continuous and Discrete Simulation Model
3. Stochastic and Deterministic Simulation Model
4. Social Simulation
5. Web based Simulation
6. Parallel and Distributed Simulation

TYPES OF SIMULATION

1. Behavioral simulation
2. Functional simulation
3. Static timing analysis
4. Gate-level simulation
5. Switch-level simulation
6. Transistor-level or circuit-level simulation

STRATEGIC COST MANAGEMENT

NETWORK ANALYSIS

MEANING OF NETWORK

A Network is a graphical representation of a project, depicting the flow as well as the sequence of well-defined activities and events and their inter-relationships. They are also called Arrow Diagram.

MEANING OF NETWORK ANALYSIS

Network analysis is the general name given to certain specific techniques which can be used for planning, management and control of project. It often acts as a network management tool for breaking down projects into components or individual activities and recording the result on a flow chart or network diagram. These results generally reveal information that is used to determine duration, resource limitations and cost estimates associated with the project.

Network analysis enables us to take a systematic quantitative structural approach to the problem of managing a project through to successful completion. Also, since it has a graphical representation, it can be easily understood and used by those with a less technical background.

Network is a graphical representation of all the Activities and Events.

APPLICATIONS

1. Construction of a Residential complex,
2. Commercial complex,
3. Petro-chemical complex
4. Ship building
5. Satellite mission development
6. Installation of a pipe line project etc...

RULES FOR DRAWING THE NETWORK DIAGRAMS

- (a) The tail of an arrow represents the start of an activity and the head represent the completion of the activity.
- (b) The event numbered 1 denotes the start of the project and is called initial event.
- (c) Event carrying the highest number in the network denotes the completion of the project and is called terminal event.
- (d) Each defined activity is represented by one and only arrow in the network.
- (e) Determine which operation must be completed immediately before other can start.
- (f) Determine which other operation must follow the other given operation.

STRATEGIC COST MANAGEMENT

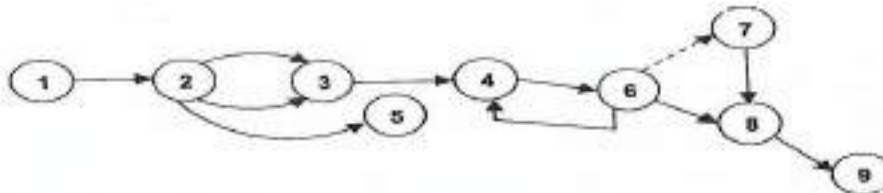
PROCEDURE OF DRAWING A NETWORK

1. Specify the Individual Activities
2. Determine the Sequence of the Activities
3. Draw the Network Diagram
4. Estimate Activity Completion Time
5. Identify the Critical Path

HOW CRITICAL PATH ANALYSIS HELPS AN ORGANISATION

1. Help the organisation to schedule and manage complex projects.
2. To control large defense projects and have been used routinely since then.
3. Help the organisation to plan all tasks that must be completed as part of a project.
4. Help the organisation to see where remedial action needs to be taken to get a project back on course.
5. Help the organisation to identify the minimum length of time needed to complete a project.
6. They act as the basis both for preparation of a schedule and of resource planning. During management of a project, they allow you to monitor achievement of project goals.

POINT OUT THE ERRORS IN THE NETWORK GIVEN BELOW



Solution:

Flows	
2-3	There are 2 activities which are duplicate. In case they are two different activities, one may pass through a dummy
2-5	is a dangling activity; No complete path exists. Can be joined to (9) with a dummy
4-6 & 6-4	Looping exists; This is not proper sequencing

THREE KINDS OF TIME ESTIMATES USED IN PERT

1. **OPTIMISTIC TIME ESTIMATE:** This is the estimate of the **shortest possible time** in which an activity can be completed under **ideal and perfect conditions**. No provision is made for delays or setbacks. It is denoted by T_o
2. **PESSIMISTIC TIME ESTIMATE:** This is the **maximum possible time** which an activity could take to accomplish the job. This represents all abnormal and inefficient situations, *i.e.*, estimated time if everything went wrong. It is denoted by T_p
3. **MOST LIKELY TIME ESTIMATE:** This is the time estimate of an activity which lies between the optimistic and the pessimistic time estimates. It presumes **normal conditions** and expected setbacks. It is denoted by T_m

STRATEGIC COST MANAGEMENT

MEANING, NATURE AND PURPOSES OF DUMMY ACTIVITY

Meaning: Dummy Activity is a **hypothetical activity**, which consumes no resources and time. It is represented by **dotted lines** in the Network Diagram.

Nature: For a Dummy Activity, Time Consumed = **Nil**, Resources Used = **Nil**, Cost Incurred = **Nil**.

Purposes: A Dummy Activity is inserted in the Network Diagram to clarify activity pattern in the following situations –

- (a) To make activities with common starting and finishing Events distinguishable easily.
- (b) To identify and maintain the proper precedence relationship between activities that are not connected by Events.
- (c) To clarify the relationship between dependent and independent activities. For example, if there are two subsequent activities C and D, C can be commenced if A is completed, while D can be commenced only if A and B are completed, a Dummy Activity may be introduced.
- (d) To bring all “loose ends” to a single initial and a single terminal event in each Network using dummies, if required.

DISTINGUISH BETWEEN PERT AND CPM

S.NO	PERT	CPM
1	PERT is that technique of project management which is used to manage uncertain (i.e., time is not known) activities of any project.	CPM is that technique of project management which is used to manage only certain (i.e., time is known) activities of any project.
2	It is event-oriented technique which means that network is constructed on the basis of event.	It is activity-oriented technique which means that network is constructed on the basis of activities.
3	It majorly focuses on time as meeting time target or estimation of percent completion is more important.	It majorly focuses on Time-cost trade off as minimizing cost is more important.
4	It is a probability model.	It is a deterministic model.
5	It is appropriate for high precision time estimation.	It is appropriate for reasonable time estimation.
6	It has non-repetitive nature of job.	It has repetitive nature of job.
7	There is no chance of crashing as there is no certainty of time.	There may be crashing because of certain time boundation.
8	It is suitable for projects which required research and development.	It is suitable for construction projects
9	It doesn't use any dummy activities.	It uses dummy activities for representing sequence of activities.

STRATEGIC COST MANAGEMENT

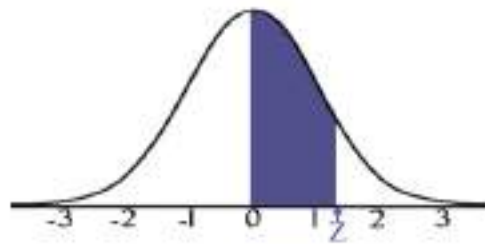
LIMITATIONS OF THE ASSUMPTIONS OF PERT AND CPM

1. Beta distribution may not always be applicable.
2. The formulae for expected duration and standard deviation are simplification. In certain cases, errors due to these have been found up to 33%.
3. The above errors may get compounded or may cancel each other.
4. Activities are assumed to be independent. But the limitations on the resources may not justify the assumption.
5. It may not always be possible to sort out completely identifiable activities and to state where they begin and where they end.

5 STEPS INVOLVED IN THE METHODOLOGY OF CRITICAL PATH ANALYSIS

1. Analyze and break down the project in terms of specific activities and/or events.
2. Determine the interdependence and sequence of specific activities and prepare a network.
3. Assign estimates of time, cost or both to all the activities of the network.
4. Identify the longest or critical path through the network.
5. Monitor, evaluate and control the progress of the project by re-planning, rescheduling and reassignment of resources.

STRATEGIC COST MANAGEMENT



STANDARD NORMAL TABLE (Z)

Entries in the table give the area under the curve between the mean and z standard deviations above the mean. For example, for $z = 1.25$ the area under the curve between the mean (0) and z is 0.3944.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0190	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2969	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3513	0.3554	0.3577	0.3529	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998



PAPER - 15

MCQs

BIT QUESTIONS

Strategic Cost Management

- Decision Making



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Behind every successful business decision, there is always a **CMA**

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Behind every successful business decision, there is always a CMA

PAPER -15
Strategic Cost Management
– Decision Making
Bit Questions

(I) Choose the most appropriate answer to the following questions giving justification.

1. Which of the following is not a term normally used in value analysis?
 - (A) Resale value
 - (B) Use value
 - (C) Esteem value
 - (D) Cost value

2. Which of the following is not suitable for a JIT production system?
 - (A) Batch production
 - (B) Jobbing production
 - (C) Process production
 - (D) Service production

3. Which of the following is NOT a method of transfer pricing?
 - (A) Cost plus transfer price
 - (B) Internal price transfer price
 - (C) Market-based transfer price
 - (D) Two part transfer price

4. When is market skimming pricing appropriate?
 - (A) If demand is very elastic
 - (B) If the product is new and different
 - (C) If there is little chance of achieving economies of scale
 - (D) If demand is inelastic
 - (E) If there is little competition and high barriers to entry

5. Which of the following is a recognised method of arriving at the selling price for the products of a business?
 - (A) Life cycle pricing (B) Price skimming (C) Penetration pricing (D) Target costing
 - (A) (A) and (B) only
 - (B) (A), (B) and (C) only
 - (C) (B) and (C) only
 - (D) (A), (C) and (D) only
 - (E) (A), (B), (C) and (D)

6. A company has estimated the selling prices and variable costs of one of its products as follows:

Selling Price Per Unit		Variable Cost Per Unit	
₹	Probability	₹	Probability
40	0.30	20	0.55
50	0.45	30	0.25
60	0.25	40	0.20

The company will be able to supply 1,000 units of its product each week irrespective of the selling price. Selling price and variable cost per unit are independent of each other. The probability that the weekly contribution will exceed ₹20,000 is ____% (round to the nearest whole %)

- (A) 40%
 - (B) 42%
 - (C) 45%
 - (D) 55%
7. An organisation is considering the costs to be incurred in respect of a special order opportunity.

The order would require 1,250 kgs of material D. This is a material that is readily available and regularly used by the organisation on its normal products. There are 265 kgs of material D in stock which cost ₹795 last week. The current market price is ₹3.24 per kg.

Material D is normally used to make product X. Each unit of X requires 3 kgs of material D, and if material D is casted at ₹3 per kg, each unit of X yields a contribution of ₹15. The relevant cost of material D to be included in the costing of the special order is nearest to:

- (A) ₹3,990
- (B) ₹4,050
- (C) ₹10,000
- (D) ₹10,300

8. Aderholt uses activity based costing to allocate its overheads. The budgeted cost/expected for the Supervisor cost pool was:

Budgeted units	5,000
Number of employees	75
Budgeted Cost	₹7,500
The actual costs incurred were:	
Actual Units	5,500
Actual Employees	77
Actual cost	₹8,085

What was the total variance for the setups?

- (A) ₹585 Adverse
 - (B) ₹165 Favourable
 - (C) ₹5550 Favourable
 - (D) ₹385 Adverse
9. P operates an activity based costing (ABC) system to attribute its overhead costs to cost objects.
- In its budget for the year ending 31 August 2017, the company expected to place a total of 2,895 purchase orders at a total cost of ₹1,10,010. This activity and its related costs were budgeted to occur at a constant rate throughout the budget year, which is divided into 13 four-week periods. During the four-week period ended 30 June 2016, a total of 210 purchase orders were placed at a cost of ₹7,650.
- The over-recovery of these costs for the four-week period was:
- (A) ₹330
 - (B) ₹350
 - (C) ₹370
 - (D) ₹390

10. A manufacturing company recorded the following costs in October for Product X:

	₹
Direct Materials	20,000
Direct Labour	6,300
Variable Production Overhead	4,700
Fixed Production Overhead	19,750
Variable Selling Costs	4,500
Fixed Distribution Costs	16,800
Total costs incurred for Product X	72,050

During October 4,000 units of Product X were produced but only 3,600 units were sold. At the beginning of October there was no inventory. The value of the inventory of Product X at the end of October using throughput accounting was:

- (A) ₹630
- (B) ₹1,080
- (C) ₹1,100

(D) ₹2,000

11. Company B uses a throughput accounting system. The details of product X per unit are as follows:

	₹
Selling Price	50
Material Cost	16
Conversion Costs	20
Time on bottle neck resource	8 minutes

The return per hour for product X is:

- (A) ₹105
 (B) ₹225
 (C) ₹255
 (D) ₹375
12. Stock Control data for Material P are:
 Annual usage: 3600 units; Cost per unit: ₹100; Cost of placing an order: ₹40;
 Stockholding Cost: 20% of the overall stock volume; Lead time: One month
 The EOQ based on the above data is:
 (A) 210 units
 (B) 175 units
 (C) 90 units
 (D) 120 units
13. Which of the following would take place if a company is able to reduce its variable cost?

Contribution Margin	Break-Even Point
(A) Increase	Increase
(B) Decrease	Decrease
(C) Increase	Decrease
(D) Decrease	Increase

14. The following details relate to Product P-1 of a manufacturing company

Level of Activity (units)	1000	2000
Cost per unit (₹)		
Direct Materials	4000	4000
Direct Labour	3600	7200
Production Overheads	3240	12960
Selling Overheads	2916	23328

The total fixed cost and variable cost per unit are:

	Total Fixed Cost (₹)	Variable Cost per Unit (₹)
(A)	2,000	7.00
(B)	2,000	8.50
(C)	3,000	7.00
(D)	3,000	8.50

15. A company makes a single product which it sells at ₹10 per unit. Fixed costs are ₹48,000 per month and the product has a contribution to sales ratio of 40%. In a period when actual sales were ₹1,40,000, the company's margin of safety in units was:
 (A) 2000
 (B) 3000
 (C) 3500
 (D) 4000
16. The following tasks are associated with ABC system:
 I. Allocation of costs to products II. Identification of cost pools

III. Identification of cost drivers

IV. Calculation of pool rates

The proper order of the preceding tasks is:

- (A) III, II, IV, I
- (B) I, II, III, IV
- (C) III, IV, II, I
- (D) IV, III, II, I

17. A company has the capacity of production of 80000 units and presently it sells 20000 units at ₹100 each. The demand is sensitive to selling price and it has been observed that every reduction of ₹10 in selling price the demand is doubled. What should be the target cost at full capacity if profit margin on sales is taken at 25%?

- (A) ₹58 lakhs
- (B) ₹52 lakhs
- (C) ₹48 lakhs
- (D) ₹50 lakhs

18. The information relating to the direct material cost of a company is as follows:

Standard price per unit ₹7.20

Actual quantity purchased in units 1600

Standard quantity allowed for actual production in units 1450

Material price variance on purchase (Favourable) ₹480

What is the actual purchase price per unit?

- (A) ₹7.50
- (B) ₹6.40
- (C) ₹6.50
- (D) ₹6.90

19. Backflush costing is most likely to be used when:

- (A) Management desires sequential tracking of costs
- (B) A Just-in-Time inventory philosophy has been adopted
- (C) The company carries significant amount of inventory
- (D) Actual production costs are debited to work-in-progress

20. The preparation and use of standard cost, their comparison with actual costs and the measurement and analysis of variances to originating causes is defined as:

- (A) Marginal Costing
- (B) Standard Costing
- (C) Throughput Costing
- (D) Kaizen Costing

21. The following are cost data for two alternative ways of processing the clerical work for legal cases brought before the district court:

	Semi-Automatic	Fully Automatic
Monthly Fixed Costs (₹)		
Occupancy	15,000	15,000
Maintenance Contract	5,000	10,000
Equipment Lease	25,000	1,00,000
Unit Variable Cost (per Report) (₹)		
Supplies	80	20
Labour	60	20

The cost indifference point will be:

- (A) 800 cases
- (B) 850 cases
- (C) 750 cases
- (D) 700 cases

22. The following figures are extracted from the books of a company:
 Budgeted O/H ₹10,000 (Fixed ₹6,000, Variable ₹4,000)
 Budgeted Hours 2000
 Actual O/H ₹10,400 (Fixed ₹6,100, Variable ₹4,300)
 Actual Hours 2100
 Variable O/H cost variance and Fixed O/H cost variance will be:
 (A) 100 (A) and 200 (A)
 (B) 100 (F) and 200 (F)
 (C) 100 (A) and 200 (F)
 (D) 200 (A) and 100 (F)
23. A company produces a product which is sold at a price of ₹80. Its Variable cost is ₹32. The company's Fixed cost is ₹11,52,000 p.a. The company operates at a margin of safety of 40%. The total sales of the company is:
 (A) 4,000 units
 (B) 40,000 units
 (C) 30,000 units
 (D) 20,000 units
24. The P/V ratio of a firm dealing in Electrical equipment is 50% and the margin of safety is 40%. BEP of the firm at a sales volume of ₹50,00,000 will be
 (A) ₹25,00,000
 (B) ₹35,00,000
 (C) ₹30,00,000
 (D) ₹36,00,000
25. ABC Limited has current PBIT of ₹19.20 lakhs on total assets of ₹96 lakhs. The company has decided to increase assets by ₹24 lakhs, which is expected to increase the operating profit before depreciation by ₹8.40 lakhs. There will be a net increase in depreciation by ₹4.80 lakhs. This will result in ROI
 (A) to increase by 1%
 (B) to decrease by 1%
 (C) to decrease by 1.5%
 (D) to remain the same
26. For a Learning Curve percentage of 72%, the time to be taken to complete the 4th unit of a 12-unit job involved in the assembly line, if the initial unit requires 80 hours, will be
 (A) 43.50 hrs
 (B) 41.47 hrs
 (C) 46.71 hrs
 (D) 40.95 hrs
27. Marketing department of an organisation estimates that 40,000 of new mixers could be sold annually at a price of ₹60 each. To design, develop and produce these new mixers an investment of ₹40,00,000 would be required. The company desires a 15% return on investment (ROI). Given these data, the target cost to manufacture, sell, distribute and service one mixer will be
 (A) ₹37.50
 (B) ₹40.00
 (C) ₹45.00
 (D) ₹48.60
28. When you wait until the manufacture of a product has been completed and then record all of the related issuances of inventory from stock that were required to create the product, it is called
 (A) Forensic Accounting

- (B) Back-flush Accounting
- (C) Tax Accounting
- (D) Lean Accounting

29. Match the following:

(A)	Dr. Deming believes	(1)	Common Causes
(B)	Ishikawa Development	(2)	To prevent defect
(C)	Type of variation is due to	(3)	Cause & Effect diagram
(D)	Crosby's Objective of quality	(4)	Histogram

The correct order is

- (A) A-3, B-2, C-1, D-4
 - (B) A-2, B-3, C-4, D-1
 - (C) A-2, B-3, C-1, D-4
 - (D) A-4, B-3, C-1, D-2
30. A company uses traditional standard costing system. The inspection and set-up costs are actually ₹1,760 against a budget of ₹2,000. ABC system is being implemented and accordingly the number of batches is identified as the cost driver for inspection and set up. The budgeted production is 10,000 units in batches of 1,000 units whereas actually 9,000 units were produced in 11 batches. The cost per batch under ABC system will be
- (A) ₹160
 - (B) ₹200
 - (C) ₹180
 - (D) ₹220
31. A company has the capacity of production of 80,000 units and presently sells 20,000 units at ₹100 each. The demand is sensitive to selling price and it has been observed that with every reduction of ₹10 in selling price the demand is doubled. What should be the target cost at full capacity if profit margin on sale is taken as 25%?
- (A) ₹75
 - (B) ₹90
 - (C) ₹60
 - (D) ₹25
32. If the direct labour cost is reduced by 20% with every doubling of output, what will be the cost of labour for the sixteenth unit produced as an approximate percentage of the cost of the first unit produced?
- (A) 51.2%
 - (B) 40.96%
 - (C) 62%
 - (D) None of these
33. A company determines its selling price by marking up variable costs 60%. In addition, the company uses frequent selling price mark down to stimulate sales. If the mark down average 10%, what is the company's contribution margin ratio?
- (A) 30.6%
 - (B) 44%
 - (C) 86.4%
 - (D) None of these
34. B Ltd. Has earned net profit of ₹1 lakh, and its overall P/V ratio and margin of safety are 25% and 50% respectively. What is the total fixed cost of the company?
- (A) ₹2,50,000
 - (B) ₹2,00,000
 - (C) ₹3,00,000
 - (D) ₹1,00,000

35. The total cost of manufacturing a component is as under at a capacity of 50,000 units of production:

	₹
Prime Cost	10.00
Variable Overheads	2.40
Fixed Overheads	4.00
	16.40

The selling price is ₹21 per unit. The variable selling and administrative expenses is 60 paise per component extra. During the next quarter only 10,000 units can be produced and sold. Management plans to shut down the plant estimating that the fixed manufacturing cost can be reduced to ₹74,000 per quarter. When the plant is operating, the fixed overheads are incurred at a uniform rate throughout the year. Additional costs of plant shutdown for the quarter are estimated at ₹14,000. The shut down cost for the quarter in units of product will be:

- (A) ₹25,000
 (B) ₹14,000
 (C) ₹11,000
 (D) ₹20,000
36. A company manufactures two products using common material handling facility. The total budgeted material handling cost is ₹60,000. The other details are:

	Product X	Product Y
Number of Units Produced	30	30
Material moves per product line	5	15
Direct Labour hour per unit	200	200

Under activity based costing system the material handling cost to be allocated to product X (per unit) would be:

- (A) ₹1,000
 (B) ₹500
 (C) ₹1,500
 (D) ₹2,500
37. A company operates throughput accounting system. The details of product X per unit are as under.

Selling Price	₹50
Material Cost	₹20
Conversion Cost	₹15
Time on bottleneck resources	10 minutes

The return per hour for product X is:

- (A) ₹210
 (B) ₹300
 (C) ₹180
 (D) ₹90
38. The information relating to the direct material cost of a company is as under:

	₹
Standard Price per unit	3.60
Actual quantity purchased in units	1,600
Standard quantity allowed for actual production in units	1,450
Material Price Variance on purchase (favourable)	240

What is the actual purchase price per unit?

- (A) ₹3.45
 (B) ₹3.75
 (C) ₹3.20
 (D) ₹3.25

39. If the time taken to produce the first unit of a product is 4000 hrs, what will be the total time taken to produce the 5th to 8th unit of the product, when a 90% learning curve applies?
 (A) 10,500 hours
 (B) 12,968 hours
 (C) 9,560 hours
 (D) 10,368 hours
40. A company has forecast sales and cost of sales for the coming year as ₹25 lakhs and ₹18 lakhs respectively. The inventory turnover has been taken as 9 times per year. In case the inventory turnover increases to 12 times and the short term interest rate on working capital is taken as 10%, what will be saving in cost?
 (A) ₹10,000
 (B) ₹20,000
 (C) ₹15,000
 (D) ₹5,000
41. Which of the following would decrease unit contribution margin the most?
 (A) 15% decrease in selling price
 (B) 15% increase in variable costs
 (C) 15% decrease in variable costs
 (D) 15% decrease in fixed costs
42. A company produces two joint products, P and V. In a year, further processing costs beyond split-off point spent were ₹8,000 and ₹12,000 for 800 units of P and 400 units of V respectively. P sells at ₹25 and V sells at ₹50 per unit. A sum of ₹9,000 of joint cost were allocated to product P based on the net realization method. What were the total joint cost in the year?
 (A) ₹20,000
 (B) ₹10,000
 (C) ₹15,000
 (D) None of these

43. A company is to market a new product. It can produce up to 1,50,000 units of this product. The following are the estimated cost data:

	Fixed Cost	Variable Cost
For Production upto 75,000 units	₹ 8,00,000	60%
Exceeding 75,000 units	₹12,00,000	50%

Sale price is expected to be ₹25 per unit.

How many units must the company sell to break even?

- (A) 1,00,000 units
 (B) 1,11,000 units
 (C) 1,27,000 units
 (D) 75,000 units
44. The following details relate to two competing companies, Alps and Himalayas, for identical projects:
 I. The net present value (NPV) of Alps is ₹20,000 and its internal rate of return (IRR) is 18%.
 II. For the same life period, Himalayas estimated cash flows are:

Year	₹ '000
0	(450)
1	300
2	200

3	100
---	-----

And its cost of capital is 15%.

Which one of the following combinations is correct concerning the NPV and the IRR of the two projects?

Projects	
Alps	Himalayas
A) Higher NPV	Higher IRR
B) Higher NPV	Lower IRR
C) Lower NPV	Higher IRR
D) Lower NPV	Lower IRR

45. Nulook Ltd. Uses a JIT system and back flush accounting. It does not use a raw material stock control account During May, 8000 units were produced and sold. The standard cost per unit is ₹100; this includes materials of ₹45. During May, ₹4,80,000 of conversion costs were incurred.

The debit balance on cost of goods sold account for May was

- (A) ₹8,00,000
- (B) ₹8,40,000
- (C) ₹8,80,000
- (D) ₹9,20,000

46. A company has estimated the selling prices and the variable costs of one of its products as under:

Probability	Selling Price (Per unit)	Probability	Variable Cost (Per unit)
0.25	60	0.25	30
0.45	75	0.40	45
0.30	90	0.35	60

The company will be able to produce and sell 4,000 units in a month irrespective of the selling price. The selling price and variable cost per unit are independent of each other. The specific fixed cost relating to this product is ₹20,000. The probability that the monthly net profit of the product will be \geq ₹1,20,000 is

- (A) 0.2525
- (B) 0.4512
- (C) 0.3825
- (D) 0.3075

47. In calculating the life cycle costs of a product, which of the following items would be included?

- A. Planning and concept design costs
- B. Preliminary and detailed design costs
- C. Testing costs
- D. Production costs
- E. Distribution costs

- (A) All of the above
- (B) D and E
- (C) B, D and E
- (D) D

48. A Ltd., developing a new product, makes a model for testing and goes for regular production. From past experience of similar models, it is known that a 90% learning curve applies. If the time taken to make the model is 300 hours, what will be the total time taken to produce 3rd to 4th unit of the product?

- (A) 540 hours
- (B) 486 hours
- (C) 432 hours
- (D) None of the above

49. A particular job required 800 kgs of material – P. 500 kgs. of the particular material is currently in stock. The original price of the material – P was ₹300 but current resale value

of the same has been determined as ₹200. If the current replacement price of the material – P is ₹0.80 per kg., the relevant cost of the material – P required for the job would be:

- (A) ₹640
- (B) ₹440
- (C) ₹300
- (D) None of these

50. A company has 2000 units of an obsolete item which are carried in inventory at the original purchase price of ₹30,000. If these items are reworked for ₹10,000, they can be sold for ₹18,000. Alternatively, they can be sold as scrap for ₹3,000 in the market. In a decision model used to analyze the reworking proposal, the opportunity cost should be taken as:

- (A) ₹8,000
- (B) ₹12,000
- (C) ₹3,000
- (D) ₹10,000

51. When allocation service department cost to production departments, the method that does not consider different cost behavior patterns is the

- (A) Step method
- (B) Reciprocal method
- (C) Single rate-method
- (D) Dual rate-method

52. ASHLIN LTD., has developed a new product just complete the manufacture of first four units of the product. The first unit took 2 hours to manufacture and the first four units together took 5.12 hours to produce. The Learning Curve rate is

- (A) 83.50%
- (B) 80.00%
- (C) 75.50%
- (D) None of (A), (B) or (C)

53. ANKIT LTD. operates Throughput Accounting System. The details of product A per unit are as under:

	₹
Selling Price	75
Material Cost	30
Conversion Cost	20
Time to Bottleneck Resources	10 minutes

The return per hour for product A is

- (A) ₹270
- (B) ₹150
- (C) ₹120
- (D) ₹90

54. A company has a capacity to make 4,00,000 units of a product. It has noted from market conditions that at a price of ₹50 per unit, it can sell 1,00,000 units but the demand would double for each ₹5 fall in the selling price. A minimum margin of 25% is required. The target cost for the company should be:

- (A) ₹50
- (B) ₹40
- (C) ₹30
- (D) ₹20

55. Division A of a company manufactures a single product and the following data are provided:

Sales = 25,000 units	Fixed Cost = ₹4,00,000
Depreciation = ₹2,00,000	Residual Income = ₹30,000
Net Assets = ₹10,00,000	

Head Office assesses divisional performance by the method of Residual Income and uses cost of capital of 12%

- (A) ₹25
 (B) ₹30
 (C) ₹35
 (D) None of these
56. A company makes components and sells internally to its subsidiary and also to external market. The external market price is ₹24 per component, which gives a contribution of 40% of sales. For external sales, variable costs include ₹1.50 per unit for distribution costs. This is, however not incurred in internal sales. There are no capacity constraints. To maximize company profit, the transfer price to subsidiary should be:
- (A) ₹9.60
 (B) ₹12.90
 (C) ₹14.40
 (D) None of these

57. The information relating to the direct material cost of a company is as under:

	₹
Standard Price per unit	3.60
Actual quantity purchased in units	1,600
Standard quantity allowed for actual production in units	1,450
Material Price Variance on purchase (favourable)	240

What is the actual purchase price per unit?

- (A) ₹3.45
 (B) ₹3.75
 (C) ₹3.20
 (D) ₹3.25
58. SUVAM Ltd., has the capacity of production of 80,000 units and presently sells 20,000 units at ₹100 each. The demand is sensitive to selling price and it has been observed that with every reduction of ₹10 in selling price, the demand is doubled. What should be the target cost at full capacity if profit margin on sale is taken as 25%?
- (A) ₹67.50
 (B) ₹60.00
 (C) ₹45.00
 (D) None of the above
59. A company makes and sells a single product. The selling price and marginal revenue equations are:
- Selling Price = ₹50 - ₹0.001X
 Marginal Revenue = ₹50 - ₹0.002X
 Where X is the product the company makes. The variable cost amount to 20 per unit and the fixed costs are ₹1,00,000. In order to maximize the profit, the selling price should be
- (A) ₹25
 (B) ₹30
 (C) ₹35
 (D) ₹40

60. A Company requires ₹85,00,000 in sales to meet its target net profit. Its contribution margin is 30% and the fixed costs are ₹15,00,000. What is the target net profit?
 (A) ₹10,50,000
 (B) ₹19,50,000
 (C) ₹25,50,000
 (D) ₹35,00,000
61. In a factory where standard costing system is followed, the production department consumed 1100 kgs of a material @ ₹8 per kg for product X resulting in material price variance of ₹2200 (Fav) and material usage variance of ₹1000 (Adv). What is the standard material cost of actual production of product X?
 (A) 11,000
 (B) 20,000
 (C) 14,000
 (D) 10,000
62. The following information relate to ABC
- | | | |
|--------------------|--------|--------|
| Activity level | 60% | 80% |
| Variable costs (₹) | 12,000 | 16,000 |
| Fixed costs (₹) | 20,000 | 22,000 |
- The differential cost for 20% capacity is
 (A) ₹4,000
 (B) ₹2,000
 (C) ₹6,000
 (D) ₹5,000
63. By making and selling 9,000 units of a product, a company makes a profit of ₹10,000, whereas in the case of 7,000 units, it would lose ₹10,000 instead. The number of units to break-even is
 (A) 7,500 units
 (B) 8,000 units
 (C) 7,750 units
 (D) 8,200 units
64. 1200 units of microchips are required to be sold to earn a profit of ₹1,06,000 in a monopoly market. The fixed cost for the period is ₹74,000. The contribution in the monopoly market is as high as 3/4th of its variable cost. Determine the target selling price per unit.
 (A) 450
 (B) 325
 (C) 400
 (D) 350
65. An operation has a 90% learning curve and the first unit produced took 28 minutes. The labour cost is ₹20 per hour. How much should the second unit cost?
 (A) ₹9.80
 (B) ₹7.60
 (C) ₹8.40
 (D) ₹6.60
66. If project A has a net present value (NPV) of ₹30,00,000 and project B has an NPV of ₹50,00,000, what is the opportunity cost if project B is selected?
 (A) ₹23,00,000
 (B) ₹30,00,000
 (C) ₹20,00,000
 (D) ₹50,00,000

67. A company operates an activity based costing (ABC) system to attribute its overhead costs to cost objects. In its budget for the year - ending 31st August, 2018. The company expected to place a total of 2000 purchase orders at a total cost of ₹1,00,000. This activity and its related costs were budgeted to occur at a constant rate throughout the budget year which is divided into 13 four week periods. During the four week period ended 30th June 2017, a total of 200 purchase orders were placed at a cost of ₹9,000. The over recovery of these costs for the four week period was
- (A) ₹2,000
 (B) ₹3,000
 (C) ₹1,500
 (D) ₹1,000
68. Empire Hotel has a capacity of 100 single rooms and 20 double rooms. Average occupancy is 70% for 365 days of the year. The rent for a double room is kept at 130% of a single room. The total room occupancy days in a year in terms of single room is
- (A) 32193
 (B) 30660
 (C) 31660
 (D) 30993
69. Which of the following is correct in the context of network analysis?
- (A) There can be one or more activities without a predecessor in a network
 (B) Where two activities have the same start and end events, the end event of one activity is numbered differently and then connected by a dummy to the original start event
 (C) When crashing is carried out, the non-critical paths have to remain non critical
 (D) If the critical path is longer than the other paths, the project may be completed by using a path having a shorter duration
70. A company has a break even point when sales are ₹3,20,000 and variable cost at that level of sales are ₹2,00,000. How much would contribution margin increase or decrease if variable expenses are dropped by ₹30,000?
- (A) Increase by 27.5%
 (B) Increase by 9.375%
 (C) Decrease by 9.375%
 (D) Increase by 37.5%
71. Twin Ltd. uses JIT and back flush accounting. It does not use a raw material stock control account. During September 2018, 10000 units were produced and sold. The standard cost per unit is ₹150 which includes materials of ₹60. During September 2018, ₹9,90,000 of conversion costs were incurred. The debit balance in cost of goods sold account for September 2018 was
- (A) ₹14,00,000
 (B) ₹14,80,000
 (C) ₹15,90,000
 (D) ₹16,20,000
72. A company operates a standard absorption costing system. The budgeted fixed production overheads for the company for last year were ₹3,30,000 and budgeted output was 2,20,000 units. At the end of the company's financial year, the total of the fixed production overheads debited to the Fixed Production Overhead Control Account was ₹2,60,000 and the actual output achieved was 2,00,000 units. The under/over absorption of overhead was
- (A) ₹40,000 over absorbed

- (B) ₹ 40,000 under absorbed
- (C) ₹ 50,000 over absorbed
- (D) ₹ 50,000 under absorbed

73. A factory can make only one of the three products X, Y or Z in a given production period. The following information are given:

Per unit ₹	X	Y	Z
Selling Price	1500	1800	2000
Variable Cost	700	950	1000

Assume that there is no constraint on resource utilization or demand and similar resources are consumed by X, Y and Z. The opportunity cost of making one unit of Z is

- (A) ₹ 850
- (B) ₹ 800
- (C) ₹ 1800
- (D) ₹ 1500

74. AB company is a supermarket group that incurs the following costs:

- (a) The bought-in price of the goods
 - (b) Inventory finance costs
 - (c) Self refilling costs
 - (d) Costs of repacking or 'pack out' prior to storage before sale
- AB company's calculating of direct product profit (DPP) would include
- (A) Costs (a) and (c) only
 - (B) All of the above cost except (b)
 - (C) All of the above costs except (d)
 - (D) All of the above costs

75. S Ltd. manufactures a product whose time for the first unit is 1000 hours. It experience a learning curve of 80%, What will be the total time taken in hours for unit 5 to 8?

- (A) 4096 hours
- (B) 3200 hours
- (C) 1536 hours
- (D) 2000 hours

76. H Group has two divisions, Division P and Division Q. Division P manufactures an item that is transferred to Division Q. The item has no external market and 6000 units produced are transferred internally each year. The costs of each division are as follows?

	Division P	Division Q
Variable Cost	₹ 100 per unit	₹ 120 per unit
Fixed cost each year	₹ 1,20,000	₹ 90,000

Head Office management decided that a transfer price should be set that provides a profit of ₹ 30,000 to Division P. What should be the transfer price per unit?

- (A) ₹ 145
- (B) ₹ 125
- (C) ₹ 120
- (D) ₹ 135

77. In the context of Critical Path Analysis, the portion of the float of an activity which cannot be consumed without affecting adversely the float of the subsequent activities is called

- (A) Free float
- (B) Interfering float
- (C) Independent float
- (D) Total float

78. In CPA (Critical Path Analysis) which of the following is not a correct step in sequence?
 (A) Understanding the logic of the system under consideration
 (B) Constructing the net work
 (C) Providing estimates for activity duration
 (D) Implementing and controlling the net work

79. XYZ Ltd. has the following alternative planned activity levels.

Level	E	F	G
Total cost	₹ 1,00,000,	₹ 1,50,000,	₹ 2,00,000
No. of units produced	5000	10000	15000

If fixed overhead remains constant, then fixed overhead cost per unit at Level E is

- (A) ₹ 20
 (B) ₹ 15
 (C) ₹ 13.33
 (D) ₹ 10
80. T Ltd. produces and sells a product. The company expects the following revenues and costs in 2018:
- | | |
|---|------------|
| Revenues (400 sets sold @ ₹600 per product) | ₹ 2,40,000 |
| Variable costs | ₹ 1,60,000 |
| Fixed costs | ₹ 50,000 |
- What amount of sales must T Ltd. have to earn a target net income of ₹63,000 if they have a tax rate of 30%?
 (A) ₹ 4,20,000
 (B) ₹ 4,29,000
 (C) ₹ 3,00,000
 (D) ₹ 4,89,000

81. Excel Products Ltd. manufactures four products e.g. Product E, Product F, Product G and Product H using same raw materials. The input requirements for Products E, F, G and H are 1kg, 2kgs, 5kgs and 7kgs, respectively. Product-wise Selling Price and Variable Cost data are given hereunder:

Products	E	F	G	H
Selling Price (₹)	100	150	200	300
Variable Cost (₹)	50	70	100	125

Assuming raw material availability is a limiting factor, the correct ranking of the products would be:

- (A) E, F, G & H
 (B) E, F, H & G
 (C) F, E, G & H
 (D) F, E, H & G
82. S Ltd. recently sold an order of 50 units having the following costs:

	₹
Direct materials	1,500
Direct labour (1000 hours @ ₹ 8.50)	8,500
Variable overhead (1000 hours @ ₹ 4.00) ¹	4,000
Fixed overhead ²	<u>1,400</u>
	<u>15,400</u>

¹ Allocated on the basis of direct labour-hours.

² Allocated at the rate of 10% of variable cost.

The company has now been requested to prepare a bid for 150 units of the same product.

If an 80% learning curve is applicable, Stone Isle's total cost on this order would be

- (A) ₹ 38,500
 (B) ₹ 37,950

- (C) ₹ 26,400
(D) ₹ 31,790

83. A company manufactures and sells packaging machines. It recently introduced activity-based costing to refine its existing system. Each packaging machine requires direct materials costs of ₹50,000; 50 equipment parts; 12 machine hours; 15 assembly line hours and 4 inspection hours. The details about the cost pools, allocation bases and allocation rates are given below:

<i>Indirect cost pool</i>	<i>Cost allocation base</i>	<i>Budgeted allocation rate</i>
Material handling	No. of component parts	₹ 8 per part
Machining	Machine hours	₹68 per machine hour
Assembly	Assembly line hours	₹75 per assembly hour
Inspection	Inspection hours	₹104 per inspection hour

The company has received an order for 40 can-packaging machines from a customer. Using activity-based costing, indirect costs allocated to the order of the customer would be:

- (A) ₹ 1,30,850
(B) ₹ 1,25,280
(C) ₹ 1,15,050
(D) ₹ 1,10,280

84. AB Ltd. uses standard cost system. The following information pertains to direct labour for Product X for the month of March, 2019:

Standard rate per hour	₹ 8
Actual rate per hour	₹ 8.40
Standard hours allowed for actual production	2000 hours
Labour Efficiency variance	₹ 1,600 (Adverse)

What were the actual hours worked?

- (A) 1,800
(B) 1,810
(C) 2,200
(D) 2,190

85. X Ltd. has 1000 units of an obsolete item which are carried in inventory at the original price of ₹50,000. If these items are reworked for ₹20,000, they can be sold for ₹36,000. Alternatively, they can be sold as a scrap for ₹6,000 in the market. In a decision model used to analyse the reworking proposal, the opportunity cost should be taken as

- (A) ₹ 16,000
(B) ₹ 6,000
(C) ₹ 30,000
(D) ₹ 20,000

86. Uniform Costing may *not* be successfully applied in the following case:

- (A) In a single enterprise having a number of branches, each of which manufactures the same set of products with the same facilities
(B) In a number of entities in the same industry bound by a trade association
(C) In a number of units across different geographical locations manufacturing one or more of a given set of products
(D) In different branches of the same company, each branch making a different product using a unique process

87. Which of the following is a valid constraint for a linear programming problem?

- (A) $3x^2 + 4x + 1 = 0$
(B) $5x_1 + 2x_2 \leq 10$
(C) $4x_x + 3x_2 > 7$
(D) $(12x_1 + 4x_2)/3x_2 \leq 8x_1$

88. The shadow price of skilled labour for SD Ltd. is currently ₹ 10 per hour. What does this mean?
- (A) The cost of obtaining additional skilled labour is ₹ 10 per hour
 - (B) There is a hidden cost of ₹ 10 for each hour of skilled labour actively worked
 - (C) Contribution will be increased by ₹10 per hour for each extra hour of skilled labour that can be obtained
 - (D) The total costs will be reduced by ₹10 for each additional hour of skilled labour that can be obtained
89. The break-even point of a manufacturing company is ₹1,60,000. Fixed cost is ₹48,000. Variable cost is ₹ 12 per unit. The PV ratio will be:
- (A) 20%
 - (B) 40%
 - (C) 30%
 - (D) 25%
90. A factory has a key resource (bottleneck) of Facility A which is available for 31,300 minutes per week. The time taken by per unit of Product X and Y in Facility A are 5 minutes and 10 minutes respectively. Last week's actual output was 4750 units of product X and 650 units of Product Y. Actual factory cost was ₹ 78,250. The throughput cost for the week would be:
- (A) ₹ 75,625
 - (B) ₹ 76,225
 - (C) ₹ 77,875
 - (D) ₹ 79,375
91. In a PERT network, the optimistic time for a particular activity is 9 weeks and the pessimistic time is 21 weeks. Which one of the following is the best estimate of the standard deviation for the activity?
- (A) 12
 - (B) 9
 - (C) 6
 - (D) 2
92. The higher the actual hours worked.
- (A) The lower the capacity usage ratio
 - (B) The higher the capacity usage ratio
 - (C) The lower the capacity utilization ratio
 - (D) The higher the capacity utilization ratio
93. X is a factory making a certain product where learning curve ratio of 80% and 90% apply respectively for two equally paid workers, A and B
- (A) The labour cost of manufacturing the 4th product will be more for A
 - (B) The labour cost of manufacturing the 4th product will be more for B
 - (C) The labour cost is the same for the fourth product
 - (D) Nothing can be said about the specific product since learning applies ratio to the average quantity of the product
94. What is the opportunity cost of making a component part in a factory given no alternative use of the capacity?
- (A) The variable manufacturing cost of the component
 - (B) The total manufacturing cost of the component
 - (C) The total variable cost of the component
 - (D) Zero

95. The product of XYZ company is sold at a fixed price of ₹1,500 per unit. As per company's estimate, 500 units of the product is expected to be sold in the coming year. If the value of investments of the company is ₹ 15 lakh and it has a target ROI of 15%, the target cost would be:
 (A) ₹ 930
 (B) ₹ 950
 (C) ₹ 1050
 (D) ₹ 1130
96. Max Ltd. fixes the inter divisional transfer prices for its products on the basis of cost plus a return on investment in the division. The budget for division X for 2019 – 20 appears as under -

	₹
Fixed assets	5,00,000
Current assets	3,00,000
Debtors	2,00,000
Annual fixed cost of the division	8,00,000
Variable cost per unit of the product	10
Budgeted volume	4,00,000 units per year
Desired ROI	28%

Transfer price for division X is

- (A) ₹ 12.70
 (B) ₹ 10.70
 (C) ₹ 8.70
 (D) ₹ 14.70
97. Which of the following is not a correct match?

Activity	Cost Drivers
(A) Production scheduling	Number of production runs
(B) Dispatching	No. of Dispatch orders
(C) Goods receiving	Goods received order
(D) Inspection	Machine hours

98. A manufacturing company uses two types of materials. X and Y, for manufacture of a standard product. The following information is given:

	Standard Mix		Actual mix	
Materials X	120 Kg	@ ₹5 = 600	112 Kg	@ ₹5 = 560
Y	80 Kg	@ ₹10 = 800	88 Kg	@ ₹10 = 880
	200	1400	200	1440
30% loss	60		25% loss	50
	140	1400	150	1440

Direct Materials Mix Variance is:

- (A) ₹ 40 (fav.)
 (B) ₹ 40 (unfav.)
 (C) ₹ 80 (fav.)
 (D) ₹ 80 (unfav.)

Answer Key:

- (1) (A) Resale Value
 The resale value is normally referred to as the 'exchange value'
 (2) (A) Batch production

Batch production uses stocks to supply customers whilst other products are being produced. Stocks are avoided in a JIT system. Jobbing production makes products to customer order and is ideal for JIT.

(3) (B) Internal price transfer price

The internal price is just another name for the TP. So it is not a method of transfer pricing.

(4) (B) If the product is new and different

Here market skimming would be more appropriate. A high price could be changed to the 'opinion leaders' who want to be seen to have the new product and are prepared to pay a high price.

(5) (B) (A), (B) and (C) only

At first inspection all four appear to be methods of arriving at selling price. However, target costing is a method to arrive at the cost at which a product should be produced for having worked backwards from the price already set for the product.

(6) (C) 45%

To generate a contribution greater than \$20,000 it is necessary to earn a unit contribution greater than ₹ 20. Consider each of the feasible combinations:

Selling Price	Variable Cost	Contribution	Probability
50	20	30	0.45 x 0.55 = 0.2475
60	20	40	0.25 x 0.55 = 0.1375
60	30	30	0.25 x 0.25 = 0.0625

Answer = 44.75% = 45% to nearest full %

(7) (B) ₹4,050

The material is in regular use by the organization and so would be replaced if it is used on the special order. The material is readily available at a price of 3.24 per kg.

Therefore the relevant cost of the material is 1,250 kgs x 3.24 = 4,050

(8) (B) ₹ 585 Adverse

Standard quantity (SQ) = 75 employees/5,000 units x 5,500 units = 82.5 employees

Standard price (SP) = 7500/75 employees = 100

Standard cost (SQ x SP) = 82.5 x 100 = 8,250

Actual cost = 8,085

Total Variance = 8250-8085=165 F

(9) (A) ₹ 330

Cost driver rate = Budgeted cost of orders/Budgeted number of orders
= 1,10,000/2895 = 38 for each order

Cost recovered : 210 orders x 38 = 7,980

Actual costs incurred = 7650

Over-recovery of costs for four-week period = 7980 - 7650 = 330.

(10) (D) ₹ 2,000

Using throughput accounting inventory is valued at material cost Inventory value = 20,000/4,000 x 400 units = 2,000

(11) (C) ₹ 255

Return per minute = (Selling price - material cost)/Time on bottleneck resource

= (50 - 16)/8 = 4.25

Return per hour

= 4.25 x 60 = 255

(12) (D) 120 units

120 units as per the following computation:

EOQ = $\sqrt{2AB/C}$, where

A = Annual Requirement of the material = 3,600 units.

B = Buying or Ordering Cost /Order = ₹40.

C = Carrying or Stockholding Cost per unit per annum = ₹100 x 20%

EOQ = $\sqrt{2 \times 3,600 \times 40/20}$ = 120 units.

(13) (C) Increase, Decrease

Contribution margin = Sales Less Variable Cost

So, reduction in variable cost will increase contribution.

BEP = FC/Contribution Margin

Hence, increase in contribution will reduce BEP.

(14) (D) 3,000;8.50

Variable Cost per unit = 4.00 + 3.00 = ₹7.00

Total FC (included in Production Overheads and Selling Overheads) is as follows:

Units	1,000	2,000
Total OH	$4.50 \times 1,000 = 4,500$	$3.00 \times 2,000 = 6,000$

Difference in Overhead = ₹1,500

Difference in Volume = 1,000

Therefore, Variable per unit = ₹1.50

Add this to Variable cost per unit of ₹7.00.

The Total variable cost = ₹1.50 + ₹7.00 = ₹8.50

Fixed Cost = ₹4,500 - (1,000 × 1.50) = ₹4,500 - ₹1,500 = ₹3,000.

(15) (A) 2000

BEP = Fixed Cost ÷ C/S Ratio = ₹48,000 / 0.4 = ₹1,20,000 or 12,000 units.

When sells are ₹1,40,000, the volume is ₹1,40,000 ÷ 10 = 14,000 units

Therefore, Margin of Safety is 14,000 – 12,000 = 2,000 units.

(16) (A) III, II, IV, I

Because cost is allocated based on the cost pool rates. So, whole process starts with identification of cost drivers followed by identification of cost pools, determination of rates and then allocation.

(17) (C) ₹48 lakhs

Maximum Capacity	80,000 Units
Present Sale	20,000 Units @ ₹100/-per Unit
Selling Price/Unit	Demand
100	20,000
90	40,000
80	80,000
Target Price	₹80
Target Cost/Unit	80 - 25% of Sales = 80 - 20 = ₹60/- per unit
Total Target Cost	80,000 Units × ₹60/- per unit = ₹48 lakhs.

(18) (D) ₹6.90

Material Price Variance (MPV) = Standard cost of Actual Quantity - Actual Cost

480 = 7.20 × 1,600 - Actual Cost

or, Actual Cost = 11,520 - 480 = 11,040

Actual Price / Unit = 11,040 ÷ 1,600 = ₹6.90.

(19) (B) A Just-in-Time inventory philosophy has been adopted

A Just-in-Time inventory philosophy has been adopted. The reason for this is that JIT assumes zero inventory for raw materials, work-in-progress and finished goods and the system of back flush accounting records the transaction only at the termination of the production and sales cycle.

(20) (B) Standard Costing

Because standard costing only involves the process described.

(21) (A) 800 cases

Cost Indifference Point is calculated as follows:

$$\text{Difference in monthly FC} \div \text{Difference in unit VC} = \frac{1,25,000 - 45,000}{140 - 40} = \frac{80,000}{100} = 800 \text{ Cases}$$

(22) (C) 100 (A) and 200 (F)

Variable O/H Cost variance = Recovered O/H - Actual O/H = 4200 – 4300 = 100(A)

Fixed O/H Cost variance = 6300 - 6100 = 200 (F).

(23) (B) 40,000 units

SP 80 – VC 32 = Contribution 48

F.C. 11,52,000

B.E.P. = 11,52,000/48 – 24,000 units

MOS = 40%; B.E.P. = 60%

∴ Total sales = 24,000 × 100 ÷ 60 = 40,000 units.

(24) (C) ₹30,00,000

Actual Sales - M.O.S. = BEP Sales

Sales = ₹50,00,000
 Less: Margin of safety 40% on sales = ₹20,00,000
 Break even sales = ₹30,00,000

(25) (B) to decrease by 1%

	Before installing new assets	After installing new assets
PBIT	₹19.20 lakhs	= ₹19.20 lakhs + (₹8.40 lakhs – ₹4.80 lakhs) = ₹22.80 lakhs
Value of Assets	₹96.00 lakhs	= ₹96.00 lakhs + ₹24.00 lakhs = ₹120.00 lakhs
ROT	= 20%	= 19%

Conclusion: There will be a decrease of 1% in ROI under the proposed dispensation.

(26) (B) 41.47 hrs

At 72% Learning Curve, T-4 - Time taken by the 4th Unit = 80 (.72)(.72) = 41.47 hrs.

Note: In the arithmetic method followed above, every time the number the number of repetitions doubles, the time to perform the activity is reduced by the Learning Curve Coefficient.

(27) (C) ₹45.00

Projected sales (40,000 mixers X ₹60 per mixer) (A)	= ₹24,00,000
Less desired profit (15% of ₹40,00,000) (B)	= ₹6,00,000
Target Cost for 40,000 mixers (A - B)	= ₹18,00,000
Target cost per mixer (₹18,00,000 / 40,000 mixer)	= ₹45.00 per unit

(28) (B) Back-flush Accounting

(29) (C) A-2, B-3, C-1, D-4

(30) (B) ₹200

Number of batches under ABC = 9000 ÷ 1000 = 9
 Std. Cost under ABC = Budget Cost / Batch × ABC number of batches
 = ₹200 × 9 = ₹1800

Production	9000 Units
Number of batches	9
Cost /Batch	₹200

(31) (C) ₹60

Demand	Price (₹)
20,000	100
40,000	90
80,000	80

Target Cost = ₹80 – (25% of ₹80) = ₹80 – ₹20 = ₹60

(32) (B) 40.96%

Units	Average Time (hours)
1 st	100%
2 nd	80% x 100%
4 th	80% of 2 nd
8 th	80% of 4 th
16 th	80% of 8 th = 0.80 x 0.80 x 0.80 x 0.80 = 40.96%

Say, 41% of the time required for the 1st Unit.

(33) (A) 30.6%

When V (Var. cost) = 100, SP = 160, M.Cost/SP = 60/100
 SP after 10% mark down of SP = 144, Cost = 60-16=44
 Contribution Margin Ratio = 44/144=0.3056=30.6%

(34) (D) ₹1,00,000

MS=Profit/PV Ratio = ₹4 Lakh: MS=50%; BE Sales = (1 - 0.50) = 0.50 Hence BES = ₹4 lakh
 Fixed Cost 25% of ₹4,00,000 = ₹1,00,000

(35) (B) ₹14,000

Contribution per unit of component	₹	₹
Variable Prime Cost	10.00	
Variable Overhead	2.40	
Selling / Administrative Expenses	0.60	13.00

Contribution	8.00
--------------	------

Avoidable fixed cost per quarter
 = total fixed cost - (unavoidable fixed cost + additional shut down cost)
 = (50,000 × ₹4) (₹74,000 + ₹14,000) = ₹1,12,000.
 The required shut down point for the quarter = ₹1,12,000 / ₹8 = 14,000 units.

(36) (B) ₹500

Total moves in material handling = 5+15=20
 Percentage move for Product A = 5/20 = 25%
 Material handling cost to be allocated to Product A = ₹60,000/25% = ₹15,000
 i.e., ₹15,000/30 = ₹500 per unit.

(37) (C) ₹180

(Selling Price - Material Cost)/ Time of bottleneck resource
 = [(₹50 - ₹20)/10 minutes] × 60 = ₹180 per hour.

(38) (A) ₹3.45

Actual quantity bought × standard price = 1,600 × ₹3.60 = ₹5,760
 Deduct favorable price variance = 240
 Actual quantity × actual price = 5,520 Or, 1,600 × actual price = ₹5,520
 So, Actual price ₹5,520/1,600 = ₹3.45

(39) (D) 10,368 hours

Units	Average Time (hours)	Total Time (hours)
1	4000	4000
2	3600	7200
4	3240	12960
8	2916	23328

Total Time for 5th to 8 units = 23328 – 12960 = 10,368 hrs.

(40) (D) ₹5,000

$$\text{Saving Cost} = \frac{18,00,000}{9} \times \frac{10}{100} - \frac{18,00,000}{12} \times \frac{10}{100}$$

(41) (A) 15% decrease in selling price

A given percentage change in unit sale price must have greater effect on contribution margin than any other factor affected by the same percentage change.

(42) (C) ₹15,000

Products	P	V	Total
Units	800	400	
S.P. (₹)	25	50	
Sales (₹)	20,000	20,000	
Further costs (₹)	8,000	12,000	
NRV (₹)	12,000	8,000	20,000

Joint cost appropriated ₹9,000
 Total Joint Cost = (9,000/12,000) × 20,000 = ₹15,000

(43) (B) 1,11,000 units

At a production of 75,000 units or less the fixed costs amount to ₹8 lakh
 Contribution is ₹10 per unit (₹25 - 60% of ₹25).
 Production will however, be more than this level. Total fixed cost is then ₹12 lakh.
 Contribution for first 75,000 units = ₹7,50,000
 Hence, to meet ₹12 lakh fixed cost, further ₹4,50,000 contribution is required.
 Contribution beyond 75,000 units is ₹12.5 (₹25 - 50% of ₹25).
 Additional units to be sold = ₹4,50,000 / ₹12.50 = 36,000 units = 1,11,000 units

(44) (C) Lower NPV; Higher IRR

Working for Himalayas

Year	CF	DF at 15%	PV Rs	DF at 20%	PV Rs
0	(450)	1.000	(450)	1.000	(450)
1	300	0.870	261	0.833	250
2	200	0.756	151	0.694	139
3	100	0.658	66	0.57	58

		NPV	28		(3)
--	--	-----	----	--	-----

Hence IRR = 20% (approx.)

Projects

Alpas Himalayas
Lower NPV Higher IRR

(45) (B) ₹8,40,000

Cost of goods sold	8,00,000
(Less) Material Cost	(3,60,000)
Conversion Cost Allocated	4,40,000
Conversion Cost incurred	4,80,000
Excess charged to cost of goods sold account	40,000

Total debit on cost of goods sold account = ₹8,00,000 + ₹40,000 = ₹8,40,000

(46) (D) 0.3075

The sales demand is 4,000 units per month. The monthly contribution must absorb the fixed costs of ₹20,000 and leave at least a surplus of ₹1,20,000 profit. So, the contribution per unit must be ₹1,40,000/4,000 units = ₹35 in the minimum.

The following selling price and variable cost pairs will produce a contribution of more than ₹35.

Selling Price	Variable Cost	Contribution	Joint Probability of SP & VC
75	30	45	0.45 x 0.25 = 0.1125
90	30	60	0.30 x 0.25 = 0.0750
90	45	45	0.30 x 0.40 = 0.1200
			0.3075

(47) (A) All of the above

All the costs mentioned in the question are parts of the total life cycle costs.

(48) (C) 432 hours

Cumulative Output	Average Time / Unit (hrs)	Total Time (hrs)	Incremental Time (hrs)
1	300	300	
2	270 (0.9 x 300)	540	
3	243 (0.9 x 270)	972	432 (972 – 540)

(49) (B) ₹440

Particulars	₹
500 kgs of material in stock at resale value	200
Balance 300 kgs of material at current price of ₹0.80	240
Relevant Cost of the Material	440

(50) (C) ₹3,000

Original price is not relevant

Rework Income	18,000
Deduct cost of rework	10,000
Net Inflow	8,000 It is relevant

The other alternative relevant cash flow is from sale as scrap = ₹3,000 Hence, the opportunity cost is ₹3,000.

(51) (C) Single rate-method

The single rate method combines fixed and variable costs without regard to cost behavior patterns. A and B do not exactly fit in with the given question as they can be used on a single or dual rate; and answer D allows variable costs to be allocated on different basis from fixed costs.

(52) (B) 80.00%

Let the learning rate be x.

Since the first unit took 2 hours, average time for the first two units = 2x and the average time for the first 4 units = 2x × x = 2x².

$$2x^2 = 5.12 \div 4 = 1.28.$$

$$\text{Or, } x = \sqrt{1.28 \div 2} = \sqrt{0.64} = 0.80 \text{ i.e. } 80\%.$$

(53) (A) ₹270

(Selling Price – Material Cost) / Time on bottleneck resources.
 = $[(\text{₹}75 - \text{₹}30) / 10 \text{ minutes}] \times 60 = \text{₹}270$

(54) (C) ₹30

(55) (B) ₹30

Total contribution required: 12% of ₹10 lakhs
 = ₹1,20,000 + 30,000 (RI) + 2,00,000 (Depr.) + 4,00,000 (FC)
 = ₹7,50,000 ÷ 25,000 = ₹30

(56) (B) ₹12.90

Transfer Price = Marginal Cost – Opportunity Cost = ₹24 × 60% - ₹1.50 = ₹12.90.

(57) (B) ₹3.75

(58) (B) ₹60.00

Target Cost at Full Capacity

Selling Price per unit	₹100	₹90	₹80	
Demand	20,000 units	40,000 units	80,000 units	= Full Capacity

Hence, Target Cost at Full capacity = Sale price less Profit Margin = ₹80 less 25% thereon
 = ₹60 p.u.

(59) (C) ₹35

Selling price = ₹50 – ₹0.001x
 Marginal Revenue = ₹50 – ₹0.002x
 Variable cost per unit = Marginal Cost per unit = ₹20
 Optimal output for maximum profit: $20 = 50 - 0.002x$,
 Hence, $x = 30 / 0.002 = 15,000$ units
 SP = $50 - 0.001x = 50 - 0.001(15000) = 50 - 15 = \text{₹}35$.

(60) (A) ₹10,50,000

$$= (85,00,000 \times 30\%) - 15,00,000 = 10,50,000$$

Or

Sales × Contribution margin ratio or P.V. Ratio – Fixed Cost

(61) (D) 10,000

Actual Cost + Favourable Cost Variance = Standard Cost
 $1100 \times 8 + 2200 - 1000 = 8800 + 1200 = 10,000$

(62) (C) ₹6,000

Differential Costs = Differences in Fixed and Variable Cost
 = $4000 + 2,000 = 6,000$.

(63) (B) 8,000 units

Contribution for 2000 units = 20,000 (difference in profits for two output levels)
 Hence, contribution per unit = 10.
 Substituting in equation $1,00,000 = F + 10,000$. Or $F = 80,000$.
 BEP = $80000 / 10 = 8000$.

(64) (D) 350

Contribution = $1,06,000 + 74,000 = 1,80,000$
 Contribution/Unit = $180000 / 1200 = 150$
 Variable cost/unit = $150 \div \frac{3}{4} = \text{₹}200$
 Selling price = 350

(65) (B) ₹7.60

1st unit = 28 min.
 Average time p.u. for 2 units = $0.9 \times 28 = 25.2$
 Total time for 2 units = $25.2 \times 2 = 50.4$
 Time for second unit = $50.4 - 28 = 22.4$ minutes
 Cost for second unit = $22.4 \times 20 \text{ ₹/hr.} / 60 \text{ minutes} = 7.47$
 Since, (B) is close to 7.47, b is acceptable. Otherwise, none of the given data.

(66) (B) ₹30,00,000

Opportunity cost represents the next best alternative foregone.

If B is chosen, only A is being foregone and hence the NPV of 30,00,000 is the present value of the opportunity lost.

(67) (D) ₹1,000

For 2,000 purchase orders, cost budgeted is 1 lac.
 For 200, corresponding amount would be 10,000.
 But actual = 9,000. Hence over recovered is 10,000 – 9000 = 1000.
 Or
 Cost driver rate for order = 1,00,000 / 2,000 = 50 per order.
 Cost recovered = 50 × 200 = 10,000.
 Actual = 9,000
 Over recovery = 1000

(68) (A) 32193

1 double room = 1.3 single in terms of revenue.
 Capacity = 100 + 1.3 × 20 = 100 + 26 = 126 equivalent single rooms.
 Total Room Occupancy p.a. = 126 × 365 × 70% = 32193 days.
 Note: This can be arrived at by other ways also, taking for example 70% of only single rooms and then double rooms, etc.

(69) (A) There can be one or more activities without a predecessor in a network.

More than 1 activity can begin at the first node, say 1 – 2, 1 – 3, 1 – 4, etc.
 Each of these will have no predecessor.

(70) (B) Increase by 9.375%

$S - V = C = ₹ 3,20,000 - 2,00,000 = ₹ 1,20,000$
 $c/s \text{ ratio} = \frac{1,20,000}{3,20,000} \times 100 = 37.5\%$
 New VC = ₹ 1,70,000,
 $C = ₹ 1,50,000$
 $c/s \text{ ratio} = \frac{1,50,000}{3,20,000} \times 100 = 46.875\%$
 $\% \text{ increase in } c = 46.875 - 37.5\% = 9.375\%$

(71) (C) ₹ 15,90,000

Standard cost of goods sold (10,000 units @ ₹ 150)	15,00,000
Less : Std. material cost (10,000 @ ₹ 60)	<u>6,00,000</u> 9,00,000
Standard conversion cost	
Conversion cost incurred	9,90,000
Excess charged to cost of goods sold a/c. (debit)	<u>90,000</u>
Total debit balance of cost of goods sold Account = ₹ 15,00,000 + 90,000 = ₹ 15,90,000	

(72) (A) ₹ 40,000 over absorbed

Overhead Absorption Rate = $\frac{₹ 3,30,000}{2,20,000 \text{ units}} = ₹ 1.50/\text{unit}$

Overhead Absorbed : 2,00,000 @ ₹ 1.50	= ₹ 3,00,000
Actual overhead	= ₹ 2,60,000
Over absorbed overhead	= ₹ 40,000

(73) (A) ₹ 850

Opportunity cost is the cost of next best alternative foregone. Between X and Y, y has a better contribution i.e. ₹ 850 as against X (₹ 1500 – 700) = ₹ 800.

(74) (D) All of the above costs

Because all of the costs mentioned can be identified with specific goods/product and would be deducted from the selling price to determine the direct product profit.

(75) (C) 1536 hours

As per the following :
 At 80% Learning Curve, the total time for 8 units will be 8*512 i.e. 4096 hours and for 4 units it is 4*640 i.e. 2560 hours. Hence the time taken for units 5 to 8 will be 1536 (4096 – 2560)

(76) (B) ₹ 125

Variable cost + (Fixed cost + Profit Desired) ÷ Volume = ₹ 100 + (1,20,000 + 30,000) ÷ 6000 = ₹ 125/-

(77) (B) Interfering float

Interfering float is that part of the total float which causes a reduction in the float of the successor activities. It is the difference between the latest finish time of the activity in question and the earliest starting time of the following activity or zero, whichever is larger.

(78) (D) Implementing and controlling the net work

Because step no. 4 i.e. (d) should be satisfying the objectives. Implementing and controlling the network would be the final step.

(79) (D) ₹ 10

Change in Costs (B – A) ₹ 50,000
 Change in Units (B – A) ₹ 5,000
 VC per unit = ₹ 50,000 ÷ 5,000 = ₹ 10
 Total Cost at A ₹ 1,00,000
 VC : 5,000 × ₹ 10 50,000
 Total FC ₹ 50,000 ÷ 5,000 units
 = ₹ 10 per unit

(80) (A) ₹ 4,20,000

$$\text{Required Sales} = \frac{\text{FC} + \frac{\text{Desired Profit}}{1 - \text{tax rate}}}{\frac{\text{Contribution}}{\text{Sales}}}$$

$$= \frac{₹ 50,000 + 90,000}{\frac{1}{3}}$$

$$= ₹ 4,20,000$$

(81) (B) E, F, H & G

Ranking of products would in order of contribution per limiting factor, in relative value.

	E	F	G	H
SP (₹)	100	150	200	300
VC (₹)	50	70	100	125
Contribution per unit	50	80	100	175
RM/unit (kg)	1	2	5	7
Contribution per kg of RM (₹)	50	40	20	25
Rank	1	2	4	3

Correct Order of ranking : E, F, H & G

(82) (C) ₹ 26,400

Cumulative hours 200 × (20 × 0.8 × 0.8) = 2560
 Less: 50 × 20 = 1000
 Net hours for 150 units = 1560
 Cost : Direct Materials 150 × 30 = 4,500
 Direct Labour 1560 × 8.50 = 13,260
 Variable Overhead 1560 × 4 = 6,240
 Total Variable Cost = 24,000
 Allocated Fixed OH = 10% = 2400
 Estimated Cost of the Order = 26,400

(83) (D) ₹ 1,10,280

Indirect costs per machine:

Material handling	₹ 8 × 50	= 400
Machining	₹ 68 × 12	= 816
Assembly	₹ 75 × 15	= 1,125
Inspection	₹ 104 × 4	= 416
		<u>= 2,757</u>

For the order: ₹2,757 × 40 = ₹1,10,280

(84) (C) 2,200

Labour Efficiency Variance = (ST – AT) × SR

or, (2,000 – AT) × ₹8 = (-) ₹1,600

or, AT = 7,600 ÷ 8 = 2,200 hours

(85) (B) ₹6,000

Original price is not relevant

Rework income	₹36,000
Less: Cost of rework	₹ 20,000
Net inflow	₹16,000, it is relevant

The other alternative relevant cash flow is from sale as scrap = ₹ 6,000

Hence the opportunity cost is ₹6,000.

(86) (D) In different branches of the same company, each branch making a different product using a unique process

Though the entity is the same, different products using different (unique) process cannot follow uniform costing.

(87) (B) $5x_1 + 2x_2 \leq 10$

Other options do not conform to linearity or fundamental of constraints.

(88) (C) Contribution will be increased by ₹10 per hour for each extra hour of skilled labour that can be obtained

A shadow price for a scarce resource is its opportunity cost. It is the amount of contribution that would be lost if one unit less of that resource were available. It is similarly the amount of additional contribution that would be earned if one unit more of that resource were available. (This is on the assumption that that the scarce resource is available at its normal variable cost)

(89) (C) 30%

$$\text{BEP} = \frac{\text{FC}}{\frac{\text{P}}{\text{V}} \text{ratio}} = \frac{\text{P}}{\text{V}} \text{ratio} = \frac{\text{FC}}{\text{BEP}} = \frac{48,000}{1,60,000} = 30\%$$

(90) (A) ₹75,625

$$\begin{aligned} \text{Cost per Factory Minute} &= \text{Total Factory Cost} / \text{Minutes Available} \\ &= ₹78,250 / 31,300 \\ &= ₹2.50 \end{aligned}$$

$$\begin{aligned} \text{Standard Minutes of throughput for the week} &= (4750 \times 5) + (650 \times 10) \\ &= 30,250 \text{ minutes.} \end{aligned}$$

$$\text{Therefore, throughput Cost for the week} = 30,250 \times ₹2.50 = ₹75,625$$

(91) (D) 2

Standard Deviation equals (pessimistic time minus optimistic Time) / 6 that is $21 - 9 / 6 = 2$.

(92) (D) The higher the capacity utilization ratio

$$\text{Capacity Utilization Ratio} = \frac{\text{Actual Hours}}{\text{Budgeted Hours}}$$

So, the capacity utilization ratio would be higher.

(93) (B) The labour cost of manufacturing the 4th product will be more for B

The labour cost of manufacturing the 4th product will be more for B since B will take more time per unit of product.

(94) (D) Zero

Opportunity cost is not an out of pocket cost. It is the benefit given up by not selecting the next best alternative. Therefore, answers A, B and C are incorrect and D is correct.

(95) (C) ₹1050

$$\text{ROI at 15\% of total investment ₹15 lakhs} = ₹15,00,000 \times 0.15 = ₹2,25,000.$$

$$\text{Profit per unit of future output} = ₹2,25,000 / 500 = ₹ 450 \text{ per unit.}$$

$$\text{Therefore, target cost per unit} = \text{Selling Price} - \text{Profit per unit}$$

$$= ₹1,500 - ₹450$$

$$= ₹1,050 \text{ per unit.}$$

(96) (A) ₹12.70

	Per unit (₹)
VC	10.00
FC (₹ 8, 00,000 ÷ 4, 00,000)	2.00
Investment: (FA + CA + Debtors) = ₹10, 00,000	
Return = $\frac{10,00,000 \times 0.28}{4,00,000}$	<u>0.70</u>
TP for Div. X	<u>12.70</u>

(97) (D) Inspection, Machine hours

Inspection hours, and not machine hours, drive the cost of inspection.

(98) (B) ₹40 (unfav.)

Direct Materials Mix Variance is: ₹ 40 (unfav.)

	SP (SQ – AQ)	
X	₹ 5 (120 – 112)	= ₹40 (fav.)
Y	₹10 (80 – 88)	<u>= ₹80 (unfav)</u>
		<u>= ₹40 (unfav)</u>

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SUGGESTED ANSWERS

(JUNE-2017 to DEC-2022)

**FINAL EXAMINATION
GROUP - III
(SYLLABUS 2016)**

**SUGGESTED ANSWERS TO QUESTIONS
JUNE - 2017**

Paper-15 : STRATEGIC COST MANAGEMENT – DECISION MAKING

Time Allowed : 3 Hours

Full Marks : 100

The figures in the margin on the right side indicate full marks.
Answer Question No. 1 in Section A, which is compulsory, carrying 20 marks.
Further, answer any 5(five) Questions from Section B, each carrying 16 marks.

Section – A (20 Marks)

1. Choose the most appropriate answer to the following questions giving justification. Each question carries 2 (two) marks. 2x10=20

- (i) Stock Control data for Material P are:

Annual usage: 3600 units; Cost per unit: ₹100/-; Cost of placing an order: ₹40;
Stockholding Cost: 20% of the overall stock volume; Lead time: One month

The EOQ based on the above data is:

- (a) 210 units
- (b) 175 units
- (c) 90 units
- (d) 120 units

- (ii) Which of the following would take place if a company is able to reduce its variable cost?

Contribution Margin	Break-Even Point
(a) Increase	Increase
(b) Decrease	Decrease
(c) Increase	Decrease
(d) Decrease	Increase

- (iii) The following details relate to Product P-1 of a manufacturing company:

Level of activity (units)	1000	2000
Cost per unit (₹):		
Direct materials	4.00	4.00
Direct labour	3.00	3.00
Production Overheads	3.50	2.50
Selling Overheads	1.00	0.50
	11.50	10.00

The total fixed cost and variable cost per unit are:

	Total Fixed Cost (₹)	Variable Cost per unit (₹)
(a)	2,000	7.00
(b)	2,000	8.50
(c)	3,000	7.00
(d)	3,000	8.50

- (iv) A company makes a single product which it sells at ₹10 per unit. Fixed costs are ₹ 48,000 per month and the product has a contribution to sales ratio of 40%. In a period when actual sales were ₹1,40,000, the company's margin of safety in units was:

- (a) 2000
- (b) 3000

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- (c) 3500
(d) 4000
- (v) The following tasks are associated with ABC system:
- I. Allocation of costs to products
 - II. Identification of cost pools
 - III. Identification of cost drivers
 - IV. Calculation of pool rates
- The proper order of the preceding tasks is:
- (a) III, II, IV, I
(b) I, II, III, IV
(c) III, IV, II, I
(d) IV, III, II, I
- (vi) A company has the capacity of production of 80000 units and presently it sells 20000 units at ₹ 100 each. The demand is sensitive to selling price and it has been observed that every reduction of ₹ 10 in selling price the demand is doubled. What should be the target cost at full capacity if profit margin on sales is taken at 25%?
- (a) ₹ 58 lakhs
(b) ₹ 52 lakhs
(c) ₹ 48 lakhs
(d) ₹ 50 lakhs
- (vii) The information relating to the direct material cost of a company is as follows:
- | | |
|--|--------|
| Standard price per unit | ₹ 7.20 |
| Actual quantity purchased in units | 1600 |
| Standard quantity allowed for actual production in units | 1450 |
| Material price variance on purchase (Favourable) | ₹ 480 |
- What is the actual purchase price per unit?
- (a) ₹7.50
(b) ₹6.40
(c) ₹6.50
(d) ₹6.90
- (viii) Backflush costing is most likely to be used when:
- (a) Management desires sequential tracking of costs
 - (b) A Just-in-Time inventory philosophy has been adopted
 - (c) The company carries significant amount of inventory
 - (d) Actual production costs are debited to work-in-progress
- (ix) The preparation and use of standard cost, their comparison with actual costs and the measurement and analysis of variances to originating causes is defined as:
- (a) Marginal Costing
 - (b) Standard Costing
 - (c) Throughput Costing
 - (d) Kaizen Costing
- (x) The following are cost data for two alternative ways of processing the clerical work for legal cases brought before the district court:

	Semi-automatic	Fully automatic
Monthly fixed costs (₹):		
Occupancy	15,000	15,000
Maintenance contract	5,000	10,000
Equipment lease	25,000	1,00,000
Unit variable cost (per report) (₹)		
Supplies	80	20
Labour	60	20

The cost indifference point will be:

- (a) 800 cases
- (b) 850 cases
- (c) 750 cases
- (d) 700 cases

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Answer:

1. (i) (d)

Explanation: 120 units as per the following computation:

$EOQ = \sqrt{2AB/C}$, where

A = Annual Requirement of the material = 3,600 units.

B = Buying or Ordering Cost /Order = ₹ 40.

C = Carrying or Stockholding Cost per unit per annum = ₹ 100 × 20%

$EOQ = \sqrt{2 \times 3,600 \times 40/20} = 120$ units (d).

(ii) (c)

Explanation: Contribution margin = Sales Less Variable Cost

So, reduction in variable cost will increase contribution.

$BEP = FC/Contribution\ Margin$

Hence, increase in contribution will reduce BEP.

(iii) (d)

Explanation: Variable Cost per unit = 4.00 + 3.00 = ₹ 7.00

Total FC (included in Production Overheads and Selling Overheads) is as follows:

Units	1,000	2,000
Total OH	$4.50 \times 1,000 = 4,500$	$3.00 \times 2,000 = 6,000$

Difference in Overhead = ₹ 1,500

Difference in Volume = 1,000

∴ Variable per unit = ₹ 1.50

Add this to Variable cost per unit of ₹ 7.00.

The Total variable cost = ₹ 1.50 + ₹ 7.00 = ₹ 8.50

Fixed Cost = ₹ 4,500 - (1,000 × 1.50) = ₹ 4,500 - ₹ 1,500 = ₹ 3,000.

(iv) (a)

Explanation: $BEP = \frac{FC}{C/S\ Ratio} = \frac{₹ 48,000}{0.4} = ₹ 1,20,000$ or 12,000 units.

When sells are ₹ 1,40,000, the volume is ₹ 1,40,000 ÷ 10 = ₹ 14,000 units

∴ Margin of Safety is 14,000 – 12,000 = 2,000 units.

(v) (a)

Explanation: Because cost is allocated based on the cost pool rates. So, whole process starts with identification of cost drivers followed by identification of cost pools, determination of rates and then allocation.

(vi) (c)

Explanation:

Maximum Capacity	80,000 Units
Present Sale	20,000 Units @ ₹ 100/-per Unit
Selling Price/Unit	Demand
100	20,000
90	40,000
80	80,000
Target Price	₹ 80
Target Cost/Unit	80 - 25% of Sales = 80 - 20 = ₹ 60/- per unit
Total Target Cost	80,000 Units × ₹ 60/- per unit = ₹ 48 lakhs.

(vii) (d)

Explanation:

Material Price Variance (MPV) = Standard cost of Actual Quantity - Actual Cost

480 = 7.20 × 1,600 - Actual Cost

or, Actual Cost = 11,520 - 480 = 11,040

Actual Price / Unit = 11,040 ÷ 1,600 = ₹ 6.90.

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(viii) (b)

Explanation: A Just-in-Time inventory philosophy has been adopted. The reason for this is that JIT assumes zero inventory for raw materials, work-in-progress and finished goods and the system of backflush accounting records the transaction only at the termination of the production and sales cycle.

(ix) (b)

Explanation: Because standard costing only involves the process described.

(x) (a)

Explanation: Cost Indifference Point is calculated as follows:

$$\frac{\text{Difference in monthly FC}}{\text{Difference in unit VC}} = \frac{\text{₹1,25,000} - \text{₹45,000}}{\text{₹140} - \text{₹40}} = \frac{\text{₹80,000}}{\text{₹100}} = 800 \text{ Cases.}$$

Section – B

Answer any five questions.

Each Question carries 16 Marks.

16×5=80

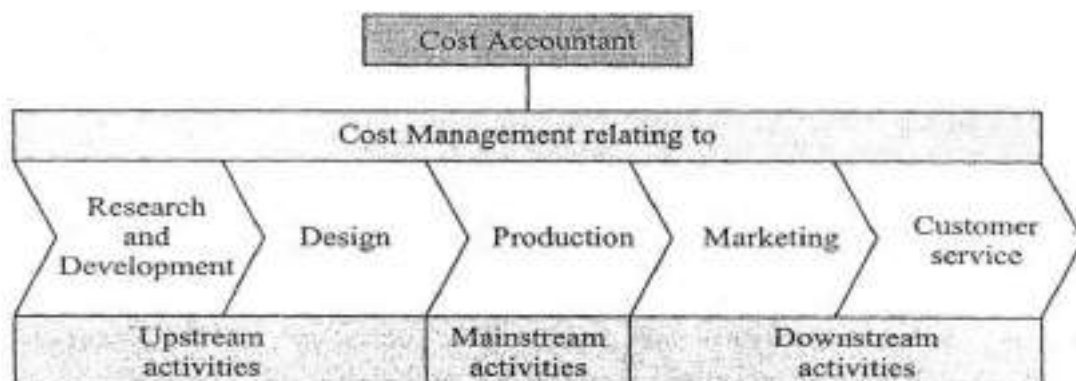
2. (a) What is Value Chain? How does it help modern cost management? 2+4=6
- (b) (i) What are the problems of Traditional Costing arising out of volume-based cost allocation to products?
(ii) How can Activity-Based Costing help refining such costing system? 1+3=4
- (c) (i) What are relevant costs and relevant revenues?
(ii) In making repetitive decisions using relevant costs and benefits, should a decision maker be aware of several pitfalls? If so, mention a few and briefly explain them. 2+4=6

Answer:

2. (a) A value chain is the sequence of business functions in which utility (usefulness) is added to the products or services of the firm. Through proper analysis and management of each segment of the value chain, customer value is enhanced. Non-value creating activities are eliminated.

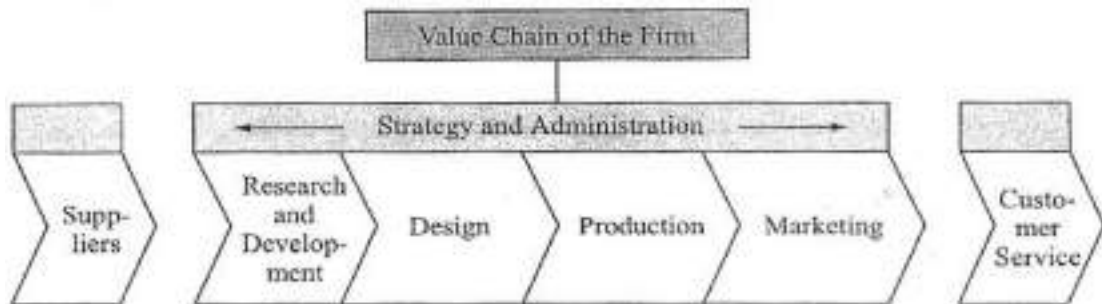
In value chain analysis, each of the business functions is treated as an essential and valued contributor and is constantly analyzed to enhance value relative to the cost incurred. Like business functions, in value chain approach also, it is important that the efforts of all functions are integrated and co-ordinated to increase the value of the products or services to the customers.

The following diagram shows the important functions or activities of a firm and the role of the cost accountant in cost management.



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Michael Porter introduced the value chain concept in cost management in 1985. It was developed further by Ahw subsequently. When the supplier and customers are included, the firm is viewed as an extended value chain as shown below:



The value chain approach is an integral part of strategic cost management, which is an approach to Management Accounting that explicitly highlights strategic issues and concerns. It sets cost analysis as a broader context in which cost information is used to develop superior strategies.

Modern cost accountant has an important role to play in analyzing cost information relating to each of the segments of the value chain and supplying the same to other functional managers for improved decisions.

- (b) (i) Under traditional costing, overhead which occupies an important share of the total cost structure of the firm is generally allocated based on volume-based allocation rates viz. rates per labour hour, rate per machine hour, % of labour cost, etc. It does not take into consideration disproportionate consumption of service department services. As a result, the product cost gets distorted i.e., some products are over costed while others are under costed. The basic assumption in cost allocation is; the higher the volume, the greater the share of indirect costs to the product or service. This simplistic assumption does not hold good in reality.
- (ii) The Activity-Based Costing (ABC) is a system that focuses on activities as the fundamental cost objects and uses the cost of these activities for computing the costs of products. The Activity-Based Costing refines the problems of Traditional Costing System by the following means:
- 1) In the traditional system, cost analysis is done by product. In ABC, the managers focus attention on activities rather than products because activities in various departments may be combined and costs of similar activities ascertained, e.g., quality control, handling of materials, repairs to machines etc.,. If detailed costs are kept by activities, the total company costs for each activity can be obtained, analysed, planned and controlled.
 - 2) Unlike the Traditional Costing Systems, managers under ABC, manage activities and not products. Changes in activities lead to changes in costs. Therefore, if the activities are managed well, costs will fall and the resulting products will be more competitive.
 - 3) Allocating Overhead Cost to production based on a single cost driver (allocation base, such as unit basis, percentage of material, percentage of prime cost, labour hour rate, machine hour rate etc.) can result in an unrealistic product cost because the traditional system fails to capture cause-and-effect relationships. To manage activities better and to make wiser economic decisions, managers need to identify the relationships of causes (activities) and effects (costs) in a more detailed and accurate manner.
 - 4) ABC highlights problem areas that deserve management's attention and more detailed analysis. Many actions are possible, on pricing, on process technology, on product design, on operational movements and on product

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mix. Traditional Costing can lead to under costing for over costing of products or services. Over or Under Costing of products distorts cost information. A poor quality of cost information causes management to make poor decisions for pricing, product emphasis, make or buy etc.

ABC differs from the traditional system only in respect of allocations of overheads or indirect costs. Direct Costs are identified with, or assigned to, the cost object, in the same manner as is done in case of traditional costing system. Overhead costs are linked to the cost objects based on activities.

(c) (i) Relevant costs are costs appropriate to aiding the making of specific management decisions (CIMA). They are estimated future costs that differ among alternatives. Similarly, relevant revenues and expected future revenues that differ among alternatives. The two key aspects of relevance are:

- (1) The costs and revenues must occur in future, and
- (2) They must differ among alternatives.

(ii) In such decision making, the decision maker must be aware of some pitfalls. Examples are:

- (1) Sunk cost – be ignored as not relevant.
- (2) Fixed Costs – if they change for the decision at hand, the changed portion only becomes relevant.
- (3) Opportunity costs – They need not be overlooked (e.g., to outsource an activity when there is no idle capacity). An opportunity cost is the cost of an opportunity foregone by not using a limited resource in its next best alternative use.

3. (a) Accelerate Co. Ltd., manufactures and sells four types of products under the brand names of A, B, C and D. The sales mix in value comprises 33 1/3%, 41 2/3%, 16 2/3% and 8 1/3% of products A, B, C and D, respectively. The total budgeted sales (100%) are ₹ 60,000 p.m. Operating Costs are — Variable costs: Product A 60% of selling price, Product B 68% of selling price, Product C 80% of selling price, Product D 40% of selling price; Fixed costs: ₹ 14,700 p.m.

Required:

Calculate the break-even-point for the products on overall basis.

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(b) A2Z p.l.c supports the concept of zero technology or life cycle costing for new investment decisions covering its engineering activities. The financial side of this philosophy is now well established and its principles extended to all other areas of decision making. The company is to replace a number of its machines and the Production Manager is torn between the Exe Machine, a more expensive machine with a life of 12 years, and the Wye machine with an estimated life of 6 years. If the Wye machine is chosen, it is likely that it would be replaced at the end of 6 years by another Wye machine. The pattern of maintenance and running costs differs between the two types of machine and relevant data are shown below:

	Exe	Wye
Purchase price	₹ 19,000	₹ 13,000
Trade-in value/breakup/scrap	₹ 3,000	₹ 3,000
Annual repair costs	₹ 2,000	₹ 2,600
Overhaul costs	(at year 8) ₹ 4,000	(at year 4) ₹ 2,000
Estimated financing costs	10% p.a.	10% p.a.

averaged over machine life

Required: Recommend with supporting figures, which machine to purchase, stating any assumptions made?

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Answer:

3. (a) Computation of overall breakeven point

			A	B	C	D	Total	
a	Sales	(₹)	20,000	25,000	10,000	5,000	60,000	
b	Variable cost	(₹)	12,000	17,000	8,000	2,000	39,000	
c	Contribution	(₹)	8,000	8,000	2,000	3,000	21,000	
d	Fixed cost	(₹)					14,700	
e	Profit	(₹)					6,300	
f	P/V ratio	(%)	40%	32%	20%	60%	35%	
g	Break even sales	(₹)	14700/35% =					42,000

- (b) Profitability of Alternate Machines

		Exe Machine		WYE Machine
Initial cost (₹)		19,000		13,000.00
Less: Scrap at the end of the life (₹)	(3,000x0.32)	960.00	(3,000x0.56)	1,680.00
		18,040.00		11,320.00
Present value of total annual cost (₹)	(2,000x6.81)	13,620.00	(2,600x4.36)	11,336.00
Overhaul Cost	(4,000x0.47)	1,880.00	(2,000x0.68)	1,360.00
		33,540.00		24,016
Capital recovery factor	(1/6.81)	0.15	(1/4.36)	0.23
Equivalent annual cost (₹)		5,031.00		5,523.68

Conclusion:

As the equivalent annual cost is less for Exe Machine, it is better to purchase the same.

4. (a) SRM Ltd. has developed a new product 'Kent' which is about to be launched into the market and anticipates to sell 80,000 of these units at a sale price of ₹ 300 over the product's life cycle of four years. Data pertaining to product 'Kent' are as follows:

Costs of Design and Development of Moulding Dies and Other tools	₹ 10,25,000
Manufacturing costs	₹ 125 per unit
Selling costs	₹ 12,500 per year + ₹ 100 per unit
Administration costs	₹ 50,000 per year
Warranty expenses	5 replacement parts per 25 units at ₹ 10 per part, 1 visit per 500 units (cost ₹ 500 per visit)

Required:

- (i) Compute the product Kent's Life Cycle Cost.
 (ii) Suppose SRM Ltd. can increase sales volume by 25% through 15% decrease in selling price, should SRM Ltd. choose the lower price? 8

- (b) BCG Manufacturers sell their product at ₹ 1,000 per unit. Their competitors are likely to reduce the price by 15%. BCG Manufacturers want to respond aggressively by cutting price by 20% and expect that the present volume of 150,000 units per annum will increase to 200,000 units. BCGM want to earn a 10% target profit on sales. Based on a detailed value engineering, the comparative position is given below:

Particulars	Existing (₹)	Target (₹)
Direct Material Cost per unit	400	385
Direct Labour Cost per unit	55	50
Direct machinery costs per unit	70	60
Direct Manufacturing expenses per unit	525	425
Manufacturing Overheads		
No. of orders (₹ 80 per order)	22,500	21,250
Testing hours (₹ 2 per hour)	45,00,000	30,00,000
Units reworked (₹ 100 per unit)	12,000	13,000

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Manufacturing overheads are allocated using relevant cost drivers. Other operating costs per unit for the expected volume are estimated as follows:

Research and Design	₹ 50
Marketing and Customer Service	₹ 130
	₹ 180

Required:

- (i) Calculate target costs per unit and target costs for the proposed volume showing break up of different elements.
 (ii) Prepare target product profitability statement. 4+4=8

Answer:

4. (a)

Statement showing 'Kent's Life Cycle Cost (80,000 Units)

Particulars	Amount (₹)
Costs of Design and Development of Moulds, Dies and other tools	10,25,000
Manufacturing Costs (₹125 × 80,000 units)	1,00,00,000
Selling Costs (₹100 × 80,000 units + ₹ 12,500 × 4)	80,50,000
Administration Costs (₹ 50,000 × 4)	2,00,000
Warranty : (80,000 units / 25 units × 5 parts × ₹ 10)	1,60,000
(80,000 units / 500 units × 1 visit × ₹ 500)	80,000
Total cost	1,95,15,000

Statement showing 'Kent's Life Cycle Cost (1,00,000 Units)

Particulars	Amount (₹)
Costs of Design and Development of Moulds, Dies and other tools	10,25,000
Manufacturing Costs (₹125 × 1,00,000 units)	1,25,00,000
Selling Costs (₹100 × 1,00,000 units + ₹ 12,500 × 4)	1,00,50,000
Administration Costs (₹ 50,000 × 4)	2,00,000
Warranty: (1,00,000 units / 25 units × 5 parts × ₹10)	2,00,000
(1,00,000 units / 500 units × 1 visit × ₹ 500)	1,00,000
Total cost	2,40,75,000

Statement showing "Kent's Life Time Profit"

Particulars	Amount (₹) 80,000 units	Amount (₹) 100,000 units
Sales	(80,000 × ₹ 300) 2,40,00,000	(1,00,000 × ₹ 255) 2,55,00,000
Less : Total Cost	1,95,15,000	2,40,75,000
Profit	44,85,000	14,25,000

Decision: Reducing the, price by 15% will decrease profit by ₹ 30,60,000. Therefore, SRM Ltd. should not cut the price.

(b) Part 1:

Target Selling Price: ₹ 1000 less 20%	₹ 800
Less: Target Profit Margin (10% of ₹ 800)	₹ 80
Target Cost per unit	₹ 720

The breakup of the target cost per unit of ₹ 720 per unit is as follows:

Direct Materials		385
Direct Labour		50
Direct Machinery costs		60
Direct Manufacturing Costs		495
Add: Manufacturing Overheads:		
Ordering and receiving (21250 × ₹ 80)/200000	8.50	

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Testing and Inspection (30,00,000 × ₹.2)/200000	30.00	
Rework (13,000 × ₹ 100)/200000	6.50	45
Other Operating Costs:		
Research and Design	50	
Marketing and Customer Service	130	180
Full Product Costs		720

Part 2:

Target Product Profitability

Particulars	Per Unit (₹)	Total for 200000 units (₹)
1. Sales	800	16,00,00,000
2. Cost of Goods Sold:		
Direct Materials	385	7,70,00,000
Direct Labour	50	1,00,00,000
Direct Manufacturing Costs	60	1,20,00,000
	495	9,90,00,000
Manufacturing Overheads	45	90,00,000
	540	10,80,00,000
3. Gross Margin (1-2)	260	5,20,00,000
4. Operating Costs:		
Research and Design	50	1,00,00,000
Marketing and Customer Service	130	2,60,00,000
	180	3,60,00,000
5. Operating Profit (3 - 4)	80	1,60,00,000

5. (a) A manufacturing company currently operating at 80% capacity has received an export order from Middle East, which will utilise 40% of the capacity of the factory. The order has to be either taken in full and executed at 10% below the current domestic prices or rejected totally.

The current sales and cost data are given below:

Sales	₹ 16.00 lakhs
Direct Material	₹ 5.80 lakhs
Direct Labour	₹ 2.40 lakhs
Variable Overheads	₹ 0.60 lakhs
Fixed Overheads	₹ 5.20 lakhs

The following alternatives are available to the management:

- (I) Continue with domestic sales and reject the export order.
- (II) Accept the export order and allow the domestic market to starve to the extent of excess of demand.
- (III) Increase capacity so as to accept the export order and maintain the domestic demand by:
 - (i) Purchasing additional plant and increasing 10% capacity and thereby increasing fixed overheads by ₹ 65,000, and
 - (ii) Working overtime at one and half time the normal rate to meet balance of the required capacity.

Required:

Evaluate each of the above alternatives and suggest the best one.

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- (b) The following particulars are extracted from the records of Ajanta Works Limited:

Particulars	Product A	Product B
Selling price per unit	₹ 1,000.00	₹ 1,200.00
Consumption of Material	Kg. 20.00	Kg. 30.00
Material cost	₹ 100.00	₹ 150.00

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Direct wages	₹150.00	₹ 100.00
Direct expenses	₹ 50.00	₹ 60.00
Machine Hours used	3	2
Overhead Expenses:		
Fixed	₹ 50.00	₹ 100.00
Variable	₹ 150.00	₹ 200.00

Note: Direct wages per hour is ₹ 50.00

Required:

- (i) Comment on the profitability of each product (both use the same raw material) when:
- (I) Total sales potential in units is limited
 - (II) Total sales potential in value is limited
 - (III) Raw Material is in short supply, and
 - (IV) Production Capacity (in terms of Machine Hours) is the limiting factor.
- (ii) Assuming raw material as the key factor, availability of which is 10000 Kg., and maximum sales potential of each product being 3500 units, find out the product mix which will yield the maximum profit. 4+6=10

Answer:

5. (a)

	Present Sales 80%	40% - Foreign 60% - Domestic	40% - Foreign 80% - Domestic
1. Sales	16.00	(7.20+12.00)= 19.20	(7.20 + 16.00) = 23.20
2. Variable Cost			
Direct Material	5.80	7.25	8.70
Direct Labour	2.40	3.00	3.60
Variable Overheads	0.60	0.75	0.90
Overtime Premium	--	---	0.15
	8.80	11.00	13.35
3. Contribution	7.20	8.20	9.85
4. Fixed Cost	5.20	5.20	(5.20 + 0.65) = 5.85
5. Profit	2.00	3.00	4.00

As per the above calculations, it is evident that the profit is maximum in Alternative III i.e., accepting the foreign order fully and monitoring the present domestic sales. It is the best alternative to be pursued by the management.

(b) Marginal Cost Statement of Ajanta Works Limited

Particulars	Cost Per Unit (₹)	
	A	B
Selling Price	1000	1200
Direct Materials	100	150
Direct Wages	150	100
Direct Expenses	50	60
Variable Overheads	150	200
Marginal Cost	450	510
Contribution Margin	550	690
P/V Ratio	55%	57.50%
Contribution per Kg of material	27.5	23.0
Contribution per Machine Hour	183	345

Suggested Answer_Syllabus 2016_Jun2017_Paper 15

- (i) The comments based on the above statement are as follows:
- I. When total sales potential in units is a limiting factor, Product B is more profitable, as it is making a larger contribution margin per unit as compared to A.
 - II. When total sales potential in value is a limiting factor, Product B is still more profitable, as its P/V ratio is more than that of A.
 - III. When Raw Material is in short supply, A is more profitable as its contribution in per kg, of material is more than that of Product B.
 - IV. When production capacity is limited, B is more profitable as it makes larger contribution per machine hour than A.
- (Note: Best position is reached when contribution per unit of key factor is maximum.)
- (ii) Contribution per kg. of materials of A is more than that of B. So, 10,000 kg. ÷ 20 kg.
= 500 units of A will only be produced and sold.

6. (a) Nikee Ltd. manufactures and sells one variety of sports-shirt in India. Noted football clubs and supporters of these clubs are the main customers. Nikee's products show some rectifiable defects. These problems can generally be detected and repaired during internal inspection at a cost of ₹ 15 per unit.

During 2016, 50000 shirts were produced and sold. After inspection defect was detected in respect of 5% of output. Inspection cost is ₹25 per shirt. After sales, customers reported defects in respect of 6% of output. These shirts were received back from customers at a transportation cost of ₹8 per unit. Because of negative publicity due to defects, there would be loss of sales in 2017 to the extent of 5% of external failures.

Required:

- (i) Analyse costs of quality showing separately (with workings) the:
- (I) Inspection or appraisal cost
 - (II) Internal failure cost
 - (III) External failure cost
 - (IV) Opportunity cost due to external failure, and
 - (V) Total costs of quality
- (ii) If the selling price per shirt is ₹250 and variable cost is 60% of sales, fixed cost ₹5,50,000 p.a., prepare a statement showing profitability of the product during 2016. 6+2=8

- (b) You are given the following estimates for next year's budgeted sales and costs of single product produced by Bee Ltd.:

Selling Price	*12	
Sales demand:	Units	Probability
	3200	0.50
	4000	0.30
	5000	0.20
	₹	Probability
Variable cost per unit	5.00	0.3
	6.00	0.5
	7.00	0.2
Fixed cost for the period:	₹ 20,000	

Required:

- (i) Expected value of sales for the period.
- (ii) Expected variable cost and contribution for the period.
- (iii) Expected profit or loss for the budget period. 2+4+2=8

Answer:

6. (a)

Statement of Costs of Quality

		₹
(a)	Inspection or Appraisal Cost (₹ 25 × 50,000 shirts)	12,50,000
(b)	Internal failure (re-work) cost (5% × 50,000 × ₹ 15)	37,500

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(c)	External failure cost (i.e., transportation + re-work cost) [6% × 50,000 × (₹ 8 + 15)]	39,000
(d)	Opportunity cost (i.e., loss of contribution) [10% × (5% × 50,000) × (₹ 250 × 40%)]	25,000
	Total Quality Cost	13,51,500

Profitability statement

	₹
Sales (50,000 × ₹ 250)	1,25,00,000
Less: Variable Cost (60%)	75,00,000
Contribution	50,00,000
Less: Quality Cost (as above)	13,51,500
Contribution, net of quality costs	36,48,500
Less: Fixed Cost	10,00,000
Net Profit	26,48,500

(b)

(1)	Expected Value of Sales:		
	Expected Sales × Profitability		
	3,200 × 0.5 = 1,600		
	4,000 × 0.3 = 1,200		
	5,000 × 0.2 = 1,000	3,800 @ ₹ 12	45,600
(2)	Expected Variable Cost:		
	Unit Variable costs × Profitability		
	₹ 0.5 × 0.3 = 1.5		
	₹ 0.6 × 0.5 = 3.0		
	₹ 0.7 × 0.2 = 1.4	5.9 × 3,800	22,420
	Expected Contribution		23,180
(3)	Expected Profit:		
	Expected Contribution		23,180
	(-) Fixed Cost		20,000
	Expected Profit	₹	3,180

7. (a) XYZ Auto-manufacturing company has to prepare a design of its latest model of motorcycle. The various activities to be performed to prepare a design are as follows:

Activity	Description of activity	Preceding activity
A	Prepare drawing	-
B	Carry out cost analysis	A
C	Carry out financial analysis	A
D	Manufacture tools	C
E	Prepare bill of material	B,C
F	Receive material	D,E
G	Order sub-accessories	E
H	Receive sub-accessories	G
I	Manufacture components	F
J	Final assembly	I,H
K	Testing and shipment	J

Prepare an appropriate network diagram.

8

(b) In a processing industry two products A and B are made involving two operations. The production of B also results in a by-product C. The product A can be sold at a profit of ₹ 3 per unit and B at a profit of ₹ 8 per unit. The by-product C has a profit of ₹ 2 per unit. Forecast shows that upto 5 units of C can be sold. The company gets 3 units of C for each

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unit of B produced. The manufacturing times are 3 hours per unit for A on each of the operation one and two and 4 hours and 5 hours per unit for B on operation one and two, respectively. Because the product C results from producing B, no time is used in producing C. The available times are 18 hours and 21 hours of operation one and two respectively. The company desires to know how much of A and B should be produced keeping C in mind to make the highest profit.

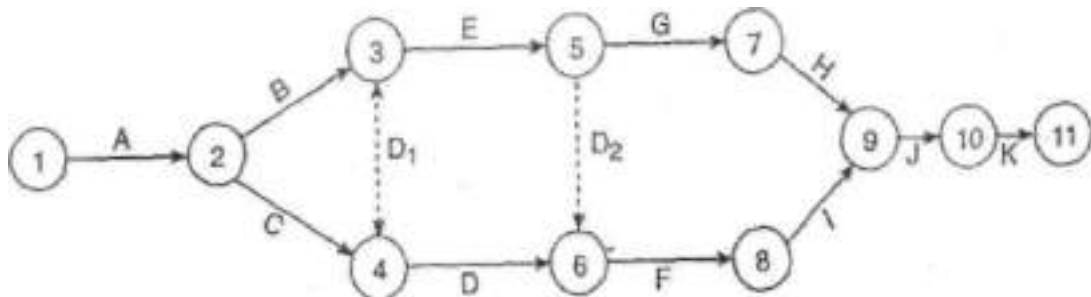
Required:

Formulate LP model for this problem.

8

Answer:

7. (a) The network diagram will be as follows:



(b) Let X_1 , X_2 , X_3 be the number of units produced of products A, B and C respectively.

Objective function:

Then the profit gained by the industry is given by

$$Z = 3x_1 + 8x_2 + 2x_3$$

Here it is assumed that all the units of products A and B are sold.

Condition-1:

In first operation, A takes 3 hrs of manufacturer's time and B takes 4 hrs of manufacturer's time. Therefore, total number of hours required in first operation becomes - $3x_1 + 4x_2$

In second operation, per unit of A takes 3 hrs of manufacturer's time and per unit B takes 5 hrs of manufacturer's time. Therefore, the total number of hours used in second operation becomes - $3x_1 + 5x_2$

Since there are 18 hours available in first operation and 21 hours in second operation, the restrictions become

$$3x_1 + 4x_2 \leq 18$$

$$3x_1 + 5x_2 \leq 21$$

Condition-2:

Since the maximum number of units of C that can be sold is 5, therefore,

$$X_3 \leq 5$$

Condition-3:

Further, the company gets three units of by product C for every unit of product B produced, therefore,

$$X_3 = 3X_2$$

Now, the allocation problem of the industry can be finally put in the following linear programming problem:

Maximise

$$Z = 3x_1 + 8x_2 + 2x_3$$

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Subject to the Constraints

$$3x_1 + 4x_2 \leq 18$$

$$3x_1 + 5x_2 \leq 21$$

$$x_3 \leq 5$$

$$x_3 = 3x_2$$

$$x_1, x_2, x_3 \geq 0$$

8. Write short notes on any four of the following:

4x4= 16

- (a) Variants of Backflush Accounting
- (b) Transfer Pricing
- (c) Principles of Total Quality Management (TQM)
- (d) Learning Curve Theory
- (e) Simulation Technique

Answer:

8. (a) There are a number of variants of the Backflush system, each differing as to the 'trigger points' at which costs are recognized within the cost accounts and thus associated with products. Variant-1-This has two trigger points (TP): TP 1 - purchase of raw materials/components. A 'raw and in process (RIP)' account will be debited with the actual cost of materials purchased, and creditors credited. TP 2 - completion of good units. The finished goods (FG) account will be debited with the standard cost of unit produced and the RIP and CC account will be credited with the standard cost. Variant-2- This has only one trigger points - the completion of good units. The FG account is debited with the standard cost of units produced, with corresponding credits to the CC account and the creditors account.

(b) **Transfer Pricing:**

A transfer price is the price of one segment(sub unit, department, division etc.,) of an organization charges for a product or services supplied to another segment of the same organization. Transfer prices are used when individual entities of a larger multi-entity firm are treated and measured as separately run entities.

The benefits of Transfer Pricing Policy are as under:

- (i) Divisional performance evaluation is made easier.
- (ii) It will develop healthy inter-divisional competitive spirit.
- (iii) Management by exception is possible.
- (iv) It helps in co-ordination of divisional objectives in achieving organizational goals.
- (v) It provides useful information to the top management in making policy decisions like expansion, sub-contracting, closing down of a division, make or buy decisions, etc.
- (vi) Transfer Price will act as a check on supplier's prices.
- (vii) It fosters economic entity and free enterprise system.
- (viii) It optimizes the allocation of company's financial resources based on the relative performance of various profit centres, which in turn, are influenced by transfer pricing policies.

(c) Principles of Total Quality Management (TQM):

The philosophy of TQM rest on the following principles, which are enlisted below:

- (i) Clear exposition of the benefits of a project.
- (ii) Total Employee Involvement (TEI).
- (iii) Process measurement.
- (iv) Involvement of all customers and contributors.
- (v) Elimination of irrelevant data.
- (vi) Understanding the needs of the whole process.
- (vii) Use of errors to prompt continuous improvement.
- (viii) Use of statistics to tell people how well they are doing.

(d) **Learning Curve Theory:**

Learning Curve Theory is concerned with the idea that when a new job, process or activity commences for the first time, it is likely that the workforce involved will not achieve maximum efficiency immediately. Repetition of the task is likely to make the people more confident and knowledgeable and will eventually result in a more efficient and rapid operation. Eventually the learning process will stop after continually repeating the job. As a consequence the time to complete a task will initially decline and then stabilize once efficient working is achieved. The cumulative average time per unit is assumed to decrease by a constant percentage every time that output doubles. Cumulative average time refers to the average time per unit for all units produced so far, from and including the first one made.

Learning is the process by which an individual acquires skill, knowledge and ability. When a new product or process is started, the performance of a worker is not at its best and a learning phenomenon takes place. As the experience is gained, the performance of a worker improves, time taken per unit of activity reduces and his productivity goes up. This improvement in productivity of a worker is due to learning effect. Cost predictions especially those relating to direct labour cost must allow for the effect of learning process. This technique is a mathematical technique. It can be very much used to accurately and graphically predict cost.

Learning Curve is essentially a measure of the experience gained in production of an article by an individual or organization. As more units are produced, people involved in production become more efficient than before. Each subsequent unit takes fewer man-hours to produce. The amount of improvement will differ with each type of article produced. This improvement or experience gain is reflected in a decrease in man-hours or cost.

The learning curve ratio can be calculated with the help of the following formula:
Learning Curve ratio = Average cost of first 2 units/Average labour cost of first unit.

(e) **Simulation:**

Simulation is a modelling and analysis tool that is widely used for the purpose of designing, planning and control of manufacturing systems. Simulation in general is to pretend that one deals with a real thing while really working with an imitation. In Operations Research, the imitation is a computer model of the simulated reality. The task of executing simulations provides insight and a deep understanding of physical processes that are being modelled.

Simulation is generally referred to as computer simulation, which simulates the operation of a manufacturing system. A computer simulation or a computer model is a computer program, which attempts to simulate an abstract model of a particular system.

A simple example of a simulation involves the tossing of a ball into the air. The ball can be said to "simulate" a missile, for instance. That is, by experimenting with throwing balls starting at different initial heights and initial velocity vectors, it can be said that we are simulating the trajectory of a missile.

Monte Carlo method of simulation is the most popular method of simulation. In Linear Programming, Simulation is called as the 'technique of last resort'. It means, when all other methods fail, we resort to Simulation as the last resort.

FINAL EXAMINATION

GROUP - III

(SYLLABUS 2016)

SUGGESTED ANSWERS TO QUESTIONS

DECEMBER - 2017

Paper-15: STRATEGIC COST MANAGEMENT-DECISION MAKING

Time Allowed : 3 Hours

Full Marks : 100

The figures in the margin on the right side indicate full marks.

Answer Question No. 1 in Section A, which is compulsory, carrying 20 marks.

Further, answer any 5 (five) Question from Section B, each carrying 16 marks.

Section – A

(20 Marks)

1. Choose the most appropriate answer to the following questions giving justification. Each question carries 2 (two) marks. 2×10=20
- (i) The following figures are extracted from the books of a company:
Budgeted O/H ₹ 10,000 (Fixed ₹ 6,000, Variable ₹ 4,000)
Budgeted Hours 2000
Actual O/H ₹ 10,400 (Fixed ₹ 6,100, Variable ₹ 4,300)
Actual Hours 2100
Variable O/H cost variance and Fixed O/H cost variance will be:
- (a) 100 (A) and 200 (A)
(b) 100 (F) and 200 (F)
(c) 100 (A) and 200 (F)
(d) 200 (A) and 100 (F)
- (ii) A company produces a product which is sold at a price of ₹ 80. Its Variable cost is ₹ 32. The company's Fixed cost is ₹11,52,000 p.a. The company operates at a margin of safety of 40%. The total sales of the company is:
- (a) 4,000 units
(b) 40,000 units
(c) 30,000 units
(d) 20,000 units
- (iii) The P/V ratio of a firm dealing in Electrical equipment is 50% and the margin of safety is 40%. BEP of the firm at a sales volume of ₹ 50,00,000 will be
- (a) ₹ 25,00,000

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- (b) ₹ 35,00,000
- (a) ₹ 30,00,000
- (b) ₹ 36,00,000
- (iv) ABC Limited has current PBIT of ₹19.20 lakhs on total assets of ₹96 lakhs. The company has decided to increase assets by ₹24 lakhs, which is expected to increase the operating profit before depreciation by ₹8.40 lakhs. There will be a net increase in depreciation by ₹4.80 lakhs. This will result in ROI
- (a) to increase by 1%
- (b) to decrease by 1%
- (c) to decrease by 1-5%
- (d) to remain the same
- (v) For a Learning Curve percentage of 72%, the time to be taken to complete the 4th unit of a 12-unit job involved in the assembly line, if the initial unit requires 80 hours, will be
- (a) 43.50 hrs
- (b) 41.47 hrs
- (c) 46.71 hrs
- (d) 40.95 hrs
- (vi) Marketing department of an organisation estimates that 40,000 of new mixers could be sold annually at a price of ₹60 each. To design, develop and produce these new mixers an investment of ₹40,00,000 would be required. The company desires a 15% return on investment (ROI). Given these data, the target cost to manufacture, sell, distribute and service one mixer will be
- (a) ₹ 37.50
- (b) ₹ 40.00
- (a) ₹ 45.00
- (c) ₹ 48.60
- (vii) When you wait until the manufacture of a product has been completed and then record all of the related issuances of inventory from stock that were required to create the product, it is called
- (a) Forensic Accounting
- (b) Back-flush Accounting
- (c) Tax Accounting
- (d) Lean Accounting
- (vii) Match the following:

(A)	Dr. Deming believes	(1)	Common causes
(B)	Ishikawa development	(2)	To prevent defect
(C)	Type of variation is due to	(3)	Cause & effect diagram
(D)	Crosby's objective of quality	(4)	Histogram

The correct order is

- (a) A-3, B-2, C-1, D-4

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(b) A-2, B-3, C-4, D-1

(c) A-2, B-3, C-1, D-4

(d) A-4, B-3, C-1, D-2

- (ix) Sab Ltd. fixes the inter-divisional transfer prices for its products on the basis of cost plus a return on investment in the division. The budget for division X for 2016-17 appears as under:

	₹
Fixed Assets	5,00,000
Current Assets	3,00,000
Debtors	2,00,000
Annual Fixed cost of the Division	8,00,000
Variable cost per unit of product	10
Budgeted Volume	400000 units per year
Desired R.O.I.	28%

Transfer price for division X is

(a) ₹ 12.70

(b) ₹ 10.70

(c) ₹ 8.70

(d) ₹ 14.70

- (x) A company uses traditional standard costing system. The inspection and set-up costs are actually ₹ 1,760 against a budget of ₹ 2,000. ABC system is being implemented and accordingly the number of batches is identified as the cost driver for inspection and set up. The budgeted production is 10,000 units in batches of 1,000 units whereas actually 9,000 units were produced in 11 batches. The cost per batch under ABC system will be

(a) ₹ 160

(b) ₹ 200

(c) ₹ 180

(d) ₹ 220

Answer:

1.

- (i) (c) Variable O/H Cost variance = Recovered O/H - Actual O/H

$$= 4200 - 4300 = 100(A)$$

$$\text{Fixed O/H Cost variance} = 6300 - 6100 = 200 (F).$$

- (ii) (b) SP 80 – VC 32 = Contribution 48

$$\text{F.C. } 11,52,000$$

$$\text{B.E.P.} = 11,52,000/48 = 24,000 \text{ units}$$

$$\text{MOS} = 40\%; \text{ B.E.P.} = 60\%$$

SUGGESTED ANSWERS TO QUESTIONS_SYL2016_DEC2017_PAPER-15

$$\therefore \text{Total sales} = \frac{24,000 \times 100}{60} = 40,000 \text{ units.}$$

- (iii) (c) Actual Sales - M.O.S. = BEP Sales
Sales = ₹ 50,00,000
Less: Margin of safety 40% on sales = ₹ 20,00,000
Break even sales = ₹ 30,00,000

(iv) (b)	Before installing new assets	After installing new assets
PBIT	₹ 19.20 lakhs	= ₹ 19.20 lakhs + (₹ 8.40 lakhs - ₹ 4.80 lakhs) = ₹ 22.80 lakhs
Value of Assets	₹ 96.00 lakhs	₹ 96.00 lakhs + ₹ 24.00 lakhs = ₹ 120.00 lakhs
ROT	= 20%	= 19%

Conclusion: There will be a decrease of 1% in ROI under the proposed dispensation.

- (v) (b) At 72% Learning Curve,

$$T-4 - \text{Time taken by the 4}^{\text{th}} \text{ Unit} = 80 (.72)(.72) = 41.47 \text{ hrs.}$$

Note: In the arithmetic method followed above, every time the number the number of repetitions doubles, the time to perform the activity is reduced by the Learning Curve Coefficient.

- (vi) (c) Projected sales (40,000 mixers X ₹60 per mixer) (A) = ₹ 24,00,000
Less desired profit (15% of ₹ 40,00,000) (B) = ₹ 6,00,000
Target Cost for 40,000 mixers (A - B) = ₹ 18,00,000
Target cost per mixer (₹ 18,00,000 / 40,000 mixer) = ₹ 45.00 per unit

- (vii) (b) Back-flush Accounting

- (viii) (c) A-2, B-3, C-1, D-4

- (ix) (a) VC ₹ 10; FC per unit = ₹ 8,00,000 ÷ 4,00,000 = ₹ 2
Total Cost = 10 + 2 = ₹ 12
Required Return = $\frac{₹ 10,00,000 \times 28\%}{4,00,000} = 0.70$
 $\therefore \text{T.P. } ₹ 12 + 0.70 = ₹ 12.70$

SUGGESTED_ANSWERS TO QUESTIONS_SYL2016_DEC2017_PAPER-15

- (x) (b) Number of batches under ABC = $9000 \div 1000 = 9$
Std. Cost under ABC = Budg Cost / Batch \times ABC number of batches
= ₹ 200 \times 9 = ₹ 1800
- | | |
|-------------------|------------|
| Production | 9000 Units |
| Number of batches | 9 |
| Cost /Batch | ₹ 200 |

Section-B

Answer any five questions.

Each Question carries 16 Marks.

16 \times 3=80

2. (a) What do you understand by 'quality' in the context of Quality Cost Management? Explain. 8
- (b) Why would you classify costs of quality into different groups? Enumerate them and give suitable examples where possible. 4+4=8

Answer:

2. (a) Quality is defined (by the American Society) as the total features and characteristics of a product or service made or rendered according to specifications to satisfy customers at the time of purchase and during use. There are two basic aspects of quality: (a) design quality, and (b) conformance quality. Quality of product or service is decided by the customer and is built into the service on product through the design for it. A customer has certain needs or requirements for product or service. It is the design of product or service which builds these requirements as product or service specifications into the product or service—including the way the product or service would be delivered to the customer. The way the product is made or the service is delivered is according to a set of processes which are in sequence. This set of processes, their sequence and interdependence gets defined while the design activity is performed and the design of process has a direct impact on the outcome, that is, the extent to which the outcome meets the specifications developed during design. Process design also contributes to quality. Conformance to specifications measures how well the product or service meets the targets and tolerances determined by its designers. For example, the dimensions of a machine part may be specified by its design engineers as 3 + .05 inches. This would mean that the target dimension is 3 inches but the dimensions can vary between 2.95 and 3.05 inches. Similarly, the wait for hotel room service may be specified as 20 minutes, but there may be an acceptable delay of an additional 10 minutes. Also, consider the amount of light delivered by a 60 watt light bulb. If the bulb delivers 50 watts it does not conform to specifications. As these examples illustrate, conformance to specification is directly measurable, though it may not be directly related to the consumer's idea of quality.

Thus, actual performance (quality) of a product or service may fall short of customer expectation either due to design quality failure and/or due to conformance quality failure.

Quality has both financial and non-financial perspectives. Financially, it, represents costs of quality where as non-financial measures are the number of customer complaints, defectives to good production (%), employee empowerment and training, etc. Quality affects all aspects of the organization and has dramatic cost implications. The most obvious consequence occurs when poor quality creates dissatisfied customers and eventually leads to loss of business. However, quality has many other costs, which can be divided into two categories. The first category consists of costs necessary for achieving high quality, which are called quality control costs. These are of two types: prevention costs and appraisal costs. The second category consists of the cost consequences of poor quality, which are called quality failure costs. These include external failure costs and internal failure costs. The first two costs are incurred in the hope of preventing the second two.

- (b) Costs of quality can be classified into the following groups for better quality costs management: (1) Prevention costs, (2) Appraisal costs, (3) Internal failure costs, (4) External failure costs, (5) opportunity costs (e.g. loss of contribution).

Prevention costs are all costs incurred in the process of preventing poor quality from occurring. They include quality planning costs, such as the costs of developing and implementing a quality plan. Also included are the costs of product and process design, from collecting customer information to designing processes that achieve conformance to specifications. Example; Quality training, Quality circles, Statistical process control activities, System Development for prevention, Quality improvement.

Appraisal costs are incurred in the process of uncovering defects. They include the cost of quality inspections, product testing, and performing audits to make sure that quality standards are being met. Also included in this category are the costs of worker time spent measuring quality and the cost of equipment used for quality appraisal. Example:-testing and inspecting materials, final product testing and inspecting, WIP testing and inspecting, package inspection and depreciation of testing equipment.

Internal failure costs are associated with discovering poor product quality before the product reaches the customer site. One type of internal failure cost is rework, which is the cost of correcting the defective item. Sometimes the item is so defective that it cannot be corrected and must be thrown away. This is called scrap, and its costs include all the material, labor, and machine cost spent in producing the defective product. Example: - cost of scrap (net of realization), cost of spoilage, cost of rework, down time due to defect in quality and retesting.

External failure Costs are incurred when inferior products are delivered to customers. They include cost of handling customer complaints, warranty replacements, repairs of returned products and cost arising from a damaged company reputation. Example: - cost of field servicing, cost of handling complaints, warranty repairs, lost sales, warranty replacements.

For better management, quality costs may be classified into direct (e.g. employees and inspectors involved in defect rectification) and indirect costs (indirect costs are incurred in each of the costs-of-quality activities).

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3. (a) The Stock Control Policy of Vidhata Co. is that each stock is ordered twice a year, the quantum of each order being one-half of the year's forecast demand. The Materials Manager, however, wishes to introduce a policy in which for each item of stock, Re-order Levels and EOQ are calculated. For one of the items X, the following information are available:

Forecast Annual Demand	3,600 units
Cost per unit	₹ 100
Cost of Placing an order	₹ 40
Stockholding Cost	20% of the average stock value
Buffer Stock to cover fluctuations in demand	100 Nos.

Required:

If the new policy is adopted, calculate for stock item X,

- Re-order Level that would be set by the Materials Manager.
- Anticipated reduction in value of the average stock investment.
- Anticipated reduction in total inventory costs in the first and subsequent years.

$$2+3+(3+2)=10$$

- (b) The management of W Ltd., which is now operating at 50% capacity, expects that the volume of sales will drop below the present level of 5,000 units per month. The operating statement prepared for monthly sales shows:

	₹	₹
Sales (5,000 units at ₹ 3 per unit)		15,000
Less: Variable Costs at ₹ 2 per unit	10,000	
Fixed Overheads	<u>5,000</u>	<u>15,000</u>
Net Profit		Nil

It is proposed that the company should suspend production until market conditions improve. The General Manager estimated that a minimum of fixed cost (shut down costs) amounting to ₹ 2,000 would be necessary in any event.

Required:

- Advise Management at what level of sales it could think of suspending production.
- If the sales price is ₹2.80, what should be the level of sales for shut down decision?

$$3+3=6$$

Answer:

3. (a)

- Reorder Level = Safety Stock + Lead Time Consumption = 100 units (given) + (3,600 units ÷ 12 months) = 100 + 300 = 400 units.
- Economic Order Quantity - Square Root of (2AB ÷ C) where
A = Annual Requirement of Raw Materials = 3,600 units,

SUGGESTED ANSWERS TO QUESTIONS_SYL2016_DEC2017_PAPER-15

B = Buying or Ordering Cost per order = ₹ 40

C = Carrying or Stockholding Cost p.u per annum = ₹ 100 × 20% = ₹ 20

On substitution, EOQ = 120 units

Average Stock Quantity under Old Policy = (1,800 units ÷ 2) = 900 units

Average Stock Quantity under EOQ = Safety Stock + (120 units ÷ 2) = 100 units + 60 units = 160 units

Reduction in the value of the Average Stock Investment = (900 - 160) × ₹ 100 = ₹ 74,000.

iii. Cost Comparison of Old Policy and EOQ

Particulars	Old Policy	EOQ
Quantity ordered every time	1,800 units	120 units
Number of orders per annum	2 orders	30 orders
Buying Cost at ₹ 40 per order	2 × ₹ 40 = ₹ 80	30 × ₹ 40 = ₹ 1,200
Average Inventory = ½ x Quantity	900 units	160 units (iucl. Safety Stock)
Carrying Cost at ₹ 20 per unit	900 × ₹ 20 = ₹ 18,000	160 × ₹ 20 = ₹ 3,200
Total Associated Cost	₹ 18,080	₹ 4,400

Savings in Cost per annum due to EOQ Policy = ₹ 18,080 - ₹ 4,400 = ₹ 13,680

However, for the first year, the Company has to specifically purchase the safety stock also, in addition to the annual consumption requirements. This will be at a cost of ₹ 100 × 100 units = ₹ 10,000. Hence, savings in the first year will be ₹ 13,680 - ₹ 10,000 = ₹ 3,680.

3. (b)

(i) If selling price is ₹ 3 per unit

$$\text{Shutdown Point} = \frac{\text{F. Cost} - \text{Shut down cost}}{\text{Contribution pu.}} \times \text{SP}$$

$$= \frac{5000 - 2000}{(\text{₹ } 3 - \text{₹ } 2)} \times \text{₹ } 3$$

$$= 3000 \times 3 = \text{₹ } 9,000$$

or, 3000 units

Verification of the above is as under:

	₹
Sales 3,000 units @ ₹ 3	9,000
Less: Variable Cost 3,000 units @ ₹ 2	<u>6,000</u>
Contribution	3,000
Less: Fixed Cost	<u>5,000</u>
Operating Loss	<u>2,000</u>
Operating Loss = Loss at Shutdown Point	

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- (ii) If selling price is reduced to ₹ 2.80

$$\left(\frac{5000 - 2000}{2.80 - 2.00} \right) \times ₹ 2.80$$

$$= ₹ 10,500$$

or 3,750 units

4. (a) The following data are obtained from the records of a company:

	Year 1 (₹)	Year 2 (₹)
Sales	80,000	1,00,000
Profit	10,000	15,000

Required:

- (i) Calculate Break-even Point
(ii) Profit or Loss when sales amount to ₹ 60,000, and
(iii) Required sales for level of profit of ₹ 20,000.

4+2+2=8

- (b) Your company wants to buy one machine. Two alternative models are available — A and B. The following information are available with respect to them:

	Model A	Model B
Output p.a.	10,000	10,000
Fixed costs p.a. (₹)	30,000	16,000
Profit at 100% capacity (₹)	30,000	24,000

Both the machines will produce identical products. The annual market demand for the product is 10,000 units @ ₹ 10 per unit.

Required:

- (i) The level of sales at which both are equally profitable;
(ii) The range of sales at which one is more profitable than the other.

4+4=8

Answer:

4. (a)

$$P/V \text{ ratio} = \frac{\text{Change in profit}}{\text{Change in sales}} = \frac{5,000}{20,000} = \frac{1}{4} \text{th or } 25\%$$

$$C = F + P$$

$$\text{or, } F = C - P = 25\% \text{ of } 8,000 - 10,000$$

$$= ₹ 10,000$$

$$[\text{or, } 25\% \text{ of } 1,00,000 - 15,000 = ₹ 10,000]$$

$$(i) \therefore \text{BEP} = \frac{FC}{P/V \text{ ratio}} = \frac{₹ 10,000}{.25} = ₹ 40,000$$

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(ii) $S = ₹ 60,000$

$$P = C - F = 25\% \text{ of } 60,000 - 10,000 = ₹ 5,000$$

(iii) Required Sales for (P) = ₹ 20,000

$$C = F + P = ₹ 10,000 + 20,000 = ₹ 30,000$$

$$\therefore \text{Required Sales} = \frac{₹ 30,000}{.25} = ₹ 1,20,000$$

(b)

$$[C = F + P]$$

	A ₹	B ₹
Sales @ ₹ 10	1,00,000	1,00,000
Contribution	60,000	40,000
P/V ratio	60%	40%
Contribution/unit	6	4
Variable cost/unit	4	6
BEP	5,000 units	4,000 units

(i) For A : $4x + 30,000$

$$B : 6x + 16,000$$

$$\therefore 4x + 30,000 = 6x + 16,000 ; \text{ Solving } X = 7,000 \text{ units}$$

(ii) At 7,000 units both are equally profitable. BEP of A and B being 5,000 units and 4,000 units, Machine B is more profitable below 7,000 units, and A will be more profitable above 7,000 units.

A : Range of production 7,000 to 10,000 units

B : Range of production 4,000 to 6,999 units

5. (a) Zip Ltd. manufactures three products. The material cost, selling price and bottleneck resource details per unit are as follows:

Particulars	Product T	Product C	Product S
Selling Price (₹)	66	75	90
Material and other variable cost (₹)	24	30	40
Bottleneck resource time (minutes)	15	15	20

Budgeted factory costs for the period are ₹ 4,43,200. The bottleneck resource time available is 1,50,240 minutes per period.

Required:

(i) Company adopted throughput accounting and products are ranked according to 'product return per minute'.

Select the highest rank product.

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(ii) Calculate throughput accounting ratio and comment on it. 3+3=6

- (b) Force Ltd. is a manufacturer of a fire fighting equipment which consists of five components three of which are made using general purpose machines and two by manual labour. The data for the manufacture of the equipment are as follows:

Components	F	O	R	C	E	Total
Machine hours required per unit	20	28	24			72 hrs
Labour hours required per unit				2	1	3 hrs
Variable cost per unit ₹	64	108	116	24	8	320
Fixed cost per unit (apportioned) ₹	96	204	232	48	72	632
Total component cost ₹	160	312	348	72	60	952
Assembly cost/unit (all variable) ₹						80
Selling price/unit ₹						1,200

The marketing department of the company anticipates 50% increase in demand during the next period. General purpose machinery used to manufacture. F, O and R are already working to the maximum capacity of 9,504 hours and there is no possibility of increasing this capacity during the next period. But labour is available for making components C and E and also for assembly according to demand. The management is considering the purchase of one of the components F, O or R from the market to meet the increase in demand. These components are available in the market at the following prices:

Component F : ₹ 160

Component O : ₹ 320

Component R : ₹ 250

Required:

- (i) Profit made by the company from current operations.
- (ii) If the company buys any one of the components F, O or R, what is the extent of additional capacity that can be created?
- (iii) Assuming 50% increase in demand during the next period, which component should the company buy from the market?
- (iv) The increase in profit, if any, if the component suggested in (iii) is purchased from the market. 2+3+2+3=10

5. (a) (i) Calculation of Rank according to product return per minute.

Particulars	T	C	S
Selling price	66	75	90
Less : Variable Cost	24	30	40
Throughput contribution (a)	42	45	50
Minutes per unit (b)	15	15	20
Contribution per minute (a) ÷ (b)	2.8	3	2.5
Ranking	II	I	III

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(ii) Calculation of Throughput Accounting ratio:

Particulars	T	C	S
Factory cost per minute (₹ 2,21,600/75,120 minutes) (₹)	2.95	2.95	2.95
TA Ratio (Contribution per minute/Cost per minute)	0.95	1.02	0.85
Ranking based on TA ratio	II	I	III

Analysis - Product C yields more contribution compared to average factory contribution per minute, whereas T and S yield less.

(b) (i) Statement showing profit at current operations :

		₹
SP		1200
Variable Cost	320+80	400
Contribution		800
Number of units	9504/72	Units 132
Total contribution		1,05,600
Fixed Cost		83,424
Profit		22,176

(ii)

	F	O	R
	₹	₹	₹
Buying cost	160	320	250
Variable Cost	64	108	116
Extra buying cost	96	212	134
Excess buying cost per hour	4.8	7.571	5.583

It is better to buy component F from the market because excess buying cost per machine hour is less. Computation of additional capacity created if components are bought from outside:

If F is bought:

Number of units that can be manufactured (9504/52)	182.76 units
Increase in capacity (182.76 - 132/132 x 100)	38.46%
If O is bought:	
Number of units (9504/44)	216
Increase in capacity (216 - 132 / 132 x 100)	63.64%
If R is bought:	
Number of units 9504/48	198
Increase in capacity (198 - 132 /132 x 100)	50%

(iii) F is cheaper to buy. But the increase in capacity will not be sufficient to meet the expected demand for next year. Therefore, we shall try to buy the next cheaper component, i.e., R and by buying it the increase in capacity will be exactly equal to the demand for our product during the next year. Hence, component 'R' should be bought from the market.

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(iv) Statement showing computation of profit by buying R from outside :

(i) No. of units	(9504 / 48)	Units 198
(ii) Selling price		₹1200
(iii) Variable Cost	(400-116 + 250)	₹534
(iv) Contribution		₹666
(v) Total Contribution		₹131868
(vi) Fixed Cost		₹83424
(vii) Profit		₹48444
Less : Existing Profit		₹22176
Increase in profit		₹26268

6. (a) Wipro is examining the profitability and pricing policies of its Software Division. The Software Division develops Software Packages for Engineers. It has collected data on three of its more recent packages — (i) ECE Package for Electronics and Communication Engineers, (ii) CE Package for Computer Engineers, and (iii) IE Package for Industrial Engineers.

Summary details on each package over their two-year cradle to grave product lives are:

Package	Selling Price	Number of units sold	
		Year 1	Year 2
ECE	₹ 250	2,000	8,000
CE	₹ 300	2,000	3,000
IE	₹ 200	5,000	3,000

Assume that no inventory remains on hand at the end of year 2. Wipro is deciding which product lines to emphasize in its software division. In the past two years, the profitability of this division has been mediocre.

Wipro is particularly concerned with the increase in R & D costs in several of its divisions. An analyst at the Software Division pointed out that for one of its most recent packages (IE), major efforts had been made to reduce R&D costs. Last week, Amit, the Software Division Manager, decides to use Life Cycle Costing in his own division. He collects the following Life Cycle Revenue and Cost information for the packages (in ₹):

Particulars	Package ECE		Package CE		Package IE	
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
Revenues	5,00,000	20,00,000	6,00,000	9,00,000	10,00,000	6,00,000
Costs:						
R&D	7,00,000	—	4,50,000	—	2,40,000	—
Design of Product	1,15,000	85,000	1,05,000	15,000	76,000	20,000
Manufacturing	25,000	2,75,000	1,10,000	1,00,000	1,65,000	43,000
Marketing	1,60,000	3,40,000	1,50,000	1,20,000	2,08,000	2,40,000
Distribution	15,000	60,000	24,000	36,000	60,000	36,000
Customer Service	50,000	3,25,000	45,000	1,05,000	2,20,000	3,88,000

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Required:

Prepare a Product Life Cycle Income Statement for each Software Package. Which package is most profitable and which is the least profitable? How do the three packages differ in their cost structure (the percentage of total costs in each category)? 6+2+2=10

- (b) A practicing Cost and Management Accountant now spends ₹ 0.90 per K.M. on taxi fares for his client's work. He is considering two other alternatives - the purchase of a new small car or an old bigger car.

Item	New Small Car	Old Bigger Car
	(₹)	(₹)
Purchase Price	35,000	20,000
Sale Price after 5 years	19,000	12,000
Repairs and servicing per annum	1,000	1,200
Taxes and insurance p.a.	1,700	700
Petrol consumption per litre (k.m.)	10	7
Petrol price per litre	3.5	3.5

He estimates that he will travel 10000 K.M. annually.

Required:

Which of the three alternatives will be cheaper? If his practice expands and he has to travel 19,000 K.M. per annum will the cost of the two cars break even and why? Ignore interest and Income tax. 6

Answer:

6. (a) Life Cycle Income Statement (in ₹ '000)

Particulars	Package ECE				Package CE				Package IE			
	Y1	Y2	Total	%	Y1	Y2	Total	%	Y1	Y2	Total	%
Revenues	500	2,000	2,500	100%	600	900	1,500	100%	1,000	600	1,600	100%
Costs												
R&D	700	-	700	28%	450	-	450	30%	240	-	240	15%
Design	115	85	200	8%	105	15	120	8%	76	20	96	6%
Manufacturing	25	275	300	12%	110	100	210	14%	165	43	208	13%
Marketing	160	340	500	20%	150	120	270	18%	208	240	448	28%
Distribution	15	60	75	3%	24	36	60	4%	60	36	96	6%
Cust. Service	50	325	375	15%	45	105	150	10%	220	388	608	38%
Total Costs	1065	1085	2150	86%	884	376	1260	84%	969	727	1696	106%
Profit			350	14%			240	16%			(96)	-6%

Observation: Package ECE is most profitable, while package IE is least profitable.

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(b) Statement showing computation of break-even point for three alternatives:

	Taxi (₹)	New smaller car (₹)	Old bigger car (₹)
Fixed Cost: Depreciation		16000/5 = 3200	8000/5 = 1600
Repairs		1000	1200
Taxes		1700	700
		5900	3500
Variable cost per KM	0.9	0.35	0.5
TOTAL COST PER 10000 KMS	9000	3500 + 5900 = 9400	5000 + 3500 = 8500
Cost per 19000 KMS	17100	12550	13000

(a) At 10000 KMS old bigger car is cheaper than the other two alternatives.

(b) At 19000 KMS it is better and cheaper to purchase the new smaller car.

Indifference point = (difference in fixed cost/difference in variable cost per unit)

$$= (2400/0.15) = 16000 \text{ kms}$$

7. (a) Draw a network from the following activities. Find the critical path and total duration of the project.

Activity	Immediate predecessor activity	Duration (days)
A	—	10
B	A	5
C	A	4
D	A	7
E	B,C	6
F	C,D	4
G	E,F	7

(b) A company produces products P, Q and R from three raw materials A, B and C. One unit of product P requires 2 units of A and 3 units of B. One unit of product Q requires 2 units of B and 5 units of C and one unit of product R requires 3 units of A, 2 units of B and 4 units of C. The company has 8 units of material A, 10 units of B and 15 units of C available to it. Profits per unit of product P, Q and R are ₹ 3, ₹ 5 and ₹ 4 respectively.

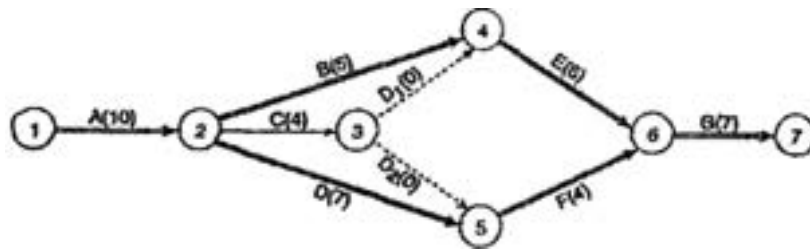
(i) Formulate the problem mathematically.

(ii) Write the Dual problem.

4+4=8

Answer:

7. (a) The network is drawn as follows :



Network Diagram

Various paths Duration of paths (days)

- (i) 1-2-4-6-7 $10 + 5 + 6 + 7 = 28$
- (ii) 1-2-3-4-6-7 $10 + 4 + 0 + 6 + 7 = 27$
- (iii) 1-2-3-5-6-7 $10 + 4 + 0 + 4 + 7 = 25$
- (iv) 1-2-5-6-7 $10 + 7 + 4 + 7 = 28$

Critical paths are 1-2-4-6-7 and 1-2-5-6-7 with duration of 28 days and are marked with double lines.

(b)

Raw Materials	P	Q	R	Available Units
A	2	-	3	8
B	3	2	2	10
C	-	5	4	15

Profits 3/- , 5/-, 4/-

Let x_1 be the number of units of P
 Let x_2 be the number of units of Q
 Let x_3 be the number of units of R

(i) **Formulation of the problem**

Objective function:
 $\text{Max } Z = 3x_1 + 5x_2 + 4x_3$
 Subject to constraints:
 $2x_1 + 3x_3 \leq 8$
 $3x_1 + 2x_2 + 2x_3 \leq 10$
 $5x_2 + 4x_3 \leq 15$
 $x_1, x_2, x_3 \geq 0.$

(ii) **Dual of the problem**

$\text{Min } C = 8y_1 + 10y_2 + 15y_3$
 Subject to constraints:
 $2y_1 + 3y_2 \geq 3$
 $3y_1 + 2y_2 + 4y_3 \geq 4$
 $5y_2 + 4y_3 \geq 5$
 $y_1, y_2, y_3 \geq 0.$

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8. Write short notes on any four of the following:

- (a) Usefulness of Pareto Analysis
- (b) Seven Principles of BRR
- (c) Four P's of TQM
- (d) Lean Accounting
- (e) Value Engineering

Answer:

8.

(a) **Pareto analysis is useful to:** 1. Prioritize problems, goals, and objectives to Identify root causes, 2. Select and define key quality improvement programs, 3. Select key customer relations and service programs, 4. Select key employee relations improvement programs, 5. Select and define key performance improvement programs, 6. Maximize research and product development time, 7. Verify operating procedures and manufacturing processes, 8. Product or services sales and distribution, 9. Allocate physical, financial and human resources.

(b) **Seven Principles of BPR:** 1. Processes should be designed to achieve a desired outcome rather than focusing on existing tasks, 2. Personnel who use the output from a process should perform the process, 3. Information processing should be included in the work, which produces the information, 4. Geographically dispersed resources should be treated, as if they are centralized, 5. Parallel activities should be linked rather than integrated, 6. Doers should be allowed to be self-managing, 7. Information should be captured once at source.

(c) **Four P's of TQM**

The 4P's	
People	To avoid misdirection, TQM teams should consist of team spirited individuals who have a flair for accepting and meeting challenges. Individuals who are not ideally suited to the participatory process of TQM. Should not be involved at all. e.g. lack of enthusiasm, non-attendance at TQM meetings, failure to complete delegated work, remaining a "Mute Spectator" at TQM meetings, etc.
Process	It is essential to approach problem-solving practically and to regard the formal process as a system designed to prevent participants from jumping to conclusions. As such, it will provide a means to facilitate the generation of alternatives while ensuring that important discussion stages are not omitted.
Problem	Problems need to be approached in a systematic manner, with teams tackling solvable problems with a direct economic impact, allowing for immediate feedback together with recognition of the

SUGGESTED_ANSWERS TO QUESTIONS_SYL2016_DEC2017_PAPER-15

	contribution made by individual participants.
Preparation	Additional training on creative thinking and statistical processes are needed in order to give participants a greater appreciation of the diversity of the process. This training must quickly be extended beyond the immediate accounting circle to include employees at supervisory levels and also who are involved at the data input stagey

(d) Lean Accounting is the general term used for the changes required to a company's accounting, control, measurement, and management processes to support lean manufacturing and lean thinking. Most companies embarking on lean manufacturing soon find that their accounting processes a management methods are at odds with the lean changes they are making. The reason for this is that traditional accounting and management methods were designed to support traditional manufacturing; they are based upon mass production thinking. Lean manufacturing breaks the rules of mass production, and so the traditional accounting and management methods are (at best) unsuitable and usually actively hostile to the lean changes the company is making.

(e) **Value Engineering** : Value engineering is an organized / systematic approach directed at analyzing the function of systems, equipment, facilities, services, and supplies for the purpose of achieving their essential functions at the lowest life-cycle cost consistent with required performance reliability, quality and safety. Society of Japanese Value Engineering defines VE as:

"A systematic approach to analyzing functional requirements of products or services for the purposes of achieving the essential functions at the lowest total cost".

Value Engineering is an effective problem solving technique. Value engineering is essentially a process which uses function analysis, team-work and creativity to improve value. Value Engineering is not just "good engineering". It is not a suggestion program and it is not routine project or plan review. It is not typical cost reduction in that it doesn't "cheaper" the product or service, nor does it "cut corners".

FINAL EXAMINATION

GROUP - III

(SYLLABUS 2016)

SUGGESTED ANSWERS TO QUESTIONS

JUNE - 2018

Paper-15 : STRATEGIC COST MANAGEMENT – DECISION MAKING

Time Allowed : 3 Hours

Full Marks : 100

The figures in the margin on the right side indicate full marks.

Section – A (20 Marks)

1. Choose the most appropriate answer to the following questions giving justification:

2x10=20

(i) A Company requires ₹ 85,00,000 in sales to meet its target net profit. Its contribution margin is 30% and the fixed costs are ₹ 15,00,000. What is the target net profit?

- (a) ₹ 10,50,000
- (b) ₹ 19,50,000
- (c) ₹ 25,50,000
- (d) ₹ 35,00,000

(ii) In a factory where standard costing system is followed, the production department consumed 1100 kgs of a material @ ₹ 8 per kg for product X resulting in material price variance of ₹ 2200 (Fav) and material usage variance of ₹ 1000 (Adv). What is the standard material cost of actual production of product X?

- (a) 11,000
- (b) 20,000
- (c) 14,000
- (d) 10,000

(iii) The following information relate to ABC

Activity level	60%	80%
Variable costs (₹)	12,000	16,000
Fixed costs (₹)	20,000	22,000

The differential cost for 20% capacity is

- (a) ₹ 4,000
- (b) ₹ 2,000
- (c) ₹ 6,000
- (d) ₹ 5,000

(iv) By making and selling 9,000 units of a product, a company makes a profit of ₹ 10,000, whereas in the case of 7,000 units, it would lose ₹ 10,000 instead. The number of units to break-even is

- (a) 7,500 units
- (b) 8,000 units
- (c) 7,750 units
- (d) 8,200 units

(v) 1200 units of microchips are required to be sold to earn a profit of ₹ 1,06,000 in a monopoly market. The fixed cost for the period is ₹ 74,000. The contribution in the monopoly market is as high as 3/4th of its variable cost. Determine the target selling price per unit.

SUGGESTED ANSWERS TO QUESTION_SYL2016_JUNE2018_PAPER-15

- (a) 450
(b) 325
(c) 400
(d) 350
- (vi) An operation has a 90% learning curve and the first unit produced took 28 minutes. The labour cost is ₹ 20 per hour. How much should the second unit cost?
(a) ₹ 9.80
(b) ₹ 7.60
(c) ₹ 8.40
(d) ₹ 6.60
- (vii) If project A has a net present value (NPV) of ₹ 30,00,000 and project B has an NPV of ₹ 50,00,000, what is the opportunity cost if project B is selected?
(a) ₹ 23,00,000
(b) ₹ 30,00,000
(c) ₹ 20,00,000
(d) ₹ 50,00,000
- (viii) A company operates an activity based costing (ABC) system to attribute its overhead costs to cost objects. In its budget for the year-ending 31st August, 2018. The company expected to place a total of 2000 purchase orders at a total cost of ₹ 1,00,000. This activity and its related costs were budgeted to occur at a constant rate throughout the budget year which is divided into 13 four week periods.
During the four week period ended 30th June 2017, a total of 200 purchase orders were placed at a cost of ₹ 9,000. The over recovery of these costs for the four week period was
(a) ₹ 2,000
(b) ₹ 3,000
(c) ₹ 1,500
(d) ₹ 1,000
- (ix) Empire Hotel has a capacity of 100 single rooms and 20 double rooms. Average occupancy is 70% for 365 days of the year. The rent for a double room is kept at 130% of a single room. The total room occupancy days in a year in terms of single room is
(a) 32193
(b) 30660
(c) 31660
(d) 30993
- (x) Which of the following is correct in the context of network analysis?
(a) There can be one or more activities without a predecessor in a network.
(b) Where two activities have the same start and end events, the end event of one activity is numbered differently and then connected by a dummy to the original start event.
(c) When crashing is carried out, the non-critical paths have to remain non critical.
(d) If the critical path is longer than the other paths, the project may be completed by using a path having a shorter duration.

Answer:

1. (i) (a)
Explanation: ₹ 10,50,000
 $= (85,00,000 \times 30\%) - 15,00,000 = 10,50,000$
Or
Sales \times Contribution margin ratio or P.V. Ratio – Fixed Cost
- (ii) (d)
Explanation: Actual Cost + Favourable Cost Variance = Standard Cost
 $1100 \times 8 + 2200 - 1000 = 8800 + 1200 = 10,000$

SUGGESTED ANSWERS TO QUESTION_SYL2016_JUNE2018_PAPER-15

(iii) (c)

Explanation: Differential Costs = Differences in Fixed and Variable Cost = 4000 + 2,000 = 6,000.

(iv) (b)

Explanation:

Contribution for 2000 units = 20,000 (difference in profits for two output levels)

Hence, contribution per unit = 10.

Substituting in equation $1,00,000 = F + 10,000$. Or $F = 80,000$.

$BEP = 80000 / 10 = 8000$.

(v) (d)

Explanation: Contribution = 1,06,000 + 74,000 = 1,80,000

Contribution/Unit = $180000/1200 = 150$

Variable cost/unit = $150 \div \frac{3}{4} = 200$

Selling price = 350

(vi) (b)

Explanation:

1st unit = 28 min.

Average time p.u. for 2 units = $0.9 \times 28 = 25.2$

Total time for 2 units = $25.2 \times 2 = 50.4$

Time for second unit = $50.4 - 28 = 22.4$ minutes

Cost for second unit = $22.4 \times 20 \text{ ₹ /hr.} / 60 \text{ minutes} = 7.47$

Since, (b) is close to 7.47, b is acceptable. Otherwise, none of the given data.

(vii) (b)

Explanation:

Opportunity cost represents the next best alternative foregone.

If B is chosen, only A is being foregone and hence the NPV of 30,00,000 is the present value of the opportunity lost.

(viii) (d)

Explanation:

For 2,000 purchase orders, cost budgeted is 1 lac. For 200, corresponding amount would be 10,000. But actual = 9,000. Hence over recovered is $10,000 - 9000 = 1000$.

Or

Cost driver rate for order = $1,00,000 / 2,000 = 50$ per order.

Cost recovered = $50 \times 200 = 10,000$.

Actual = 9,000

Over recovery = 1000

(ix) (a)

Explanation:

1 double room = 1.3 single in terms of revenue.

Capacity = $100 + 1.3 \times 20 = 100 + 26 = 126$ equivalent single rooms.

Total Room Occupancy p.a. = $126 \times 365 \times 70\% = 32193$ days.

Note: This can be arrived at by other ways also, taking for example 70% of only single rooms and then double rooms, etc.

(x) (a)

Explanation:

More than 1 activity can begin at the first node, say 1 - 2, 1 - 3, 1 - 4, etc. Each of these will have no predecessor.

SUGGESTED ANSWERS TO QUESTION_SYL2016_JUNE2018_PAPER-15

Section – B

Answer any five questions.
Each Question carries 16 Marks.

16×5=80

2. (a) Relevant data relating to Trident Industries Limited are:

	Products			
	P	Q	R	Total
Production and Sales (Units)	60,000	40,000	16,000	
Raw Material Usage (in Units)	10	10	22	
Raw Material Costs (₹)	50	40	22	24,76,000
Direct Labour Hours	2.5	4	2	3,42,000
Machine Hours	2.5	2	4	2,94,000
Direct Labour Costs (₹)	16	24	12	
No. of Production Runs	6	14	40	60
No. of Deliveries	18	6	40	64
No. of Receipts	60	140	880	1080
No. of Production Orders	30	20	50	100

Overheads:	₹
Set-up	60,000
Machines	15,20,000
Receiving	8,70,000
Packing	5,00,000
Engineering	7,46,000

The Company operates a JIT inventory policy and receives each component once per production run.

Required:

(a) (i) Compute the product cost based on direct labour hour recovery rate of overheads.

(ii) Compute the product cost using Activity Based Costing. 4+8=12

(b) What is Target Cost? How would you determine it? 2+2=4

Answer:

2. (a) (i) Computation of overhead rate based on direct labour hour hours:

P	60,000	2.5	150000
Q	40,000	4	160000
R	16,000	2	32000
Total			342000

Total Overheads = 60,000 + 15,20,000 + 8,70,000 + 5,00,000 + 7,46,000 = 36,96,000

Overhead rate per direct labour hour = 36,96,000/3,42,000 = 10.807 = 10.81

Product Cost based on direct labour recovery rate:

	P	Q	R
Raw Material	50	40	22
Direct Labour	16	24	12
Overheads @ ₹ 10.81 per hour			
2.5 × 10.81	27.03		
4 × 10.81		43.24	
2 × 10.81			21.62

SUGGESTED ANSWERS TO QUESTION_SYL2016_JUNE2018_PAPER-15

Total Cost	93.03	107.24	55.62
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(ii) Cost Driver Rates:

Nature of Overhead	Overhead cost (₹)	Total Quantity of activity Driver	Activity Driver	Cost Driver Rate ₹/ unit of Cost driver
Set-up	60,000	60	Production Runs	1000
Machines	15,20,000	294000	Machine Hours	5.17
Receiving	8,70,000	1080	No. of Receipts	805.56
Packing	5,00,000	64	No. of Deliveries	7812.5
Engineering	7,46,000	100	No. of Production Orders	7460
Total				

Overhead allocation to products based on Activity Based Costing: (Total Value for Production units Basis)

Based on the whole production figures,

	P	Q	R
Production units	60,000	40,000	16,000
Raw Material	30,00,000	16,00,000	3,52,000
Direct Labour	9,60,000	9,60,000	1,92,000
Overheads Set-up @ ₹ 1000 per hour production run			
1000x6	6000		
1000x14		14,000	
1000x40			40,000
Machines @ ₹ 5.17 per machine hour			
2.5x60,000x5.17	7,75,500		
2x40,000x5.17		4,13,600	
4x16,000x5.17			3,30,880
Receiving @ 805.56 per receipt			
60x805.56	48,333.60		
140x805.56		1,12,778.40	
880x805.56			7,08,892.80
Packing @ 7812.5 per delivery			
18x7812.5	1,40,625		
6x7812.5		46,875	
40x7812.5			3,12,500
Engineering @ 7460 per production order			
30 x 7460	2,23,800		
20 x 7460		1,49,200	
50x7460			3,73,000
Total Overhead Cost	11,94,258.60	7,36,453.40	17,65,272.80
Total Cost	51,54,258.60	32,96,453.40	23,09,272.80

(b) Target Cost is the cost at which a proposed product with specified functionality and quality must be produced to generate a desired level of profitability at its anticipated selling price.

Target cost is Target selling price less the required profit margin

The target selling price is the price that is dictated by competition in case there are comparable products, or the perceived value that a customer will pay for the product in case there is no competition.

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The desired profit level is fixed by the seller. The difference between the selling price and the profit margin represents the target cost to be achieved by design or cost reduction or by economies of scale or by other means.

How to determine target cost:

The market requirement is identified regarding design, utility, need for the product.

Target selling price is determined based on customer expectation and sales forecast.

Target production volume is set based on price volume relationship

Target profit margin is established based on the company's long term profit objectives, projected volumes, course of action, etc.

The target cost or allowable cost is determined as the target selling price minus the target profit margin.

3. An Engineering Co. manufactures a single product whose standard cost structure is as follows:

Direct materials: 24 kg at ₹ 30 per kg	72.00
Direct Labour : 6 hours at ₹ 4 per hour	24.00
Factory Overheads : 6 hours at ₹ 0.75 per hour	4.50
Total	100.50

The factory overheads are based on the following flexible budget:

Capacity	80%	90%	100%	100%
Production (units)	6,000	6,750	7,500	8,250
Overheads (₹)	29,250	3,150	33,750	36,000

Actual data for the month of January, 2018:

Budgeted production	7,500 units
Materials used	19,240 kg at ₹ 31 per kg
Direct labour	46,830 hours at ₹ 4.20 per hour
Actual factory overheads	₹ 36,340
Production completed	7,620 units

Details of Work-in-Progress:

Opening : 120 units, materials fully supplied, 50% converted.

Closing : 100 units, materials fully supplied, 50% converted.

Required:

(i) Effective or Equivalent Production for each element of cost.

(ii) Calculate:

(a) Material variances (cost, price and usage)

(b) Labour variances (cost, rate of pay and efficiency)

(c) Overhead variances (expenditure and volume variance, efficiency and capacity variance)

4+3+6=13

Answer:

3. (i) Statement of Equivalent Production

	Units	Material		Labour and Overheads	
		%	Units	%	Units
Opening Work-in-Progress	120	---	---	50	60
Completely processes during the month	7,500	100	7,500	100	7,500
Closing Work-in-Progress	100	100	100	50	50
	7,720		7,600		7,610

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Some required data (computed)

Material:

Standard Quantity: 7,600 @ 2.40 kg = 18,240 kg

Standard Value : 18,240 kg @ ₹ 30 = ₹ 5,47,200

Labour:

Standard Hours : 7,610 @ 6 hours = 45,660 hours

Standard Wages : 45,660 @ ₹ 4 per hour = ₹ 1,82,640

$$\text{Standard Production} = \frac{\text{Actual Hours}}{\text{Standard Hours per Unit}} = \frac{46,830}{6} = 7,805 \text{ units}$$

Budgeted Production = 7,500 units

$$\text{Standard rate per unit} = \frac{\text{Budgeted Overheads}}{\text{Budgeted Production}} = \frac{\text{₹ } 33,750}{7,500} = \text{₹ } 4.50$$

Standard Overheads (or overheads recovered) = 7,610 @ ₹ 4.50 = ₹ 34,245

Actual cost of materials: 19,240 kg @ ₹ 31 = ₹ 5,96,440

Actual Wages: 46,830 hr @ ₹ 4.20 = ₹ 1,96,686

(ii) Statement of Variances

(a) Material cost variance: (SC - AC) = (₹ 5,47,200 - 5,96,440) = ₹ 49,240 (A)

which can be analyzed into:

(a) Material price variance: (SP - AP) AQ = (30 - 31) x 19,240 = ₹ 19,240 (A)

(b) Material usage variance: (SQ - AQ) SP = (18,240 - 19,240) x ₹30 = ₹30,000 (A)

(b) Labour cost variance: (SC - AC) = (₹ 1,82,640 - 1,96,686) = ₹ 14,046 (A)

which can be further analyzed as follows:

(a) Rate variance: (SR - AR) AT = (4.00 - 4.20) 46,830 = ₹ 9,366 (A)

(b) Efficiency variance: (AP - SP) SR = (7,610 - 7,805) x ₹ 24 = ₹ 4,680 (A)

(c) Factory O.H. cost variance: Std. O.H. - Actual O.H. = ₹34,245 - 36,340 = ₹2,095 (A)

which can be analyzed as follows:

(a) Expenditure or Budgeted variance: Budgeted O.H. - Actual O.H.

₹ 33,750 - 36,340 = ₹ 2,590 (A)

(b) Volume variance: SR (AP - BP) = ₹ 4.5 (7,610 - 7,500) = ₹ 495 (F)

Volume variance can be further divided as follows:

1. Efficiency variance: SR (AP - SP) = ₹ 4.50 (7,610 - 7,805) = ₹ 877.50 (A)

2. Capacity variance: SR (SP - BP) = ₹ 4.50 (7,805 - 7,500) = ₹ 1,372.50 (F)

4. (a) A company manufactures two types of herbal product, A and B. Its budget shows profit figures after apportioning the fixed joint cost of ₹ 15 lakhs in the proportion of the numbers of units sold. The budget for 2018 indicates:

Particulars	A	B
Profit (₹)	1,50,000	30,000
Selling price per unit (₹)	200	120
P/V Ratio (%)	40	50

Required to advise on the best option among the following, if the company expects that the number of units to be sold would be equal.

- (i) Due to change in manufacturing process, the joint fixed cost would be reduced by 15% and the variable cost would be increased by 7%.

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(ii) Price of A could be increased by 20% as it is expected that the price elasticity of demand would be unity over the range of price.

(iii) Simultaneous introduction of both the options, viz. (i) and (ii) above. 4+4+4=12

(b) What are the advantages of Inter-firm comparison?

4

Answer:

4. (a) Contribution of A = 40% x 200 = 80

Contribution of B = 50% x 120 = 60.

Average contribution per unit, considering equal units of both = $(80 + 60)/2 = 70$

Total units of production = $(\text{Total fixed costs} + \text{Profits})/70 = \frac{15,00,000 + 1,80,000}{70} =$

$\frac{16,80,000}{70} = 24,000$

Of which 12000 of A and 12000 of B

Evaluation of Option:

(i)

	A		B	
Selling price/u	200	200	120	120
Variable Cost /u	120	128.4	60	64.20
Contribution/u	80	71.6	60	55.80
Contribution for 12000 units		859200		669600
Total Contribution	1528800			
Fixed Cost	15,00,000 x 85% = 12,75,000			
Profits	1528800-1275000 = 2,53,800			

(ii) Volume for A originally = 12,000.

Since price elasticity of demand = 1, for 20 % increase in unit selling price, there will be a drop in demand by 20 %, i.e. 20% of 12,000 = 2400.

Revised sales quantity for A at increased price = 12000 - 2400 = 9600

	A		B	
Selling price/u	200	240	120	120
Variable Cost /u	120	120	60	60
Contribution/u	80	120	60	60
Contribution for 9600 units For 12000 units		1152000		720000
Total Contribution	1872000			
Fixed Cost	15,00,000			
Profits	1872000-1500000 = 3,72,000			

(iii) Simultaneous introduction of both:

	A		B	
Selling price/u	200	240	120	120
Variable Cost /u	120	128.4	60	64.20
Contribution/u	80	111.6	60	55.80
Contribution for 9600 units For 12000 units		1071360		669600
Total Contribution	17,40,960			
Fixed Cost	15,00,000 x 85% = 12,75,000			
Profits	1740960-1275000 = 465960			

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Decision: Option (iii) has the maximum profits and should be chosen.

(b) The advantages of Inter-firm Comparison are appended below –

- (1) Inter-firm Comparison makes the management of the organisation aware of strengths and weakness in relation to other organisations in same industry.
- (2) As only the significant items are reported to the Management time and efforts are not unnecessary wasted.
- (3) The management is able to keep up to data information of the trends and ratios and it becomes easier for them to take the necessary steps for improvement.
- (4) It develops cost consciousness among the members of the industry.
- (5) Information about the organisation is made available freely without the fear of disclosure of confidential data to outside market or public.
- (6) Specialized knowledge and experience of professionally run and successful organisations are made available to smaller units who can take the advantages it may be possible for them to have such an infrastructure.
- (7) The industry as a whole benefits from the process due to increased productivity, standardization of products, elimination of unfair comparison and the trade practices.
- (8) Reliable and collective data enhance the organising power in deal in with various authorities and Government bodies.
- (9) Inter firm comparison assists in a big way in identifying industry sickness and gives a timely warning so that effective remedial steps can be taken to save the organisation.

5. A regional audit firm offers audit, tax and consulting services. The segmented profit and loss position for the next year shows the following position:

	Audit (₹)	Tax (₹)	Consulting (₹)
1. Revenues	60,000	1,00,000	1,20,000
2. Costs:			
Service-level	50,000	60,000	70,000
Facility-level (apportioned)	10,000	12,000	16,000
Total	60,000	72,000	86,000
3. Operating Profit (1-2)	Nil	28,000	34,000

Partners are concerned about the profitability of their audit business and contemplate to close it down. In the event of closure of audit service, it might do more tax work. If audit service is discontinued, 50 per cent of the facility costs associated with auditing would be saved. More tax work would increase tax revenues by 45 per cent, but tax service-level costs would also increase by 45 per cent.

Required:

(a) Determine whether the firm should drop auditing service and the impact on its closure on profit. Assume that audit centre facility level costs can be allocated to two other centres based on revenues. Compare Profitability of Tax and Consulting Services before and after closure of Audit Centre.

(b) What other considerations are important to drop auditing service?

12+4=16

Answer:

5. (a) Whether to drop auditing service and the impact on profits:

Item of Cost/ Revenue	Incremental impact
Revenue loss from Audit	-60000

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Savings in facility level costs	+5000
Decrease in Service Level cost (Audit), considered avoidable	+50,000
Increase in Tax Service Revenue by 45%	+45000
Increase in service level cost for Tax Service	-27000
Cumulative Impact	+13000

Decision: Close the Audit function and improve Tax Service.

	Tax		Consulting	
	Before	After	Before	After
Revenue	100000	145000	120000	120000
Costs:				
Service- level	60000	87000	70000	70000
Facility -level	12000	14736	16000	18264
Total Costs	72000	101736	86000	88264
Operating Profits	28000	43264	34000	31736

Total operating profits before dropping: 28000+34000 = 62000

Total operating profits after dropping Audit function: 43264+31736 = 75000

Impact = 13,000

(b) Other important considerations for dropping Audit function:

- (i) The Audit function is not unprofitable or with Nil profit as shown in the question. Its revenues less its service level costs and avoidable facility level costs are 60,000 - 50,000 - 5000 = 5000. Hence, it is only due to allocated overhead that Audit function appears to be a non contributor.
- (ii) While the release of Audit function strengthens the Tax Service, the overall impact being ₹ 13,000 increase in profits, it is a major risk that the firm will be taking, since it is an audit firm.
- (iii) In the medium to long term, it could lose other potential clients who may go elsewhere to have more diversified services.
- (iv) The firm should try to improve its costs and increase its fees to have more comfortable profits.

6. (a) Explain the concept of 'quality' and enumerate 'costs of quality' under different groups. 3+5=8

(b) What is Learning Curve? What factors affect Learning Curve? 4+4=8

Answer:

6. (a) The term quality is a perception which is personal to an individual. In plain terms, quality is "features" or "worth" or "value".

Conformance to specifications measures how well the product or service meets the targets and tolerances determined by its designers.

Fitness for use focuses on how well the product performs its intended function or use.

Value for price paid is a definition of quality that consumers often use for product or service usefulness. **Support services** provided are often how the quality of a product or service is judged. Quality does not apply only to the product or service itself; it also applies to the people, processes, and organizational environment associated with it.

Psychological criteria is a subjective definition that focuses on the judgmental evaluation of what constitutes product or service quality.

Quality has many other costs, which can be divided into two categories. The first category consists of costs necessary for achieving high quality, which are called quality control costs. These are of two types:

Prevention costs and appraisal costs. The second category consists of the cost consequences of poor quality, which are called quality failure costs. These include external failure costs and internal failure costs.

Prevention costs are all costs incurred in the process of preventing poor quality from occurring. They include quality planning costs, such as the costs of developing and implementing a quality plan. Also included are the costs of product and process design, from collecting customer information to designing processes that achieve conformance to specifications. Employee training in quality measurement is included as part of this cost, as well as the costs of maintaining records of information and data related to quality.

Appraisal costs are incurred in the process of uncovering defects. They include the cost of quality inspections, product testing, and performing audits to make sure that quality standards are being met. Also included in this category are the costs of worker time spent measuring quality and the cost of equipment used for quality appraisal.

Internal failure costs are associated with discovering poor product quality before the product reaches the customer site. One type of internal failure cost is rework, which is the cost of correcting the defective item. Sometimes the item is so defective that it cannot be corrected and must be thrown away. This is called scrap, and its costs include all the material, labor, and machine cost spent in producing the defective product.

External failure Costs are incurred when inferior products are delivered to customers. They include cost of handling customer complaints, warranty replacements, repairs of returned products and cost arising from a damaged company reputation.

(b) Learning Curve Theory is concerned with the idea that when a new job, process or activity commences for the first time it is likely that the workforce involved will not achieve maximum efficiency immediately. Repetition of the task is likely to make the people more confident and knowledgeable and will eventually result in a more efficient and rapid operation. Eventually the learning process will stop after continually repeating the job. As a consequence the time to complete a task will initially decline and then stabilise once efficient working is achieved. The cumulative average time per unit is assumed to decrease by a constant percentage every time that output doubles. Cumulative average time refers to the average time per unit for all units produced so far, from and including the first one made.

Learning curve is essentially a measure of the experience gained in production of an article by an individual or organization. As more units are produced, people involved in production become more efficient than before. Each subsequent unit takes fewer man-hours to produce. The amount of improvement will differ with each type of article produced. This improvement or experience gain is reflected in a decrease in man-hours or cost.

Factors affecting Learning Curve:

1. While pricing for bids, general tendency is to set up a very high initial labour cost so as to show a high learning curve. This should the learning curve useless and sometimes misleading.
2. The method of production i.e. whether it is labour oriented or machine oriented influences the slope of the learning.
3. When labour turnover rate is high management has to train new workers frequently. In such situations the company may never reach its maximum

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efficiency potential. One of the important requisites of the learning curve concept is that there should be uninterrupted flow of work. The fewer the interruptions, the greater will be the improvement in efficiency.

4. Changes in a product or in the methods of production, designs, machinery, or the tools/used affect the slope of the learning curve. All these have the effect of starting learning a fresh because of new conditions. If the changes are frequent, there may be no learning at all.
5. Also other factors influencing the learning curve are labour strikes, lock outs and shut downs due to other cause also/affect the learning curve. In each such case there is interruption in the progress of learning.

7. (a) A small project is composed of 8 activities whose estimated time are listed below:

Activity	1-2	2-3	2-4	3-5	4-6	5-6	5-7	6-7
Optimistic time (in weeks)	3	3	2	4	4	0	3	2
Most likely time (in weeks)	3	6	4	6	6	0	4	5
Pessimistic time (in weeks)	3	9	6	8	8	0	5	8

Required:

- (i) Draw the project network.
- (ii) Find the expected duration and variance for each activity.
- (iii) Find the critical path and expected project length.
- (iv) The probability that the project will be completed in 23 weeks.

Given that:

Z Value:	1.00	1.91	1.92	1.93	1.94
Probability:	0.9713	0.9719	0.9726	0.9732	0.9738

3+3+2+2=10

(b) The management of SAB Ltd. has suggested that a linear programming model might be used for selecting the best mix of five possible products — A, B, C, D and E. The following information are available:

	Per Unit of Product				
	A	B	C	D	E
Selling Price (₹):	96	84	76	62	54
Costs (₹):					
Material	30	28	32	30	32
Direct Labour	36	32	12	8	8
Fixed Overhead	18	16	6	4	4
Total Costs	84	76	50	42	44

Expected maximum unit demand per week for each product at the prices indicated:

A	B	C	D	E
3000	24000	1800	1200	1200

Cost of material includes a special component which is in short supply. It costs ₹ 6 per unit. Only 11,600 units are available to the company during the week. The number of units of the special component needed for a unit of each product is:

A	B	C	D	E
2	1	4	3	6

The management of SAB Ltd. has ruled that expenditure on materials must not exceed a sum of ₹ 60,000.

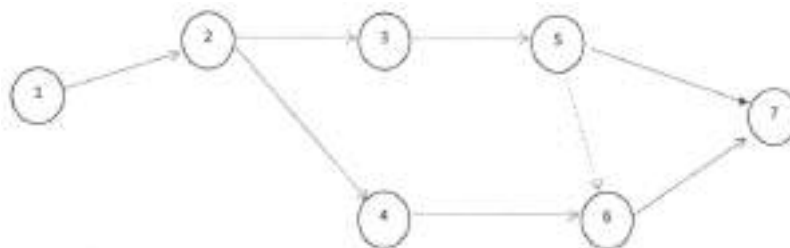
All other resources are freely available in sufficient quantities for planned need.

Formulate a linear programming model stating clearly the criterion you use. 6

Answer:

7. (a) (i) The network diagram for the given data is shown below:

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Network Diagram

- (ii) The earliest and latest expected time for each event is calculated by considering the expected time of each activity as shown in the following table:

TABLE: CALCULATION OF EXPECTED TIMES AND VARIANCES

Activity	t_o	t_m	T_p	$t_e = \frac{1}{6} [t_o + 4t_m + t_p]$	$\sigma^e = [\frac{1}{6} [t_p - t_o]^2]$
1 - 2	3	3	3	3	0
2 - 3	3	6	9	6	1
2 - 4	2	4	6	4	4/9
3 - 5	4	6	8	6	4/9
4 - 6	4	6	8	6	4/9
5 - 6	0	0	0	0	0
5 - 7	3	4	5	4	1/9
6 - 7	2	5	8	5	1

The expected duration and variance for each activity is shown in the above table.

- (iii) Critical path is : 1 — 2 — 3 — 5 — 6 — 7.

Expected project length. $T_e = 3+6+6+0+5 = 20$ weeks

- (iv) Probability that the project will be completed in 23 weeks is given by:

$$P(0 \leq X \leq 23) = P(0 \leq Z \leq \frac{23 - 20}{\sqrt{2.444}}) = P(0 \leq Z \leq 1.920) = 0.9726 \text{ or } 97.26\%$$

(b)

	A	B	C	D	E
Selling Price	96	84	76	62	54
Variable Cost	66	60	44	22	40
Contribution	30	24	32	40	14

Let a, b, c, d, e be the number of units respectively of A,B,C,D and E to be produced.

Objective function: Maximise contribution: $Z = 30a+24b+32c+40d+14e$

Subject to: Demand Constraint

a	≤	3000
b	≤	2400
c	≤	1800
d	≤	1200
e	≤	1200

Special Raw Material availability constraint

$$2a + b + 4c + 3d + 6e \leq 11600$$

Special raw material cost constraint

$$12a + 6b + 24c + 18d + 36e \leq 60,000$$

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Non negativity constraint: $a, b, c, d, e \geq 0$

8. Write short notes on any four of the following:

4x4= 16

- (a) Backflush Accounting
- (b) Relevant Cost Analysis
- (c) Treatment of Variances in cost accounts
- (d) Value Engineering
- (e) Life Cycle Costing

Answer:

8. (a) **Backflush accounting** is when you wait until the manufacture of a product has been completed, and then record all of the related issuances of inventory from stock that were required to create the product. This approach has the advantage of avoiding all manual assignments of costs to products during the various production stages, thereby eliminating a large number of transactions and the associated labor. This system records the transaction only at the termination of the production and sales cycle. The emphasis is to measure cost at the beginning and at the end with greater emphasis on the end or outputs. Backflush accounting is entirely automated, with a computer handling all transactions.

The backflushing formula is:

Number of units produced x unit count listed in the bill of materials for each component

- (b) **Relevant Cost Analysis:** For decision making purpose, it is necessary to classify costs and revenues based on whether they are relevant or irrelevant to the decisions. Relevant costs and revenues are those, that are influenced by the decisions. Irrelevant costs and revenues are those, that are not affected or influenced by the decisions.

Relevant costs are those expected future costs that are essential but differ for alternative courses of action. It is a future cost that would arise as a direct consequence of the decision under review.

The costs which should be used for decision making are often referred to as "relevant costs". CIMA defines relevant costs as 'costs appropriate to aiding the making of specific management decisions'.

Relevant costing is an incremental analysis which means that it considers only relevant costs i.e. costs that differ between alternatives and ignores sunk costs i.e. costs which have been incurred, which cannot be changed and hence are irrelevant to the scenario.

- (c) In Standard Cost Accounting Systems which contain both actual and standard costs in the accounting records and financial statements, the question of adjustment of the cost variances at the end of the accounting period arises.

Three methods of disposal of variances and the advantages and disadvantages of each are discussed below:

1. Transfer to Profit and Loss Account.
2. Allocation of Variances to Finished Stock, Work-in-Progress and Cost of Sales Account.
3. Transfer of Variances to the Reserve Account.

Under the method 'Allocation of Variances to Finished Stock, Work-in-Progress and

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Cost of Sales Account', the variances are distributed over stocks of finished and partly finished products and to the cost of sales. The distribution of each variance is made to the three accounts on a percentage basis according to the closing balance (value) of each account.

- (d)** Value Engineering is an organized/systematic approach directed at analyzing the function of systems, equipment, facilities, services, and supplies for the purpose of achieving their essential functions at the lowest life-cycle cost consistent with required performance, reliability, quality, and safety. Value Engineering is an effective problem solving technique. Value engineering is essentially a process which uses function analysis, team- work and creativity to improve value. Value Engineering is not just "good engineering."

It is not a suggestion program and it is not routine project or plan review. It is not typical cost reduction in that it doesn't "cheapen" the product or service, nor does it "cut corners."

Value Engineering methodology is a powerful tool for resolving system failures and designing improvements in performance of any process, product, service or organization.

- (e)** Life Cycle Costing; aims at cost ascertainment of a product, project etc. over its projected life. It is a system that tracks and accumulates the actual costs and revenues attributable to cost object (i.e., product) from its inception to its abandonment. Sometimes the terms; cradle-to-grave costing and womb-to-tomb costing convey the meaning of fully capturing all costs associated with the product from its initial to final stages.

Product Life Cycle is a pattern of expenditure, sale level, revenue and profit over the period from new idea generation to the deletion of product from product range. It spans the time from initial R&D on a product to when customer servicing and support is no longer offered for the product. Product life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their entire life cycle. Traces research, design and development costs and total magnitude of these costs for each individual product and compared with product revenue. Assists report generation for costs and revenues.

FINAL EXAMINATION

GROUP III

(SYLLABUS 2016)

SUGGESTED ANSWERS TO QUESTIONS

DECEMBER 2018

Paper- 15: STRATEGIC COST MANAGEMENT – DECISION MAKING

Time Allowed: 3 Hours

Full Marks :100

The figures in the margin on the right side indicate full marks.

Answer Question No. 1 in Section A, which is compulsory, carrying 20 marks.

Further, answer any 5(five) Questions from Section B, each carrying 16 marks

SECTION – A

(20 marks)

1. Choose the most appropriate answer to the following questions giving justification :

2x10=20

- (i) A company has a break even point when sales are Rs. 3,20,000 and variable cost at that level of sales are Rs. 2,00,000. How much would contribution margin increase or decrease if variable expenses are dropped by Rs.30,000 ?
- (A) Increase by 27.5%
(B) Increase by 9.375%
(C) Decrease by 9.375%
(D) Increase by 37.5%
- (ii) Twin Ltd. uses JIT and back flush accounting. It does not use a raw material stock control account. During September 2018, 10000 units were produced and sold. The standard cost per unit is Rs. 150 which includes materials of Rs. 60. During September 2018, Rs. 9,90,000 of conversion costs were incurred. The debit balance in cost of goods sold account for September 2018 was
- (A) Rs.14,00,000
(B) Rs.14,80,000
(C) Rs.15,90,000
(D) Rs.16,20,000
- (iii) A company operates a standard absorption costing system. The budgeted fixed production overheads for the company for last year were Rs. 3,30,000 and budgeted output was 220,000 units. At the end of the company's financial year, the total of the fixed production overheads debited to the Fixed Production Overhead Control Account was Rs. 2,60,000 and the actual output achieved was 2,00,000 units. The under/over absorption of overhead was
- (A) Rs. 40,000 over absorbed.
(B) Rs. 40,000 under absorbed.
(C) Rs. 50,000 over absorbed.
(D) Rs. 50,000 under absorbed.
- (iv) A company has the capacity of producing 80000 units and presently sells 20000 units

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at Rs. 100 each. The demand is sensitive to selling price and it has been observed that with every reduction of Rs. 10 in selling price the demand is doubled. What should be the target cost in selling price if the demand is doubled at full capacity and profit margin on sale is taken at 25%?

- (A) Rs.75
- (B) Rs.90
- (C) Rs.25
- (D) Rs.60

(v) A factory can make only one of the three products X, Y or Z in a given production period. The following information are given :

Per unit Rs.	X	Y	Z
Selling Price	1500	1800	2000
Variable Cost	700	950	1000

Assume that there is no constraint on resource utilization or demand and similar resources are consumed by X,Y and Z. The opportunity cost of making one unit of Z is

- (A) Rs. 850
- (B) Rs. 800
- (C) Rs. 1800
- (D) Rs. 1500

(vi) AB company is a supermarket group that incurs the following costs :

- (A) The bought-in price of the goods
- (B) Inventory finance costs
- (C) Self refilling costs
- (D) Costs of repacking or 'pack out' prior to storage before sale

AB company's calculating of direct product profit (DPP) would include

- (A) Costs (a) and (c) only.
- (B) All of the above cost except (b)
- (C) All of the above costs except (d)
- (D) All of the above costs.

(vii) S Ltd. manufactures a product whose time for the first unit is 1000 hours. It experience a learning curve of 80%, What will be the total time taken in hours for unit 5 to 8 ?

- (A) 4096 hours
- (B) 3200 hours
- (C) 1536 hours
- (D) 2000 hours

(viii) H Group has two divisions, Division P and Division Q. Division P manufactures an item that is transferred to Division Q. The item has no external market and 6000 units produced are transferred internally each year. The costs of each division are as follows ?

	Division P	Division Q
Variable Cost	Rs. 100 per unit	Rs. 120 per unit
Fixed cost each year	Rs. 1,20,000	Rs. 90,000

Head Office management decided that a transfer price should be set that provides a profit of Rs. 30,000 to Division P. What should be the transfer price per unit ?

- (A) Rs.145
- (B) Rs. 125
- (C) Rs. 120
- (D) Rs. 135

(ix) In the context of Critical Path Analysis, the portion of the float of an activity which

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cannot be consumed without affecting adversely the float of the subsequent activities is called

- (A) Free float
- (B) Interfering float
- (C) Independent float
- (D) Total float

(x) In CPA (Critical Path Analysis) which of the following is not a correct step in sequence?

- (A) Understanding the logic of the system under consideration
- (B) Constructing the net work
- (C) Providing estimates for activity duration.
- (D) Implementing and controlling the net work.

Answer: 1

(i) (b) $S - V = C = \text{Rs. } 3,20,000 - 2,00,000 = \text{Rs. } 1,20,000$

$$c/s \text{ ratio} = \frac{1,20,000}{3,20,000} \times 100 = 37.5\%$$

New VC = Rs. 1,70,000,

$$\therefore C = \text{Rs. } 1,50,000$$

$$c/s \text{ ratio} = \frac{1,50,000}{3,20,000} \times 100 = 46.875\%$$

$$\therefore \% \text{ increase in } c = 46.875 - 37.5\% = 9.375\%$$

(ii) (c)

Standard cost of goods sold (10,000 units @ Rs.150)	Rs. 15,00,000
Less : Std. material cost (10,000 @ Rs. 60)	<u>6,00,000</u> 9,00,000
Standard conversion cost	
Conversion cost incurred	9,90,000
Excess charged to cost of goods sold a/c. (debit)	----- <u>90,000</u>

\therefore Total debit balance of cost of goods sold
Account = Rs. 15,00,000 + 90,000 = Rs. 15,90,000

(iii) (a)

Overhead Absorption Rate = $\frac{\text{Rs. } 3,30,000}{2,20,000 \text{ units}} = \text{Rs. } 1.50/\text{unit}$

Overhead Absorbed : 2,00,000 @ Rs. 1.50 = Rs. 3,00,000

Actual overhead	<u>Rs. 2,60,000</u>
Over absorbed overhead	<u>Rs. 40,000</u>

(iv) (d) as per following :

Demand	price (Rs.)
20,000	100
40,000	90
80,000	80

$$\therefore \text{Target cost} = \text{Rs. } 80 - (25\% \text{ of } 80) = \text{Rs. } 60/-$$

(v) (a)

Opportunity cost is the cost of next best alternative foregone. Between X and Y, y has a better contribution i.e. Rs. 850 as against X (Rs. 1500 - 700) = Rs. 800.

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- (vi) (d) Because all of the costs mentioned can be identified with specific goods/product and would be deducted from the selling price to determine the direct product profit.
- (vii) (c) as per the following :
At 80% Learning Curve, the total time for 8 units will be 8×512 i.e. 4096 hours and for 4 units it is 4×640 i.e. 2560 hours. Hence the time taken for units 5 to 8 will be 1536 ($4096 - 2560$)
- (viii) (b) $\text{variable cost} + (\text{Fixed cost} + \text{Profit Desired}) \div \text{Volume} = \text{Rs. } 100 + (1,20,000 + 30,000) \div 6000 = \text{Rs. } 125/-$
- (ix) (b) Interfering float is that part of the total float which causes a reduction in the float of the successor activities. It is the difference between the latest finish time of the activity in question and the earliest starting time of the following activity or zero, whichever is larger.
- (x) (d) Because step no. 4 i.e. (d) should be satisfying the objectives. Implementing and controlling the network would be the final step.

SECTION – B

Answer any five question
Each Question carries 16 Marks

16 x 5 = 80

2. (a) You are given the following data for a period in respect of two products, X and Y, which consume support services in different proportions :

	Product X	Product Y
Unit produced	40	40
Material moves per product unit	12	28
Direct labour hrs. per unit	1740	1740

Budgeted material handling costs :Rs. 3,48,000

Required :

- (i) Determine cost per unit of X and Y using the volume-based allocation method (direct labour hrs.)
- (ii) Compute cost per unit of X and Y using ABC.
- (iii) How would you explain the results ?

1+3+4=8

2. (b) The profit for The Forward Look Ltd. works out to 12.5% of the capital employed and the relevant figures are as under :

	Rs.
Sales	5,00,000
Direct Materials	2,50,000
Direct Labour	1,00,000
Variable Overheads	40,000
Capital employed	4,00,000

The new Sales Manager who has recently joined the Company estimates for the next year a profit of about 23% on the capital employed provided the volume of Sales is increased by 10% and simultaneously there is an increase in Selling Price of 4% and an overall cost reduction in all the elements of cost by 2%.

Verify the contention of the Sales Manager by computing in detail the cost and profit for the next year and state whether his proposal can be adopted by the management. 8

Answer : 2(a)

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(i) Direct labour hour rate = $\frac{\text{Budgeted overheads}}{\text{Budgeted direct about hours}}$
 $= \frac{\text{Rs.348,000}}{(40 \times 1740 + 40 \times 1740)} = \frac{\text{Rs.3,48,000}}{1,39,200} = \text{Rs. 2.5}$

	Product X	Product Y
Total direct labour hours taken	69,600	69,600
Labour rate	Rs. 2.5	Rs. 2.5
Material handling cost absorbed (hrs x Rate)	1,74,000	1,74,000
Units produced	40	40
Material handling cost per unit	4,350	4350

(ii) Since number of material moves causes material handling costs, use of this cost driven gives a better result :

Rate per material move = $\frac{\text{Rs } 3,48,000}{12+28} = \text{Rs. 8,700}$

	Product X	Product Y
Total Material moves	12	28
Material handling costs applied @ Rs. 8,700/-	Rs. 1,04,400	2,43,600
units produced	40	40
Material handling cost per unit	Rs. 2,610	6,090

(iii) Product Y requires more material moves and hence shares nationally more material handling costs under (ii) above. In other words, the complexity or diversity of Product Y is taken care of when overhead costs are allocated to this product using appropriate cost driven under ABC.

Answer : 2(b)

Computation of Fixed Cost:

Annual Sales	Rs.	5,00,000
Less Profit :Rs. 4,00,000 x 12.5%		<u>50,000</u>
Total Cost		4,50,000
Less Variable Cost : Direct Material	Rs. 2,50,000	
Direct Labour	Rs. 1,00,000	
Variable Overhead	<u>Rs. 40,000</u>	
		<u>3,90,000</u>
		<u>60,000</u>

Statement showing Profit obtained upon adopting the Sales Manager's proposal :

	Rs.	
(i) Revised Sales : Rs. 5,00,000 x 110% x 104%		5,72,000
(ii) Variable Cost :Rs. 3,90,000 x 110% x 98%		<u>4,20,420</u>
(iii) Contribution		1,51,580
(iv) Fixed Cost Rs. 60,000 x 98%		<u>58,800</u>
(v) Profit		<u>92,780</u>

Percentage of Profit on Capital Employed = $(\text{Rs. } 92,780 / 4,00,000) \times 100 = 23.195 > 23\%$

Conclusion : The Sales Manager's proposal can be adopted.

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3. (a) XYZ Ltd. produces three products. The cost data are as under :

Particulars	X	Y	Z
Direct Materials	Rs.64	Rs.152	Rs.117
Direct Labour :			

Dept.	Rate per hour (Rs)	Hrs.	Hrs.	Hrs.
1	5	18	10	20
2	6	5	4	6.5
3	4	10	5	20
Variable overheads		Rs.16	Rs.9	Rs.24

Fixed overheads Rs. 4,00,000 per annum

The budget was prepared at a time, when market was sluggish. The budgeted quantities and selling prices are as under :

Product	Budged Quantity	Selling price (Rs.) unit
X	9750	270
Y	7800	280
Z	7800	400

Later the market improved and the sale quantities could be increased by 20% for product X and 25% each for products Y and Z. The Sales Manager confirmed that the increased quantities could be achieved at the prices originally budgeted. The Production Manager has stated that the output cannot be increased beyond the budgeted level due to limitation of direct labour hours in Department 2.

Required :

- (i) Set optimal product mix.
- (ii) State profit under optimal product mix. 6+6 = 12

(b) A company is producing and selling three products. How would you determine relative profitability of products in each of the following independent situation ?

- (i) Total sales potential in unit is limited,
- (ii) Total sales potential in value is limited,
- (iii) Raw materials are in short supply,
- (iv) Production capacity (machine hours) is limited.

1+1+1+1 = 4

Answer : 3(a)

Products :	X	Y	Z
Budged Quantity (units) :	9,750	7,800	7,800
Selling price (p.u.):	270	280	400
Variable cost (p.u.):			
Direct materials	64	152	117
Direct labour	160	94	219
Variable overheads	16	9	24
Total variable cost (p.u.)	240	255	360

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Contribution (p.u) (Rs.)	(i) – (ii)	30	25	40
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Statement of optima product mix and profit.

Products :		X	Y	Z	Total
Contribution (p.u) : (Rs.)	(a)	30	25	40	
Direct labour hours in Dept.2	(b)	5	4	6.5	
Contribution per hr:	(a)/(b)	6	6.25	6.15	
Ranking		III	I	II	
Optimal product mix units	(c)	5655	9750	9750	
		(28275 hrs.)	(39000 hrs)	(63375 hrs)	
Total contribution (Rs.)	(a)x(c)	169650	243750	390000	803400
Less : Fixed cost (Rs.)					400000
Optimal profit					403400

Working Notes

(1) Total hours available in Department 2

Products	Units	Hrs.(p.u.)	Total hrs.
(a)	(b)	(c)	(d) = (b) x (c)
X	9,750	5	48,750
Y	7,800	4	31,200
Z	7,800	6.5	<u>50,700</u>
Total available hrs. for budgeted production			1,30,650

(2) Maximum Sales Quantities of Products (under improved market conditions)

Products	Units	Increase in percentage	Total number of units
X	9,750	20	11,700
Y	7,800	25	9,750 x 4 = 39,000
Z	7,800	25	9,750x6.5= <u>63,375</u>
Required hours for Y+Z			1,02,375
Hours available for X : 1,30,650 – 1,02,375			= 28,275
∴ Production for X 28,275 ÷ 5			= 5655 units

Answer : 3(b)

The Section process will be based on optimization of contribution in relation to constraint.

- (i) Unit contribution
- (ii) P/V or C/S ratio
- (iii) Contribution per Kg of RM
- (iv) Contribution per machine hour.

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4. a) A company is organized into two divisions, namely X and Y, and produces three products A, B and C. Data per unit are :

	A	B	C
Market price (Rs.)	240	230	200
Variable costs (Rs)	168	120	140
Direct Labour (hours)	4	5	3
Maximum sales potential (units)	1600	1000	600

Division Y has a demand for 600 units of product B for its use. If Division X cannot supply the requirement, Division Y can buy a similar product from market at Rs. 224 per unit.

Required :

What should be the transfer price of 600 units of B for Division Y, if the total direct labour-hours available in Division X are restricted to 15000 ?

8

Answer : 4(a)

Particulars	Product		
	A	B	C
Market price (Rs.)	240	230	200
Less : Variable costs (Rs.)	168	120	140
Contribution p.u (i)	72	110	60
Direct labour hours p.u. (ii)	4	5	3
Contribution per D.L.H. (i)/(ii)	18	22	20
Rank	III	I	II

Production	Max. Sales	Hrs/Unit	Production	Hours used	Balance hours
A	1000	5	1000	5000	10000
B	600	3	600	1800	8200
C	1600	4	1600	6400	1800

Spare hours available in Division X = 1800 hrs

Division X can produce Product B in 1800 spare hours

= 1800 hrs/5 hrs. pu = 360 units of product B

Balance units of Products B required by Division Y = 600 units – 360 units = 240 units

Labour hours required for 240 units of Product B = 240 units x 5 hrs. per unit = 1200 hours.

Opportunity contribution of A per hr. = Rs. 18

Calculation of Minimum Transfer Price p.u.			Rs.
Variable cost	(600 units ×Rs. 120)		72000
Opportunity cost of contribution lost	(1200 hrs×Rs. 18)		<u>21600</u>
Amount to be recovered			93600
Transfer price p.u.	(Rs.)	(Rs. 93600 / 600 units)	156

- (b) Prism Ltd. has decided to adopt JIT policy for materials. The following effects of JIT policy are identified :**

- (i) **To implement JIT, the company has to modify its production and material receipt facilities at a capital cost of Rs. 2,00,000. The new machine will require a cash operating cost Rs. 2,16,000 p.a. The capital cost will be depreciated**

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over 10 years.

- (ii) Raw material stockholding will be reduced from Rs. 40,00,000 to Rs. 15,00,000.
- (iii) The company can earn 12% on its long-term investments.
- (iv) The company can avoid rental expenditure on storage facilities amounting to Rs. 66,000 per annum. Property Taxes and Insurance amounting to Rs. 44,000 will be saved due to JIT programme.
- (v) Presently there are 7 workers in the Store department at a salary of Rs. 10,000 each per month. After implementing JIT scheme, only 4 workers will be required in this department. Balance 3 workers' employment will be terminated.
- (vi) Due to receipt of smaller lots of Raw Materials, there will be some disruption of production. The costs of stockouts are estimated at Rs. 1,54,000 per annum.
- (vii) Since the supplier is new having no reputation as yet in the market, an additional inspection cost of Rs. 12,000 p.a. has to be incurred.

Required :

Determine the financial impact of the JIT policy. Is it advisable for the company to implement JIT system ? **6+2= 8**

Answer :4(b)

(b) Cost-Benefit Analysis of JIT policy.

Costs	Rs.	Benefits	Rs.
Interest on capital for	24000	Interest on investment on released funds	300000
modifying production facilities (Rs. 2,00,000 x 12%)		(Rs. 40,00,000 – Rs. 15,00,000) x 12%	
Operating Costs of new production facilities	216000	Saving in salary of 3 workers terminated	360000
Depreciation of new production facilities	Nil	(Rs. 10,000 x 12 months x 3)	66000
Stock-Outs costs (given)	154000	Saving in rental Expenditure	44000
Inspection cost	12000	Saving in Property Tax & Insurance	
Net benefit due to JIT policy	364000		
Total	770000	Total	770000

Conclusion : The JIT policy may be implemented, as there is a Net Benefit of Rs. 82000 per annum.

Note : Depreciation, being apportionment of non-cash capital cost, is ignored in decision-making. Tax saving on Depreciation is not considered in the above analysis.

- 5. (a) One kilogram of product 'K' requires two chemical A and B. The following were the details of product 'K' for the month of June 2018 :**
- (i) Standard mix ratio is 1:1

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- (ii) Standard price per kilogram of chemical 'A' Rs. 12 and chemical 'B' Rs. 15.
- (iii) Actual input of chemical 'B' 70 kilograms
- (iv) Actual price per kilogram of Chemical 'A' Rs. 15
- (v) Standard normal loss 10% of total input.
- (vi) Materials cost variance total Rs. 650 adverse and the same was fully attributable to Chemical 'B'.
- (vii) Materials yield variance total Rs. 135 adverse.

Required :

Compute all missing variances and complete the Variance Report.

6+4=10

Answer : 5(a)

	SPSQ	SPRSQ	SPAQ	AQAP
A	12*?	12*?	12*?	?*15
B	15*?	15*?	15*70	70*?

- 1) Let the total actual input be X kgs. Therefore applying the Standard Mix Ratio, the Revised Standard Quantity of Chemicals A and B each would be 0.5 kgs.
- 2) Total YIELD VARIANCE of 135 adverse can be split according to the ratio of SPSQ. Since inputs are equal the ratio will be that of price i.e. 4:5. Hence YIELD VARIANCE of A is 60 Adverse and B is Rs. 75 Adverse. Substituting yield variance we get SQ of A & B each as 50 kgs.
 $A = 12*(SQ - 0.5X) = -60$ $SQ - 0.5X = .5$ $SQ = 0.5X - 5$
 Similarly for B $SQ = 0.5X - 5$
- 3) total actual input = X kgs. : Actual input of A = (X-70)
- 4) Material Cost Variance of A = Nil (i.e. SPSQ-AQAP)=0
 i.e., $12*(0.5X-5) - 15*(X-70)$
 Solving this $X = 110$

Therefore, Revised Standard Quantity of A and B each is 55 kg and Standard Quantity of A and B each is 50 Kgs.

Material cost variance of B = Rs. 650 Adverse

i.e. $(15*50) - 70*AP = -650 \therefore 750 - 70AP = -650, 70AP = 1400, AP = 20$

The final variance report is as follows

	SPSQ	SPRSQ	SPAQ	AQAP
A	600	660	480	600
B	750	825	1050	1400
Total	1350	1485	1530	2000

	Yield	Mix Variance	Usage Variance	Price Variance	Cost Variance
A	60A	180F	120F	120A	0
B	75A	225A	300A	350A	650A
Total	135A	45A	180A	470A	650A

(b) For a machine the financial data are given below :

Time (Year)	0	1	2	3	4
Outlay (Rs)	5000				
Operating Costs (Rs)		1400	1500	1600	1700
Maintenance (Rs.)			300	400	500

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Value if scrapped (Rs.)		3400	2000	800	600
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The appropriate interest rate is 12% p.a. and the discount factor is as follows :

Year	0	1	2	3	4
12% Disc. Factor	1	0.893	0.797	0.712	0.636

Required :

Determine the optimal length of replacement cycle.

4+2=6

Answer : 5(b)

Year	0	1	2	3	4	Present Value	Annuity Factor	Average PV
12% Disc Factor	1	0.893	0.797	0.712	0.636			
1	-5000	2000				3214	0.893	3599
2	-5000	-1400	200			6091	1.69	3604
3	-5000	-1400	-1800	-1200		8539	2.402	3555
4	-5000	-1400	-1800	-2000	-1600	10126	3.038	3333

Decision: Better to replace at the end of year 4 as the average present value is the lowest.

6. (a) The following is the information regarding turnover and quality cost of a company.
- (i) Sales revenue Rs. 10,000,000 ; net income Rs. 10,00,000
 - (ii) During the year, customers returned 30000 units needing repair. Repair cost averages Rs. 7 per unit.
 - (iii) Six inspector are employed, each earning an annual salary of Rs. 25,000. These six inspectors are involved only with final section (Production acceptance).
 - (iv) Total scrap is 30000 units. All scrap is quality related. The cost of scrap is about Rs. 15 per unit.
 - (v) Each year, approximately 150000 units are rejected in final inspection. Of these units, 80 per cent can be recovered through rework. The cost of rework is Rs. 3.00 per unit.
 - (vi) A customer cancelled an order that would have increased the profits by Rs. 2,50,000. The customer's reason for cancellation was poor product performance. The accounting and marketing departments agree that the company loses at least this much during the year for the same reason.
 - (vii) The company employs five full time employees in its complaint department. Each earns Rs. 20,000 a year.
 - (viii) The company gave sales allowances totaling Rs. 1,30,000 due to substandard products being sent to the customer.
 - (ix) The company requires all new employees to take in three hour Quality-Training programme. The estimated cost for the programme is Rs. 80,000.
 - (x) Inspection of the final product requires testing equipment. The annual cost operating and manufacturing this equipment is Rs. 1,20,000.

Required :

Prepare a simple quality cost report classifying costs by rational category.

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Answer : 6(a) Quality Cost Report

	<u>Quality Costs</u>	<u>Percentage of sales</u>
i) <u>Prevention costs</u>		
Quality training	80,000	0.8%

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ii) <u>Appraisal costs</u> :		
Product inspection	150,000	
Test equipment	<u>120,000</u>	
	<u>270,000</u>	2.7%
iii) <u>Internal failure costs</u> :		
Scrap	450,000	
Rework	<u>360,000</u>	
	<u>810,000</u>	8.1%
iv) <u>External failure costs</u> :		
Repair	210,000	
Order cancellation	250,000	
Customer complaints	100,000	
Sales allowance	<u>130,000</u>	
	<u>690,000</u>	6.9%
Total quality costs (i to iv)	1,850,000	8.5%

(b) The following was the pattern for demand of cars rented out by a tourist operator observed for 100 days :

No. of cars	5	7	10	15
No. of days	20	30	40	10

The random numbers are 88, 76, 10, 05, 23

Required :

(i) Simulate the demand for cars over five days.

(ii) How many cars should the operator have in order to have at least 75% probability of fulfilling the demand based on your simulated results ? 5+3=8

Answer : 6(b)

No. of cars	No. of Days	Probability	Cumulative Prob	Random No. Interval	Day	Random No.	Demand
5	20	0.20	0.20	00-19	1	88	10
7	30	0.30	0.50	20-49	2	76	10
10	40	0.40	0.90	50-89	3	10	5
15	10	0.10	1.00	90-99	4	05	5
					5	23	7
		(1)		(1)		(1)	(a)

(i) For 75% or more probability, we need more than 3 days when demand is fulfilled i.e. $3/5 = 60\%$. Therefore at least 4 days' demand is fulfilled.

(ii) In this case, 10 cars when there is a 100% chance of all demand being fulfilled based on simulated results.

7. (a) Given the following information regarding a project and the time duration of each activity :

Activity	Preceding activity	Normal Time (days)
A	-	16
B	-	20
C	A	8
D	A	10
E	B,C	6

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F	D,E	12
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Required :

- (i) Draw the activity network of the project.
- (ii) Find critical path and duration of the project.
- (iii) Find the total float and free-float for each activity. $2+2+4 = 8$

(b) Coffee provider is made by a shop by blending different flavours of coffee seeds. 520 gms of Plantation A seeds and 510 gms of Plantation B seeds are ground to yield 1000 gms of Special Blend power. 520 gms of Peaberry seeds and 560 gms of Plantation A seeds are ground to yield 1050 gms of Special Peaberry powder. 500 gms of Plantation B seeds and 510 gms of Robusta seeds are ground to get 980 gms of Normal Blend powder. The contribution per kg of Special Blend, Special Peaberry and Normal Blend are Rs. 100, 120 and 140 respectively. The following stock are available for the production period:

Plantation A : 200 kgs ; Plantation B : 300 kgs ; Peaberry : 250 kgs ; Robusta : 51 kgs.
Grinding capacity on a total is limited to 500 kgs of output in a production period.

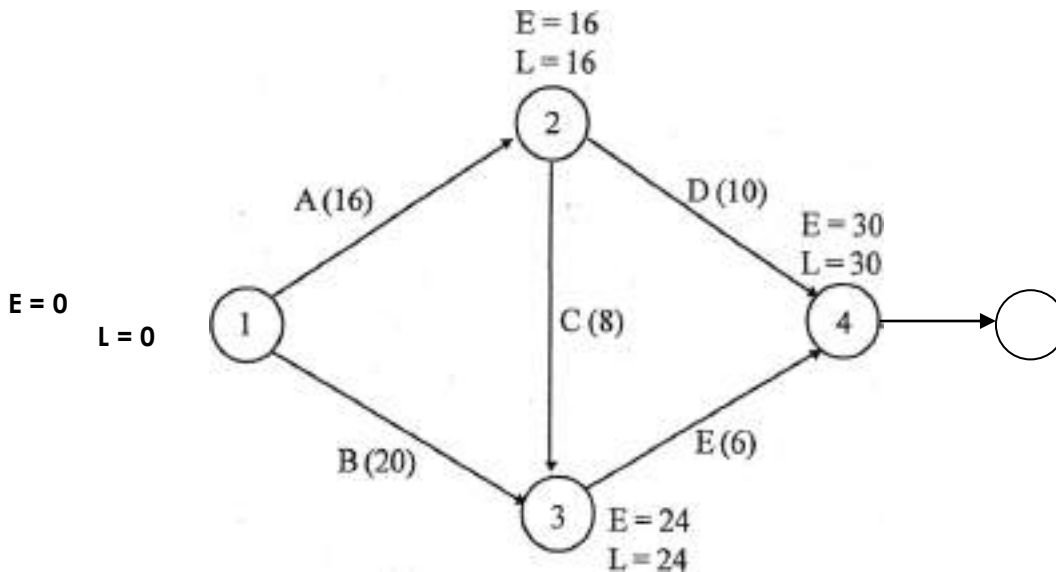
Required :

Formulate the above as a linear programme with the objective to maximize contribution. Identify the variables and give the constraints. (Consider 1000 gms = 1 kg).

8

Answer : 7(a)

- (i) The network for the given problem



$$A \rightarrow D \rightarrow F = 16 + 10 + 12 = 38$$

$$B \rightarrow E \rightarrow F = 20 + 6 + 12 = 38$$

- (ii) $A - C - E - F = 16 + 8 + 6 + 12 = 42$ days (Critical path)
- (iii) Total float and free float for each activity.

Activity	Normal time (Days)	EST	EFT	LST	LFT	Total Float	Free Float
A	16	0	16	0	16	0	0
B	20	0	20	4	24	4	4

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C	8	16	24	16	24	0	0
D	10	16	26	20	30	4	4
E	6	24	30	24	30	0	0
F	12	30	42	30	42	0	0

Answer : 7(b)

Let x, y and z be the no. of kgs of Special Blend, Special Peaberry and Normal Blend respectively to be produced in the production period.

Then, Objective fn : $\text{Max } Z = 100x + 120y + 140z$

The following are resources per kg of output :

	x	Y	Z	Availability
Plantation A	520 / 1000	560/1050		200
Plantation B	510 / 1000		500/980	300
Peaberry		520/1050		250
Robusta			510/980	51

Resource constraint :

$$\frac{520}{1000}x + \frac{560}{1050}y \leq 200$$

$$\frac{510}{1000}x + \frac{500}{980}z \leq 300$$

$$\frac{520}{1050}y \leq 250$$

$$\frac{510}{980}z \leq 51$$

Production Capacity : $x + y + z \leq 500$

$x, y, z \geq 0$

8. Write short notes on any four of the following :

4×4=16

(a) Business Process Re-engineering

(b) Assignment

(c) Features of Target Costing

(d) Differences between Standard Costing and Kaizen Costing

(e) Methods of Solving Transportation Problem.

Answer : 8(a)

Business Process Re-engineering (BPR) refers to fundamental rethinking and redesign of business processes to achieve improvement in critical measures of performance such as cost, quality, service, speed and customer satisfaction. In contrast, the concept of Kaizen, which involves small, incremental steps towards gradual improvement, re-engineering involves a giant leap. It is the complete redesign of a process with an emphasis on finding creative new way to accomplish an objective. It has been described as taking a blank piece of paper and starting from scratch to redesign a

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business process. Rather than searching continually for minute improvement, reengineering involves a radical shift in thinking about how an objective should be met. Re-engineering prescribes radical, quick and significant change. Admittedly, it can entail high risks, but it can also bring big rewards. These benefits are most dramatic, when new models are discovered for conducting business.

Answer : 8(b)

Assignment is a special linear programming problem. There are many situations where the assignment of people or machines etc. may be called for. Assignment of workers to machines, clerks to various check-out counters, salesmen to different sales areas are typical examples of these. The Assignment is a problem because people possess varying abilities for performing different jobs and therefore the costs of performing jobs by different people are different. Thus, in an assignment problem, the question is how the assignments should be made in order that the total cost involved is minimized.

The following are the methods of solving an assignment problem. They are:

- (1) Complete Enumeration Method
- (2) Simplex Method
- (3) Transportation Method and
- (4) Hungarian Method

Answer : 8(c)

Target Costing is defined as "a structured approach in determining the cost at which a proposed product with specified functionality and quality must be produced, to generate a desired level of profitability at its anticipated selling price." The main features or practices followed in Target Costing are:

- Step 1: Identify the market requirements as regards design, utility and need for a new product or improvements of existing product.
- Step 2: Set Target Selling Price based on customer expectations and sales forecasts.
- Step 3: Set Target Production Volumes based on relationships between price and volume.
- Step 4: Establish Target Profit Margin for each product, based on the company's long term profit objectives, projected volumes, and course of action, etc.
- Step 5: Set Target Cost (or Allowable cost) per unit, for each product. Target cost = Target selling price less Target profit margin
- Step 6: Determine Current Cost of producing the new product, based on available resources and conditions.
- Step 7: Set cost reduction Target in order to reduce the Current Cost to the Target Cost.
- Step 8: Analyze the Cost Reduction Target into various components and identify cost reduction opportunities using Value Engineering (VE) and Value Analysis (VA) and Activity Based Costing (ABC)
- Step 9: Achieve cost reduction and Target profit by Effective Implementation of Cost Reduction decisions
- Step 10: Focus on further possibilities of cost reduction ie Continuous Improvement program.

Answer : 8(d)

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Basis of difference	Standard costing	Kaizen Costing
Concepts	It is used for cost control	It is used for cost reduction.
	It is assumed that current manufacturing conditions remain unchanged.	It assumes continuous improvement.
	The cost focus is on standard costs based on static conditions	The cost focus is on actual costs assuming dynamic conditions
	The aim is to meet cost performance standards	The aim is to achieve cost reduction targets.
Techniques	Standards are set every six or twelve months	Cost reduction targets are set and applied monthly
	Costs are controlled using variance analysis based on standard and actual costs.	Costs are reduced by implementing continuous improvement (kaizen) to attain the target profit or to reduce the gap between target and estimated profit.
	Management should investigate and respond when standards are not met.	Management should investigate and respond when target kaizen amount are not attained.
Employees	They are often viewed as the cause of problems	They are viewed as the source of, and are empowered to find, the solutions.

Answer : 8(e)

The following are the methods of solving transportation problem:

1. The North-West corner rule
2. Least Cost Method
3. Vogel's Approximation Method

1. North West Corner Method (NWCM):

The simplest of the procedures used to generate an initial feasible solution is NWCM. It is so called because we begin with the north west or upper left corner cell of our transportation table. Various steps of this method can be summarized as under:

Step 1: Select the north west (upper left-hand) corner cell of the transportation table and allocate as many units as possible equal to the minimum between available supply and demand requirement, i.e., min

Step 2: Adjust the supply and demand numbers in the respective rows and columns allocation.

Step 3:

(a) If the supply for the first row is exhausted, then move down to the first cell in the second row and first column and go to step 2.

(b) If the demand for the first column is satisfied, then move horizontally to the next cell in the second column and first row and go to step 2.

Step 4: If for any cell, supply equals demand, then the next allocation can be made in cell either in the next row or column.

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Step 5: Continue the procedure until the total available quantity is fully allocated to the cells required.

2. Least Cost Method

The allocation according to this method is very useful as it takes into consideration the lowest cost and therefore, reduces the computation as well as the amount of time necessary to arrive at the optimum Solution. Various steps of this method can be summarized as under:

Step 1:

(a) Select the cell with the lowest transportation cost among all the rows or columns of the transportation table.

(b) If the minimum cost is not unique, then select arbitrarily any cell with this minimum cost.

Step 2: Allocate as many units as possible to the cell determined in step 1 and eliminate that row (column) in which either supply is exhausted or demand is satisfied.

Step 3:

Repeat steps 1 and 2 for the reduced table until the entire supply at different factories is exhausted to satisfy the demand at different warehouses

3. Vogel's Approximation Method

This method is preferred over the other two methods because the initial basic feasible solution obtained is either optimum or very close to the optimum solution. Therefore, the amount of time required to arrive at the optimum solution is greatly reduced. Various steps of this method are summarized as under:

Step 1: Compute a penalty for each row and column in the transportation table. The penalty for a given row and column is merely the difference between the smallest element and the next smallest element in that particular row or column.

Step 2: Identify the row or column with the largest penalty. In this identified row or column, choose the cell which has the smallest cost and allocate the maximum possible quantity to the lowest cost cell in that row or column so as to exhaust either the supply at a particular source or satisfy demand at a warehouse.

If a tie occurs in the penalties, select that row/column which has minimum cost. If there is a tie in the minimum cost also, select that row/column which will have maximum possible assignments. It will considerably reduce computational work.

Step 3: Reduce the row supply or the column demand by the amount assigned to the cell.

Step 4: If the row supply is now zero, eliminate the row, if the column demand is now zero, eliminate the column, if both the row supply and the column demand are zero, eliminate both the row and column.

Step 5: Re-compute the row and column difference for the reduced transportation table, omitting rows or columns crossed out in the preceding step.

Step 6: Repeat the above procedure until the entire supply at factories is exhausted to satisfy demand at different warehouses.

FINAL EXAMINATION

GROUP III

(SYLLABUS 2016)

SUGGESTED ANSWERS TO QUESTIONS

JUNE 2019

Paper- 15: STRATEGIC COST MANAGEMENT – DECISION MAKING

Time Allowed: 3 Hours

Full Marks :100

The figures in the margin on the right side indicate full marks.

Section – A

1. Choose the most appropriate answer to the following questions giving justification: 2x10=20

(i) XYZ Ltd. has the following alternative planned activity levels.

Level	E	F	G
Total cost	₹ 1,00,000	₹ 1,50,000	₹ 2,00,000
No. of units produced	5000	10000	15000

If fixed overhead remains constant, then fixed overhead cost per unit at Level E is

- (A) ₹ 20
(B) ₹15
(C) ₹ 13-33
(D) ₹ 10

(ii) T Ltd. produces and sells a product. The company expects the following revenues and costs in 2018:

Revenues (400 sets sold @ ₹600 per product)	₹ 2,40,000
Variable costs	₹1,60,000
Fixed costs	₹50,000

What amount of sales must T Ltd. have to earn a target net income of ₹ 63,000 if they have a tax rate of 30%?

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- (A) ₹ 4,20,000
- (B) ₹ 4,29,000
- (C) ₹ 3,00,000
- (D) ₹ 4,89,000

(iii) Excel Products Ltd. manufactures four products e.g. Product E, Product F, Product G and Product H using same raw materials. The input requirements for Products E, F, G and H are 1kg, 2kgs, 5kgs and 7kgs, respectively. Product-wise Selling Price and Variable Cost data are given hereunder:

Products	E	F	G	H
Selling Price (₹)	100	150	200	300
Variable Cost (₹)	50	70	100	125

Assuming raw material availability is a limiting factor, the correct ranking of the products would be:

- (A) E, F, G & H
- (B) E, F, H & G
- (C) F, E, G & H
- (D) F,E,H&G

(iv) S Ltd. recently sold an order of 50 units having the following costs:

	₹
Direct materials	1,500
Direct labour (1000 hours @ ₹ 8-50)	8,500
Variable overhead (1000 hours @ ₹ 4-00) ¹	4,000
Fixed overhead ²	<u>1,400</u>
	<u>15,400</u>

¹ Allocated on the basis of direct labour-hours.

² Allocated at the rate of 10% of variable cost.

The company has now been requested to prepare a bid for 150 units of the same product.

If an 80% learning curve is applicable, Stone Isle's total cost on this order would be

- (A) ₹ 38,500
- (B) ₹ 37,950
- (C) ₹ 26,400
- (D) ₹ 31,790

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- (v) A company manufactures and sells packaging machines. It recently introduced activity-based costing to refine its existing system. Each packaging machine requires direct materials costs of ₹ 50,000; 50 equipment parts; 12 machine hours; 15 assembly line hours and 4 inspection hours. The details about the cost pools, allocation bases and allocation rates are given below:

<i>Indirect cost pool</i>	<i>Cost allocation base</i>	<i>Budgeted allocation rate</i>
Material handling	No. of component parts	₹ 8 per part
Machining	Machine hours	₹ 68 per machine hour
Assembly	Assembly line hours	₹ 75 per assembly hour
Inspection	Inspection hours	₹ 104 per inspection hour

The company has received an order for 40 can-packaging machines from a customer. Using activity-based costing, indirect costs allocated to the order of the customer would be:

- (A) ₹ 1,30,850
(B) ₹ 1,25,280
(C) ₹ 1,15,050
(D) ₹ 1,10,280
- (vi) AB Ltd. uses standard cost system. The following information pertains to direct labour for Product X for the month of March, 2019:

Standard rate per hour	₹ 8
Actual rate per hour	₹ 8.40
Standard hours allowed for actual production	2000 hours
Labour Efficiency variance	₹ 1,600 (Adverse)

What were the actual hours worked?

- (A) 1,800
(B) 1,810
(C) 2,200
(D) 2,190
- (vii) X Ltd. has 1000 units of an obsolete item which are carried in inventory at the original price of ₹ 50,000. If these items are reworked for ₹ 20,000, they can be sold for ₹ 36,000. Alternatively, they can be sold as a scrap for ₹ 6,000 in the market. In a decision model used to analyse the reworking proposal, the opportunity cost should be taken as
- (A) ₹ 16,000
(B) ₹ 6,000
(C) ₹ 30,000
(D) ₹ 20,000

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(viii) Uniform Costing may *not* be successfully applied in the following case:

- (A) In a single enterprise having a number of branches, each of which manufactures the same set of products with the same facilities.
- (B) In a number of entities in the same industry bound by a trade association.
- (C) In a number of units across different geographical locations manufacturing one or more of a given set of products.
- (D) In different branches of the same company, each branch making a different product using a unique process.

(ix) Which of the following is a valid constraint for a linear programming problem?

- (A) $3x^2 + 4x + 1 = 0$
- (B) $5x_1 + 2x_2 \leq 10$
- (C) $4x_x + 3x_2 > 7$
- (D) $(12x_1 + 4x_2)/3x_2 \leq 8x_1$

(x) The shadow price of skilled labour for SD Ltd. is currently ₹10 per hour. What does this mean?

- (A) The cost of obtaining additional skilled labour is ₹10 per hour.
- (B) There is a hidden cost of ₹10 for each hour of skilled labour actively worked.
- (C) Contribution will be increased by ₹10 per hour for each extra hour of skilled labour that can be obtained.
- (D) The total costs will be reduced by ₹10 for each additional hour of skilled labour that can be obtained.

Answer:

1.

(i) (D)

Change in Costs (B – A) ₹ 50,000

Change in Units (B – A) ₹ 5,000

VC per unit = ₹50,000 ÷ 5,000 = ₹ 10

Total Cost at A ₹ 1,00,000

VC : 5,000 × ₹ 10 50,000

Total FC ₹ 50,000 ÷ 5,000 units

= ₹ 10 per unit

(ii) (A)

$$\text{Required Sales} = \frac{\text{FC} + \frac{\text{Desired Profit}}{1 - \text{tax rate}}}{\frac{\text{Contribution}}{\text{Sales}}}$$

$$= \frac{\text{₹ } 50,000 + 90,000}{1/3} = \text{₹ } 4,20,000$$

Suggested Answer_Syl16_June2019_Paper_15

(iii) (B)

Ranking of products would in order of contribution per limiting factor, in relative value.

	E	F	G	H
SP (₹)	100	150	200	300
VC (₹)	<u>50</u>	<u>70</u>	<u>100</u>	<u>125</u>
Contribution per unit	50	80	100	175
RM/unit (kg)	1	2	5	7
Contribution per kg of RM (₹)	50	40	20	25
Rank	1	2	4	3

∴ Correct Order of ranking : E, F, H & G

(iv) (C)

Cumulative hours $200 \times (20 \times 0.8 \times 0.8) = 2560$

Less: $50 \times 20 = 1000$

Net hours for 150 units = 1560

Cost : Direct Materials $150 \times 30 = 4,500$

Direct Labour $1560 \times 8.50 = 13,260$

Variable Overhead $1560 \times 4 = 6,240$

Total Variable Cost = 24,000

Allocated Fixed OH = 10% = 2400

Estimated Cost of the Order = 26,400

(v) (D)

Indirect costs per machine: ₹

Material handling ₹ $8 \times 50 = 400$

Machining ₹ $68 \times 12 = 816$

Assembly ₹ $75 \times 15 = 1,125$

Inspection ₹ $104 \times 4 = \underline{416}$

₹2,757

For the order: ₹ $2,757 \times 40 = ₹ 1,10,280$

(vi) (C)

Labour Efficiency Variance = $(ST - AT) \times SR$

or, $(2,000 - AT) \times ₹ 8 = (-) ₹ 1,600$

or, $AT = 7,600 \div 8 = \underline{2,200 \text{ hours}}$

Suggested Answer_Syl16_June2019_Paper_15

(vii) (B)

Original price is not relevant

Rework income	₹ 36,000
Less: Cost of rework	₹ 20,000
Net inflow	₹ 16,000, it is relevant

The other alternative relevant cash flow is from sale as scrap = ₹6,000

Hence the opportunity cost is ₹6,000

(viii) (D)

Though the entity is the same, different products using different (unique) process cannot follow uniform costing.

(ix) (B)

Other options do not conform to linearity or fundamental of constraints.

(x) (C)

A shadow price for a scarce resource is its opportunity cost. It is the amount of contribution that would be lost if one unit less of that resource were available. It is similarly the amount of additional contribution that would be earned if one unit more of that resource were available. (This is on the assumption that the scarce resource is available at its normal variable cost).

Section-B

Answer any five questions.

16x5=80

Each Question carries 16 marks.

2. (a) A toy manufacturing company produces different models of toy. The budget in respect of a model for the month of March, 2019 is as under:

			(₹lakhs)
Budgeted output	40000 units		
Variable costs:			
	Materials	528	
	Labour	104	
	Direct expenses	248	880
		<hr/>	
Fixed costs:			
	Specific fixed costs	180	
	Allocated fixed costs	225	405
		<hr/>	
Total costs			1285
Add: Profit			115
Sales			1400
			<hr/>

Suggested Answer_Syl16_June2019_Paper_15

Required:

- (i) Calculate profit with 10% increase in selling price with a 10% reduction in sales volume.
- (ii) Determine volume to be achieved to maintain the original profit after a 10% rise in material costs, at the originally budgeted selling price per unit.
- (b) SRM Ltd. manufactures and sells a single product X whose selling price is ₹ 80 per unit and the variable cost is ₹ 32 per unit.
- (i) Assume that for first year fixed costs are ₹ 9,60,000 and the annual sales are at 60% margin of safety.
- (ii) For second year, it is proposed to add another product line Y whose selling price would be ₹ 100 per unit and the variable cost ₹ 20 per unit. The total fixed costs are estimated at ₹ 13,33,200. The sales mix of X : Y would be 7 : 3 based on value.

Required:

- (I) For the first year, calculate the rate of net return on sales, assuming an income tax level of 30%.
- (II) For second year, at what level of sales would SRM Ltd. break even? Give separately for both X and Y the break even sales in rupees and quantities.

(4+2)+(5+5)=16

Answer:

2. (a)

(i) Present selling price	₹ 14001akhs/40,000 units	3500
Add: 10% Increase		<u>350</u>
Revised selling price		₹ 3850
Present sales volume		40,000 units
Less: 10% Decrease		<u>4000</u>
Revised sales volume		36,000 units
Revised sales revenue = 36,000 × ₹3,850 = ₹1386 lakhs		
Total variable cost/unit: Material + Labour + Direct expense		
	1320 + 260 + 620 = ₹2200	
Profitability statement:		
Sales		1386
Less: Variable costs (36000 units × ₹2,200)		<u>792</u>
Contribution		594
Less: Fixed costs		<u>405</u>
Profit		₹ 189 lakhs

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- (ii) Total variable cost/unit: Material + Labour + Direct expense

$$1452 + 260 + 620 = ₹2,332$$

Calculation of sales to be achieved to maintain the original profit of ₹115 lakhs:

Selling price	3500
Less: Variable costs	<u>2332</u>
Contribution per unit	1168

Desired sales = (Fixed cost + Desired profit)/Contribution p.u.

$$= (405 \text{ lakhs} + 115 \text{ lakhs})/1168 \text{ p.u} = 44,521 \text{ units}$$

2. (b)

- (i) Contribution per unit = SP-VC = ₹(80 - 32) = ₹48

$$\text{Break-even Point} = 960000/48 = 20,000 \text{ units}$$

Percentage Margin of Safety = (Actual Sales – Break-even Sales)/Actual Sales

Or, 60%

$$= (\text{Actual Sales} - 20,000 \text{ units})/\text{Actual Sales}$$

Actual Sales = 50,000 units

₹

Sales value (50,000 units x ₹80)	40,00,000
Less: Variable costs (50,000 units x ₹32)	16,00,000
Contribution	24,00,000
Less: Fixed cost	9,60,000
Profit	14,40,000
Less: Income Tax @30%	4,32,000
Net Return	10,08,000

$$\text{Rate of net return on sales} = (10,08,000/40,00,000) \times 100 = 25.2\%$$

- (ii) Products

	X (₹)	Y (₹)
Selling price per unit	80	100
Variable cost per unit	32	20
Contribution per unit	48	80 -
Individual products contribution margin	60% (48/80) × 100	80% (80/100) × 100

Suggested Answer_Syl16_June2019_Paper_15

Contribution margin (X and Y)

$$60\% \times 7/10 + 80\% \times 3/10 = 66\%$$

$$\text{Break even sales} = ₹20,20,000 \text{ (} ₹13,33,200/66\% \text{)}$$

Break even sales mix

$$X - 70\% \text{ of } 20,20,000 = ₹14,14,000 \text{ i.e. } 17,675 \text{ units}$$

$$Y - 30\% \text{ of } 20,20,000 = ₹6,06,000 \text{ i.e. } 6,060 \text{ units}$$

3. (a) Vikas Associates a firm of Chartered Accountants offers three different types of services, namely, accounting and auditing, taxation and management consultancy. Each service is charged on the basis of number of billable hours. The average charge per billable hours is ₹500. For the year ending 31.03.2019 the firm projects the following estimate of direct and indirect costs:

		₹ (Lakhs)	
Direct Costs:	Accounting and Auditing	100.00	
	Taxation	100.00	
	Management consultancy	50.00	250.00
Indirect Costs:	Planning and review	7.50	
	Computer processing	7.20	
	Professional salaries	5.60	
	Books, Seminars, periodicals	1.80	
	Programming costs	8.00	
	Building costs	4.90	
	General administration costs	15.00	50.00
	TOTAL		300.00

Until 31.03.2018 the firm has been allocating the indirect costs on the basis of billable hours. For the year ending 31.03.2019 it was decided to introduce a system of activity based costing to capture the indirect cost more accurately. The following data were gathered accordingly:

<i>Particulars</i>	<i>Accounting and Auditing</i>	<i>Taxation</i>	<i>Management Consultancy</i>
Billable hours	55000	35000	10000
EDP hours	5000	2500	500
Professionals (No)	30	16	10
Books, Seminars and periodicals (₹)	57,500	62,500	60,000
Programming hours	1250	500	2250
Building (Sqft) space occupied	8000	4000	2000
Administration (No. of clients)	150	250	100

Suggested Answer_Syl16_June2019_Paper_15

Required:

- (i) Prepare a comparative profitability statement on the basis of (A) conventional costing and (B) activity- based costing (ABC)
- (ii) Any suggestion for improving the billable charge on the basis of ABC?

- (b) AB Ltd. produces a variety of products, each having a number of component parts. Product X takes 5 hours to produce on machine no. 55 which is working at full capacity. X has a selling price of ₹ 50 and a marginal cost of ₹ 30 per unit. Y-5, a component part, could be made on the same machine in 2 hours for a marginal cost of ₹ 5 per unit. The supplier's price is ₹ 13-50 per unit.

Required:

Should AB Ltd., make or buy Y-5?

(4+4)+(3+1)+4=16

Answer:

3. (a)

SCHEDULE OF ALLOCATION OF INDIRECT COST BY ABC

₹ In lakhs

Overhead	Cost Driver		Accounting &		Management consulting
	Ratio	Total	Auditing	Taxation	
		₹	₹	₹	₹
Planning and Review	Billable Hrs	7.500	4.125	2.625	0.750
Computer Processing	EDP Hour	7.200	4.500	2.250	0.450
Professional Salaries	30:16:10	5.600	3.000	1.600	1.000
Books, Seminar, Periodicals	Actual	1.800	0.575	0.625	0.600
Programmed Costs	5:2:9	8.000	2.500	1.000	4.500
Building Costs	Sq Ft	4.900	2.800	1.400	0.700
Administration Cost	3:5:2	15.000	4.500	7.500	3.000
Total		50	22	17	11

COMPARATIVE PROFITABILITY STATEMENT (₹ in Lakhs)

	Conventional		ABC			
	A&A	Tax	MGMT	A&A	Tax	MGMT
Revenue	275.00	175.00	50.00	275.00	175.00	50.00
Direct Costs	100.00	100.00	50.00	100.00	100.00	50.00

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Overhead Cost	27.50	17.50	5.00	22.00	17.00	11.00
Profit	147.50	57.50	-5.00	153.00	58.00	-11.00

Suggestions:

On the basis of the ABC system the total cost of each division/service is ₹122 Lakhs, ₹ 117 Lakhs and ₹61 Lakhs respectively. Hence the billable charge should be revised accordingly. Assuming the same margin i.e. 40% of revenue overall or $66\frac{2}{3}\%$ on cost the revenue works out to

	A&A	Tax	Mgmt
Cost	122.00	117.00	61.00
Margin	81.33	78.00	40.67
	203.33	195.00	101.67
Billable Hours	55,000	35,000	10,000
Charge per Hour	370	560	1017

The analysis clearly reveals that Management Accountancy services are under charged

(b)

Selling Price of product X	₹ 50
Marginal cost	<u>30</u>
Contribution per unit	<u>20</u>

Contribution per machine hr. = ₹ 20 ÷ 5 = ₹ 4

For Component Y-5:	₹
Marginal cost	5 per unit
Opportunity cost : ₹ 4×2 =	<u>8</u>
Total (to make)	<u>13</u>

Supplier's price ₹ 13.50

So, AB Ltd. should make Y-5 for gain of (₹ 13.50 – 13.00)

= Re 0.50 per unit.

Suggested Answer_Syl16_June2019_Paper_15

4. (a) A company produces three products A, B and C, from a joint process. Costs and other details are given below:

Costs:	Joint Costs	Post-separation Costs		
	(₹)	A	B	C
		(₹)	(₹)	(₹)
Materials	20,000	1,500	3,500	2,000
Labour	8,000	1,000	1,000	1,500
Overhead	4,000	500	1,000	500
	32,000	3,000	5,500	4,000

Others:

Sales value (₹)	10,000	25,000	15,000
S & D Exp. (as % of sales)	20%	20%	20%
Estimated Net Profit (as % of sales)	20%	10%	20%

Required:

Prepare a statement showing the apportionment of joint costs over three products using Net Value Method.

- (b) Fifteen workers (10 Type I workers and 5 Type II workers) work in a production process during a month of 25 working days. Each Type I worker is expected to produce 8 units per day and Type II worker is expected to produce 12 units per day. They work on the regular shift from 9:00 a.m. to 5 p.m. and have a tea break between 10:30 to 10:45 a.m. and 3:00 to 3:15 p.m. and also have a lunch break from 1:00 to 1:30 p.m. The actual production was 1800 units by Type I workers and 1200 units by Type II workers. The standard wage rate per hour were ₹50 and ₹60 for Type I and Type II workers, respectively and corresponding actuals were 60 and 70, respectively. During the month, 16 hours were lost actually for both types of workers, which is also as per expectation for waiting for materials and inspection.

Required:

Calculate the following:

- Standard labour cost for the month
- Labour cost variance
- Labour efficiency variance

Suggested Answer_Syl16_June2019_Paper_15

(iv) Idle time variance

Indicate (A) or (F) to denote whether the variances are adverse or favourable.

8+(3+3+1+1)=16

Answer:

4. (a)

Statement of Allocation of Joint Costs

	A	B	C	Total
Sales (₹)	10,000	25,000	15,000	50,000
Less:				
Estimated NP	2,000	2,500	3,000	7,500
S & D Cost (20%)₹	2,000	5,000	3,000	10,000
Post-separation cost (₹)	3,000	5,500	4,000	12,500
Total	7,000	13,000	10,000	30,000
Net Value (i.e. basis of allocation)	3,000	12,000	5,000	20,000
Share of joint costs (₹)	4,800	19,200	8,000	30,000
	$\left(\frac{3}{20} \times 32,000\right)$	$\left(\frac{12}{20} \times 32,000\right)$	$\left(\frac{5}{20} \times 32,000\right)$	

4. (b)

	Type I	Type II	Total
Available/m (hrs)	10 workers x 25 days/m x 8 hrs/day (bet 9 to 5) = 2000hrs	5 workers x 25 days/m x 8hrs/day = 1000hrs	
Units per day per worker	8	12	
Hours/unit	8/8 = 1 hr/u	8 hrs/12 units = 2/3 = 0.67 hrs/unit	
Actual production (u)	1800	1200	
Std hrs for actual production	1800 x 1 = 1800	1200x2/3 = 800	
Standard rate/hr	50	60	
Std cost of	1800x50 = 90,000	800 x 60 =48,000	138,000

Suggested Answer_Syl16_June2019_Paper_15

production			
Actual hours paid	2000 hours	1000hrs	
Actual rate	60	70	
Actual cost	120,000	70,000	190,000
Labour cost variance			52,000 (A)
Efficiency variance	$(1800-2000) \times 50$ = 10,000(A)	$(800-1000) \times 60$ = 12000(A)	22,000(A)
Idle time variance (Since normal waiting and break are included in standard labour hours)	Nil	Nil	

(Standard production hours per day = 8 (normal breaks and waiting time have to be include in the standard)

No. of days per month = 25.

Standard hours per month = $25 \times 8 = 200$ hours per worker $\times 10$ workers = 2000 hours.)

5. (a) X Ltd. manufactures and sells a special component. It follows a Standard Marginal Costing system. For the year ended 31.03.2019, it produced 1500 components against a budgeted capacity of 2000 components. Out of the production 100 components were scrapped. Due to a computer virus most of the financials could not be retrieved.

However, the Chief Cost Accountant gave the following information:

Particulars	(₹)
Selling Price per component	213
Direct materials total cost	84,000
Direct labour cost per component (Actual efficiency 80%)	?
Variable Manufacturing overhead per component	15
Variable Selling overhead per component	8
Fixed Selling and Administration overheads	48,000
Fixed overhead manufacturing absorption rate per component (on the basis of budgeted capacity)	30
Closing stock (200 units) (Valued at prime cost for financial	18,000

Suggested Answer_Syl16_June2019_Paper_15

purpose)	
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Required:

- (i) Prepare the Profitability statements as per Marginal Costing, Absorption Costing and the actual Profit & Loss Account.
- (ii) Reconcile the actual profit with that of the Break-even profit under Marginal Costing.
- (b) What do you understand by Learning Curve? What are its different phases? State the possible areas of application of Learning Curve. (6+2)+(2+2+4)=16

Answer:

5. (a) (i)

(1)	Fixed Manufacturing Overheads	=	60,000
	Budgeted Capacity × Absorption Rate (2000×30)		
	Fixed administrative Overheads	=	48,000
	Total Fixed cost	=	108,000
(2)	Contribution per Unit		
	Selling		213
	Price Prime Cost		
	(Material + Labour)(18000/200)		90
	Variable Manufacturing Overhead		15
	Variable Selling Overhead		8
	Contribution/Unit		100
(3)	Break Even volume (108000/100 Units)	=	1,080 Units
(4)	Total Absorption Cost / Unit (60+30+15)	=	105
	(Materials + Labour + Variable Manufacturing OH)		
	Profit under Marginal Costing:		
	Contribution (1200×100)	=	1,20,000
	Less: Fixed Cost		1,08,000
	Profit under Marginal Costing		12,000

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Particulars	Profit under Absorption Costing	Actual P&L A/c
Sales (1200 Units × ₹213)	255,600	255,600
Cost of Goods Manufactured		
Production (1500 Units × ₹105)	202,500	202,500
Additional Labour cost	-	12,750
Less: Closing Stock(200 units x 135 p.u.) (18000 given in the question)	27,000	18,000
Less: Scrap 100 units x 135	13500	
Add: Under absorption of OH (500×30)	15,000	15,000
Add: Manufacturing Fixed OH	-	-
Total Cost of Manufacture	177,000	2,12,250
Gross Profit	78,600	43,350
Less: Fixed Administrative OH	48,000	48,000
Less: Variable Selling OH	9,600	9,600
Profit/(Loss)	21,000	(14,250)

(ii)

Reconciliation (actual P& L with Marginal Costing)

Profit at Break Even point 0

Margin of Safety +12,000

Stock Valuation -3000

(at variable cost under marginal costing $105 \times 200 = 21000$ and at 90 as per actual P and L given= 18000)

Less: Scrap (variable mfg cost 105×100) = -10,500

Less: Labour - 12,750

Actual Loss -14,250

5. (b)

Learning Curve Theory is concerned with the idea that when a new job, process or activity commences for the first time it is likely that the workforce involved will not achieve maximum efficiency immediately. Repetition of the task is likely to make the people more confident and knowledgeable and will eventually result in a more efficient and rapid operation. Gradually

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the learning process will stop after continually repeating the job. As a consequence the time to complete a task will initially decline and then stabilise once efficient working is achieved.

Cost predictions especially those relating to direct labour cost must allow for the effect of learning process. This technique is a mathematical technique. It can be very much used to accurately and graphically predict cost. It is a geometrical progression, which reveals that there is steadily decreasing cost for the accomplishment of a given repetitive operation, as the identical operation is increasingly repeated. The amount of decrease is less and less with each successive unit produced.

The cumulative average time per unit is assumed to decrease by a constant percentage every time that output doubles. Cumulative average time refers to the average time per unit for all units produced so far, from and including the first one made.

The slope of the decision curve can be expressed as a percentage. Experience curve, improvement curve and progress curve are other terms which can be synonymously used. Learning curve is essentially a measure of the experience gained in production of an article by an individual or organization. The improvement or experience gain is reflected in a decrease in man-hours or cost.

Phases in Learning Curve

The learning curve will pass through three different phases:

In the first phase, there will be gradual increase in production rate until the maximum expected rate is reached and this phase is generally steep.

In the second phase, the learning rate will gradually deteriorate because of the limitations of equipment.

In the third phase, the production rate begins to decrease due to a reduction in customer requirements and increase in costs.

Learning curve is essentially a measure of the experience gained in production of an article by an organization. As more and more units re-produced, workers involved in production become more efficient than before.

The learning curve ratio can be calculated with the help of the following formula:

Learning curve ratio = Average labour cost of first 2 units / Average labour cost of first units

Following are the **possible areas of application of Learning Curve**:

1. Learning curve suggests great opportunities for cost reduction to be achieved by improving learning.
2. The learning curve concept suggests a basis for correct staffing in continuously expanding production. The curve shows that the work force need not be increased at the same rate as the prospective output.
3. Learning curve concept provides a means of evaluating the effectiveness of training programs.
4. Learning curve is frequently used in conjunction with establishing bid price for contracts.

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5. Learning curve is applicable in relation to the working capital required. If the requirement is based on average cumulative unit cost, the revenues from the first few units may not cover the actual expenditures.
6. It affects the rate of production by increasing.
7. Learning curve techniques are useful in exercising control. Specific or average incremental unit cost should be used for this purpose.
8. The learning curve may be used for make-or- buy decisions especially if the outside manufacturer has reached the maximum on the learning curve.

6. (a) **AB Ltd. has two manufacturing divisions, A and B, operating as profit centres. A has a production capacity of 3500 units of product A per month, but presently, it produces 2000 units for a special customer S, @ a selling price of ₹ 400 per unit (which will not accept partial supply) and 1000 units for B. S has an agreement with AB that A shall not supply to the external market at any price lower than that to S, or it can supply to the market at any price after discontinuing supplies to S. Division B does some further work on A, incurs a variable processing cost of ₹220 per unit to produce its product B. The monthly fixed costs of Division A are ₹ 2,00,000. The monthly fixed costs of B are ₹ 1,50,000. Division A's raw material cost is ₹150 per unit and its variable manufacturing costs are ₹ 100 per unit. Variable selling overhead of ₹ 50 per unit of A and ₹ 70 per unit of B are incurred for sales other than transfers.**

A had been selling to the outside market at a price of ₹460 per unit. Due to competition, it has to reduce its price to ₹380 per unit on the entire supplies if it has to sell any quantity above 2000 units. At ₹380/unit, its entire output can be sold. B has an outside market price of ₹ 800 per unit and can sell up to 2500 units. If A does not supply to B, a close substitute is available in the market for purchase by B at ₹ 380, on which some additional work costing ₹ 40 per unit has to be done to make it comparable to A. Assume that B will accept partial supply from A and that both divisions have complete autonomy in deciding their strategy and they have the knowledge of costs/revenues/supply conditions in each other's divisions.

Required:

Using figures relevant for the following questions and calculations for the monthly period:

- (i) Find out the optimal strategy for A - how much to produce each month, how much to supply to external market and how much to supply to B and at what minimum cost to maximize its Divisional profits.
- (ii) What would be the range of transfer price per unit and the quantity that Manager of A will try to successfully negotiate with the Manager of B?
- (iii) What would be the range of transfer price that the Manager of B would consider to negotiate with A?
- (iv) As the top management person, what would you quote as the appropriate transfer price to be fair to A and B in their performance evaluation?

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(b) Briefly state the significance of Margin of Safety in management decisions.

(4+4+2+2)+4=16

Answer:

6. (a)

Strategy for A:

Strategy I:

Sell 2000 units to S at 400 ₹/u and 1500 units outside @ 460 ₹/u

Contributions: $100 \times 2000 = 200,000$

Contribution (outside) $160 \times 1500 = 240,000$

Total Contribution for 3500 units 440,000

Less: Fixed Cost = 200,000

Profit 240,000

Strategy II:

Sell 1500 units to B at 380/unit and 2000 units outside at 460/u

Contribution B: $380 - 250$ excluding selling cost = $130 \times 1500 = 195,000$

Contribution outside = $160 \times 2000 = 320,000$

Total Contribution = 515,000

Less: Fixed Cost = 200,000

Profit 315,000

Selling all 3500 units only to B or only outside are less profitable than the above two options and are rejected. Select Strategy II for A.

B can get an equivalent product outside at ₹ 380, but has to incur additional costs up to ₹420. A can negotiate anything between 380 and ₹ 420

The Manager of B knows that A will save on the external sales' variable selling overhead. What is Rs. 380 for A from outside selling price ($380 - 300 = 80$) is equivalent of Rs. 330 from B (contribution = $330 - 250 = 80$).

Manager of B will negotiate between ₹330 per unit to ₹420 per unit, beyond which B will not pay.

Top Management:

At 380 transfer price, A saves Rs. 50 on selling overhead. B saves Rs. 40 on reworking. Hence, at 375, A saves Rs. 45 and B also saves Rs. 45. Hence Rs. 375 will be a fair cost.

Alternatively,

As top management, the price to be decided will be midway between 380 and 420, which is 400, equally fair to A and B.

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(b)

Significance of Margin of Safety in Management Decisions:

Margin of Safety (MOS) is the excess sales over and above the break-even sales. It is generally expressed in % form. The size of margin of safety is a very important indicator of the soundness of a business. It shows how much sales may decrease before the firms will suffer a loss. If the size of margin of safety is high, chances of incurring loss by the business will be remote but if it is low, a small reduction in sales may lead to loss. The common cause of lower margin of safety is higher fixed costs. In such a business, a high level of activity is required. A low margin of safety is a matter of concern and so the following steps may be taken to improve an unsatisfactory margin of safety:

1. Increase the selling price.
2. Reduce the fixed or variable costs or the both.
3. Increase the volume of output by utilizing the unutilized production capacity.
4. Stop production of unprofitable products and concentrate only on the profitable products.

7. (a) In the manufacturing plant of Delite Industries Ltd., four jobs can be processed on four different machines, one job on one machine. Resulting profits vary with assignments. They are given below:

		Machines			
Jobs	I	42	35	28	21
	n	30	25	20	15
	m	30	25	20	15
	IV	24	20	16	12

Required:

Find the optimum assignment of jobs to machines and the corresponding profit.

- (b) The following information are given:

Arrival of patients		Services	
Inter-arrival time (minutes)	Probability	Inter-Service time (minutes)	Probability
2	0-20	4	0-25
4	0-24	6	0-34

Suggested Answer_Syl16_June2019_Paper_15

6	0-28	8	0-26
8	0-18	10	Balance
10	Balance		

The following random number are to be used for the simulation of arrival and service patterns:

Arrival	740	225	906	048	421
Service	402	183	706	923	638

Required:

- (i) Find out the average time spent by the patient in the queue by simulation. Assume that the time starts at 6:00 a.m. and that there is only one counter and there is no time gap between finishing with one patient and starting the next patient if the next patient is already in the queue.
- (ii) A second counter is to be set up if the probability of waiting beyond 3 minutes exceeds 40% or if the average waiting time of a patient exceeds 5 minutes if there is a wait. Should the second counter be set up? Substantiate based on the simulation results. $8+(6+2)=16$

Answer:

7. (a)

Profit Matrix

0	7	14	21
12	17	22	27
12	17	22	27
18	22	26	30

Row Operation

0	7	14	21
0	5	10	15
0	5	10	15
0	4	8	12

Column Operation

Suggested Answer_Syl16_June2019_Paper_15

0	3	6	9
0	1	2	3
0	1	2	3
0	0	0	0

Improved Matrix

0	2	5	8
0	0	1	2
0	0	1	2
1	0	0	0

Further Improvement

0	2	4	7
0	0	0	1
0	0	0	1
2	1	0	0

I	-	1	-	42
II	-	2	-	25
III	-	3	-	20
IV	-	4	-	12
				99

Maximum Profit = ₹ 99

7. (b)

Arrivals				Service			
Minutes	Probability	Cumulative Probability	Random No. Interval	Minutes	Probability	Cumulative Probability	Random No. Interval
2	0.20	0.20	000-199	4	0.25	0.25	000-249
4	0.24	0.44	200-439	6	0.34	0.59	250-589

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6	0.28	0.72	440-719	8	0.26	0.85	590-849
8	0.18	0.90	720-899	10	0.15	1.00	850-999
10	0.10	1.00	900-999				

Sl. No	Random No. Arrival	Time	Entry time In queue	Service Start time	Random No For Service	Service Time	Service End Time	Waiting Time Of Patient	Idle Time Of Centre
1	740	8	6:08	6:08	402	6	6:14	-	08
2	225	4	6:12	6:14	183	4	6:18	2	-
3	906	10	6:22	6:22	706	8	6:30	-	4
4	048	2	6:24	6:30	923	10	6:40	06	-
5	421	4	6:28	6:40	638	8	6:48	12	

Probability of waiting time being more than 3 minutes = $2/5 = 40\%$

Hence is not exceeding 40%.

Average waiting time of a patient = Total of waiting time column / 3 instances of waiting
 $= 20/3 = 6.67$

Hence the second counter should be set up based on simulated results.

Note: Ideally, for best results and interpretation, simulation should be carried out a large number of times. The decision based on small numbers, tend to be unrealistic and erroneous.

8. Write short notes on any four of the following:

4×4=16

- (a) Principal Budget Factor
- (b) Lean Accounting
- (c) Differential Costs
- (d) Product Life Cycle Costing
- (e) Activity Ratio

Answer:

(a) Principal Budget Factor

The principal budget factor is the factor that limits the activities of functional budgets of the organisation.

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The early identification of this factor is important in the budgetary planning process because it indicates which budget should be prepared first. In general sales volume is the principal budget factor. So, sales budget must be prepared first, based on the available sales forecasts. All other budgets should then be linked to this.

Failure to identify the principal budget factor at an early stage could lead to delays later on when managers realize that the targets they have been working with are not feasible.

In case of one limiting factor, we shall need to apply the concept of Marginal costing. In this we initially allot the limiting resource on the basis of highest contribution per limiting factor.

Principal Budget Factor is important concept in the process of budgetary control. This is the factor the extent of whose influence must first assessed in order to ensure that the functional budgets are reasonably capable of fulfillment. A budget key factor or principal budget factor is described as - The factor which at a particular time or over a period which limit the activities of an undertaking.

The limiting factor is usually the level of demand for the products or services of the undertaking but it could be a shortage of one of the productive resources, e.g., skilled labour, raw material or machine capacity. In order to ensure that the functional budgets are reasonably capable of fulfillment the extent of the influence of this factor must first be assessed.

(b) Lean Accounting

What we now call lean manufacturing was developed by Toyota and other Japanese companies. Toyota executives claim that the famed Toyota Production System was inspired by what they learned during visits to the Ford Motor Company in the 1920s and developed by Toyota leaders such as Taiichi Ohno and consultant Shigeo Shingo after World War II. As pioneer American and European companies embraced lean manufacturing methods in the late 1980s, they discovered that lean thinking must be applied to every aspect of the company including the financial and management accounting processes.

Lean Accounting is the general term used for the changes required to a company's accounting, control, measurement, and management processes to support lean manufacturing and lean thinking. Most companies embarking on lean manufacturing soon find that their accounting processes and management methods are at odds with the lean changes they are making. The reason for this is that traditional accounting and management methods were designed to support traditional manufacturing; they are based upon mass production thinking. Lean manufacturing breaks the rules of mass production, and so the traditional accounting and management methods are (at best) unsuitable and usually actively hostile to the lean changes the company is making.

(c) Differential Accounting

The essential features of differential costs are as follows:-

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- (i) The basis data used for differential cost analysis are costs, revenue and the investment factors which are relevant in the problem for which the analysis is undertaken.
- (ii) Total differential costs rather than the costs per unit are considered.
- (iii) Differential cost analysis is made outside the accounting records.
- (iv) As the differences in the costs at two levels are considered, absolute costs at each level are not as relevant as the difference between the two. Thus, items of costs which do not change but are identical for the alternatives under consideration, are ignored.
- (v) The differentials are measured from a common base point or position.
- (vi) The stage at which the difference between the revenue and the cost is the highest, measured from the common base point, determines the choice from amongst a number of alternative actions.
- (vii) In computing differential costs, historical or standard costs may be used but they should be adjusted to the requirements of future conditions.
- (viii) The elements and items of cost to be considered in differential cost analysis will depend upon the nature of the problem and the alternatives being considered.

(d) Product Life Cycle Costing is considered important due to the following reasons

- (i) **Time based analysis:** Life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their life cycle. Costs and revenues can be analysed by time periods. The total magnitude of costs for each individual product can be reported and compared with product revenues generated in various time periods.
- (ii) **Overall Cost Analysis:** Production Costs are accounted and recognized by the routine accounting system. However non-production costs like R&D; design; marketing; distribution; customer service etc. are less visible on a product — by — product basis. Product Life Cycle Costing focuses on recognizing both production and non-production costs.
- (iii) **Pre-production costs analysis:** The development period of R&D and design is long and costly. A high percentage of total product costs may be incurred before commercial production begins. Hence; the Company needs accurate information on such costs for deciding whether to continue with the R&D or not.
- (iv) **Pre-production costs analysis:** The development period of R&D and design is long and costly. A high percentage of total product costs may be incurred before commercial production begins. Hence; the Company needs accurate information on such costs for deciding whether to continue with the R&D or not.
- (v) **Better Decision Making:** Based on a more accurate and realistic assessment of revenues and costs, at least within a particular life cycle stage, better decisions can be taken.
- (vi) **Long Run Holistic view:** Product Life Cycle Costing can promote long-term rewarding in contrast to short-term profitability rewarding. It provides an overall framework for considering total incremental costs over the entire life span of a product, which in

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turn facilitates analysis of parts of the whole where cost effectiveness might be improved.

(vii) **Life Cycle Budgeting:** Life Cycle Budgeting, i.e., Life Cycle Costing with Target Costing principles, facilitates scope for cost reduction at the design stage itself. Since costs are avoided before they are committed or locked in the Company is benefited.

(viii) **Review:** Life Cycle Costing provides scope for analysis of long term picture of product line profitability, feedback on the effectiveness of life cycle planning and cost data to clarify the economic impact of alternatives chosen in the design, engineering phase etc.

(d) Activity Ratio

It is the number of standard hours equivalent to the work produced, expressed as a percentage of the budgeted standard hours.

$$\text{Activity Ratio} = \frac{\text{Standard Hours for Actual Work}}{\text{Budgeted Standard hours}} \times 100$$

Activity ratios gauge an organization's operational efficiency and profitability. These ratios are most useful when compared to a competitor or industry to establish whether an entity's processes are favourable or unfavourable. Activity ratios can form a basis of comparison across multiple reporting periods to determine changes over time.

FINAL EXAMINATION

**GROUP - III
(SYLLABUS 2016)**

SUGGESTED ANSWERS TO QUESTIONS

DECEMBER - 2019

Paper-15 : STRATEGIC COST MANAGEMENT – DECISION MAKING

Time Allowed : 3 Hours

Full Marks : 100

The figures in the margin on the right side indicate full marks.

Section – A

1. Choose the most appropriate answer to the following questions giving justification/
reasonable workings: 2x10=20

(i) The break-even point of a manufacturing company is ₹ 1,60,000. Fixed cost is ₹ 48,000. Variable cost is ₹ 12 per unit. The PV ratio will be:

- (A) 20%
- (B) 40%
- (C) 30%
- (D) 25%

(ii) A factory has a key resource (bottleneck) of Facility A which is available for 31,300 minutes per week. The time taken by per unit of Product X and Y in Facility A are 5 minutes and 10 minutes respectively. Last week's actual output was 4750 units of product X and 650 units of Product Y. Actual factory cost was ₹ 78,250. The throughput cost for the week would be:

- (A) ₹ 75,625
- (B) ₹ 76,225
- (C) ₹ 77,875
- (D) ₹ 79,375

(iii) In a PERT network, the optimistic time for a particular activity is 9 weeks and the pessimistic time is 21 weeks. Which one of the following is the best estimate of the standard deviation for the activity?

- (A) 12
- (B) 9
- (C) 6
- (D) 2

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- (iv) The higher the actual hours worked,
- (A) The lower the capacity usage ratio.
 - (B) The higher the capacity usage ratio.
 - (C) The lower the capacity utilization ratio.
 - (D) The higher the capacity utilization ratio.
- (v) X is a factory making a certain product where learning curve ratio of 80% and 90% apply respectively for two equally paid workers, A and B
- (A) The labour cost of manufacturing the 4th product will be more for A.
 - (B) The labour cost of manufacturing the 4th product will be more for B.
 - (C) The labour cost is the same for the fourth product.
 - (D) Nothing can be said about the specific product since learning applies ratio to the average quantity of the product.
- (vi) What is the opportunity cost of making a component part in a factory given no alternative use of the capacity?
- (A) The variable manufacturing cost of the component
 - (B) The total manufacturing cost of the component
 - (C) The total variable cost of the component
 - (D) Zero
- (vii) The product of XYZ company is sold at a fixed price of ₹ 1,500 per unit. As per company's estimate, 500 units of the product is expected to be sold in the coming year. If the value of investments of the company is ₹ 15 lakh and it has a target ROI of 15%, the target cost would be:
- (A) ₹ 930
 - (B) ₹ 950
 - (C) ₹ 1050
 - (D) ₹ 1130
- (viii) Max Ltd. fixes the inter divisional transfer prices for its products on the basis of cost plus a return on investment in the division. The budget for division X for 2019 – 20 appears as under –

	₹
Fixed assets	5,00,000
Current assets	3,00,000
Debtors	2,00,000
Annual fixed cost of the division	8,00,000
Variable cost per unit of the product	10
Budgeted volume	4,00,000 units per year
Desired ROI	28%

Transfer price for division X is

- (A) ₹ 12.70
- (B) ₹ 10.70
- (C) ₹ 8.70
- (D) ₹ 14.70

Suggested Answers_Syl 2016_December 2019_Paper 15

(ix) Which of the following is not a correct match?

Activity	Cost Drivers
(A) Production scheduling	Number of production runs
(B) Despatching	No. of Despatch orders
(C) Goods receiving	Goods received order
(D) Inspection	Machine hours

(x) A manufacturing company uses two types of materials. X and Y, for manufacture of a standard product. The following information is given:

		Standard mix			Actual mix
Materials X	120	Kg. @ ₹ 5 =	₹ 600	112	Kg. @ ₹ 5 = ₹ 560
Y	80	Kg. @ ₹ 10 =	₹ 800	88	Kg. @ ₹ 10 = ₹ 880
	<u>200</u>		<u>₹ 1,400</u>	<u>200</u>	<u>₹ 1,440</u>
30% loss	60			25% loss	50
	<u>140</u>		<u>₹ 1,400</u>	<u>150</u>	<u>₹ 1,440</u>

Direct Materials Mix Variance is:

- (A) ₹ 40 (fav.)
- (B) ₹ 40 (unfav.)
- (C) ₹ 80 (fav.)
- (D) ₹ 80 (unfav.)

Answer:

1. (i) (C)

Explanation:
$$\text{BEP} = \frac{\text{FC}}{\text{P/V ratio}} = \text{P/V Ratio} = \frac{\text{FC}}{\text{BEP}} = \frac{\text{Rs. 48,000}}{1,60,000} = 30\%$$

(ii) (A)

Explanation: Cost per Factory Minute = Total Factory Cost / Minutes Available = ₹ 78,250/31,300 = ₹ 2.50
 Standard Minutes of throughput for the week = (4750 × 5) + (650 × 10) = 30,250 minutes
 Therefore, throughput Cost for the week = 30,250 × ₹ 2.50 = ₹ 75,625

(iii) (D)

Explanation: Standard Deviation equals (pessimistic time minus optimistic Time)/6 that is 21-9/6 = 2

(iv) (D)

Explanation: Capacity utilization ratio =
$$\frac{\text{Actual Hours}}{\text{Budgeted Hours}}$$

So, the capacity utilization ratio would be higher.

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(v) (B)

Explanation: The labour cost of manufacturing the 4th product will be more for B since B will take more time per unit of product.

(vi) (D)

Explanation: Opportunity cost is not an out of pocket cost. It is the benefit given up by not selecting the next best alternative. Therefore, answers A, B and C are incorrect and D is correct.

(vii) (C)

Explanation: ROI at 15% of total investment ₹ 15 lakhs = ₹ 15,00,000 × 0.15 = ₹ 2,25,000.
 Profit per unit of future output = ₹ 2,25,000/500 = ₹ 450 per unit.
 Therefore, target cost per unit = Selling Price – Profit per unit = ₹ 1,500 – ₹ 450 = ₹ 1,050 per unit.

(viii) (A)

Explanation:

	Per unit (₹)
VC	10
FC (₹ 8,00,000 ÷ 4,00,000)	2
Investment : (FA + CA + Debtors) = ₹ 10,00,000	
Return = $\frac{\text{Rs. } 10,00,000 \times 0.28}{4,00,000}$	0.70
TP for Div. X	12.70

(ix) (D)

Explanation: Inspection hours, and not machine hours, drive the cost of inspection.

(x) (B)

Explanation: A manufacturing company uses two type of Materials, X and Y, for manufacture of a standard product:

	Standard mix	Actual mix	
Materials X	120 Kg. @ ₹ 5 = ₹ 600	112 Kg. @ ₹ 5 = ₹ 560	
Y	80 Kg. @ ₹ 10 = ₹ 800	88 Kg. @ ₹ 10 = ₹ 880	
	200	200	₹ 1,440
30% loss	60	25% loss 50	
	140	150	₹ 1,440

Direct Materials Mix Variance is: ₹ 40 (unfav.)

		SP (SQ – AQ)
X	₹ 5 (120 – 112) =	₹ 40 (fav.)
Y	₹ 10 (80 – 88) =	₹ 80 (unfav.)
		₹ 40 (unfav.)

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Section – B

Answer any five questions.

Each Question carries 16 Marks.

16×5=80

2. (a) State with brief reason whether you would recommend an Activity Based Costing system in each of the following independent situations:
- A consultancy firm consisting of Lawyers, Accountants and Computer Engineers provides management consultancy services to clients.
 - Company X produces one product. The overhead costs mainly consist of Depreciation.
 - Company Z produces two different labour intensive products. The contribution per unit in both products is very high. The BEP is very low. All the work is carried on efficiently to meet target costs.
 - Company Y produces 4 different products using different production facilities.

1½×4=6

- (b) Following is the operating results of Premier hospital for the year ended 31st March 2019:

Particulars	₹
Revenue	1,13,88,000
Cost: Variable	26,28,000
Bed capacity cost (fixed) but varies with number of beds	45,30,000
Staff cost	35,10,000
Profit	7,20,000

The hospital charged each patient an average of ₹ 650 per day, had a capacity of 60 beds operated 24 hours per day for 365 days. The hospital has minimum departmental personnel requirements based on total annual patient days and following table gives the Salary to be paid.

Annual patient days	Salary (₹ in 000s)
10,000 – 14,000	32,00
14,001 – 17,000	33,80
17,001 – 23,725	35,10

Required:

- Compute the Break even patient days for the year ended 31st March, 2019.
- Compute the Break even patient days for the year ended 31st March, 2020 if the hospital capacity is raised to 80 beds. Patient demand is unknown but assume that revenue per patient and cost per patient day, cost per bed, and employee salary will remain the same as for the year ended 31st March, 2019.

6+4=10

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Answer:

2. (a) (i) ABC system uses the cost of activities as the basis for assigning cost of services to jobs which provides more accurate cost information for services. Hence ABC can be used for the consultancy firm.
- (ii) ABC is needed by organizations for product costing where there is a great diversity in product range. Since company X produces only one product, ABC is not necessary. Moreover overhead consists of mainly depreciation. ABC is not required.
- (iii) Company Z is highly labour intensive and does not have a great diversity of products. All work is carried out efficiently, hence ABC is not required. Moreover Target costs are achieved, NVA activities have already been identified and eliminated.
- (iv) There is diversity in product range which use different amounts of OH resources as different production facilities are involved. ABC improves product costing by avoiding over or under costing of products. ABC system is recommended.

(b) (i)

No of patient days operated	1,13,88,000/650	17,520
Variable Cost per patient day	26,28,000/17520	150
Contribution per patient day	650 – 150	500
Fixed Cost		
Bed Capacity cost	45,30,000	
Staff Cost – Salary	35,10,000	80,40,000
Break Even Patient days	80,40,000 / 500	16,080
Since it falls in the previous range revised fixed cost will be		
Fixed Cost		
Bed Capacity cost	45,30,000	
Staff Cost – Salary	33,80,000	79,10,000
Break Even Patient days	79,10,000/500	15,820

(ii)

Expected patient demand with 80 beds	$80 \times 365 \times 17,520 / 365 \times 60$	23,360
Existing Staff salary will return unchanged		
Fixed Cost		
Bed Capacity cost (80/60 × 45,30,000)	60,40,000	
Staff Cost – Salary	35,10,000	95,50,000
Break Even Patient days	9550000/500	19,100

Since it is in the same range there is no change in the breakeven.

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3. (a) Zenith Ltd. manufacturers tablet batteries. The company is preparing a product life cycle budget for a new type of battery. Development on the new battery is to start shortly. Estimates for the new battery are as follows:

Life cycle units manufactured and sold	2,00,000
Selling price per battery	₹ 55
Life cycle costs:	
R&D and design cost	₹ 8,00,000
Manufacturing:	
Variable cost per battery	₹ 25
Variable cost per batch	₹ 300
Battery per batch	250
Fixed costs	₹ 12,00,000
Marketing	
Variable cost per battery	₹ 3.50
Fixed costs	₹ 8,00,000
Distribution:	
Variable cost per battery	₹ 140
Battery per batch	100
Fixed costs	₹ 4,60,000
Customer service cost per battery (Variable)	₹ 1.70

Ignore the time value of money.

Required:

- (i) Calculate the budgeted life cycle operating income for the new battery.
- (ii) What percentage of the budget total product life cycle costs will be incurred by the end of the R&D and design stages?
- (iii) Company's market research department estimates that reducing price by ₹ 2.50 will increase life cycle unit sales by 8%. If unit sale increases by 8%, the company plans to increase manufacturing and distribution batch sizes by 8% as well. Assume that all variable costs per battery, per batch and fixed costs will remain the same. Should the company reduce battery price by ₹ 2.50? Show your calculations.

5+2+5=12

(b) What do you mean by Incremental cost? Is it always variable?

3+1=4

Answer:

3. (a) (i) Statement of Budgeted Life Cycle revenue and cost
Revenue (200000 × 55 = 11000000

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Costs:

Pre-manufacturing cost	₹
Research and design	8,00,000
Manufacturing Costs:	
Variable Cost (25 × 200000)	50,00,000
Batch (300 × 200000/250)	2,40,000
Fixed cost	12,00,000
Marketing Costs:	
Variable Costs (3.5 × 200000)	7,00,000
Fixed cost	8,00,000
Distribution costs	
Batch (140 × 200000/100)	2,80,000
Fixed Cost	4,60,000
Customer Service (Variable) 1.7 × 200000	3,40,000
Total cost	98,20,000
Operating Income	11,80,000

(ii)

Budgeted product life cycle costs for R&D and design	₹ 8,00,000
Total budgeted life cycle product costs	₹ 98,20,000

Percentage of budgeted product life cycle cost incurred

Till the R&D and design ₹ 8,00,000/98,20,000 = 8.14%

(iii) Statement of Revised Budgeted Life Cycle revenue and cost

Revenue (2,16,000 × 52.50) = 1,13,40,000

Costs:

Pre-manufacturing cost	₹
Research and design	8,00,000
Manufacturing Costs:	
Variable Cost (25 × 216000)	54,00,000
Batch (300 × 800)	2,40,000
Fixed cost	12,00,000
Marketing Costs:	
Variable Costs (3.5 × 216000)	7,56,000
Fixed cost	8,00,000
Distribution costs	
Batch (140 × 2000)	2,80,000
Fixed Cost	4,60,000
Customer Service (Variable) 1.7 × 216000	3,67,200
Total cost	1,03,03,200
Operating Income	10,36,800

Since profit is lower, price should not be reduced.

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(b) Incremental costs are costs that are incurred for the additional cost object with reference to the base. It could be for any additional resource or for any decision that is over and above the current scenario. It includes all costs that are incurred in addition to the existing base level. It could be fixed or variable or both.

4. XY Co. has Profit Centre Divisions X and Y, making products X and Y respectively. Each unit of Y requires one unit of X and Y can sell a maximum of 50,000 units in the external market at a selling price of ₹ 150 per unit. X has the capacity to produce 1,00,000 units of X. The variable cost per unit is 12. Fixed costs are ₹ 7,20,000. X can sell the following quantities in the external market:

Price per unit (₹)	Demand Units
18	84,000
20	76,000
22	70,000
24	64,000
26	54,000 or less

Assume no stock to build up for X or Y.

Y can purchase its requirement from the external market at ₹ 22 per unit, but has to incur a bulk transportation cost of ₹1,50,000 for any quantity, which will not be incurred on transfers from X.

Required:

- (i) Assuming no demand from Y, what will be the best strategy for X?
- (ii) What will be the minimum transfer price that X will agree to if X has to supply 50,000 units to Y? What price will Y offer as the maximum?
- (iii) If Y is acceptable to partial supplies, what will be X's best strategy under no compulsion to transfer, but with the option to transfer as many units that it wants to? What will be the quantity that X will agree to transfer and the corresponding price, assuming both divisions agree to share the benefits of transfer equally?
- (iv) What is the best strategy of the company? Will the company's overall strategy differ from the individual divisions' strategy? Compute the benefits/disadvantages/indifference between the divisional best and company best strategies.

Present relevant calculations to substantiate all your answers.

2+4+3+3+4=16

Answer:

4. Variable cost is constant at ₹ 12. Hence the value that will give the maximum contribution will be relevant.

Price per unit	Demand Units	Contbn ₹/u	Contbn Value
18	84,000	6	5,04,000
20	76,000	8	6,08,000
22	70,000	10	7,00,000
24	64,000	12	7,68,000
26	54,000	14	7,56,000

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- (i) The optimal strategy for X would be to manufacture 64000 units for external demand in the absence of demand from Y.
- (ii) If X has to supply 50,000 units to Y, then, it can supply only 50,000 units for external sales at ₹ 26. Contribution from external sales will be ₹ $14 \times 50,000 = 7,00,000$
Minimum contribution from Y will be 56,000 for 50,000 units. Hence, X will transfer at a minimum price of ₹ $12 + (56,000/50,000) = 13.12$ or ₹ 13 so that it is able to maintain the contribution from its optimal strategy.
However, if X is strong enough, it can demand a price of ₹ 22 which Y will be paying to outside suppliers.
Y will not pay anything more than $22 + 1,50,000/50,000$, i.e., 25 ₹ /unit.
- (iii) If X can choose, X will supply 64000 units for external demand and supply 36000 units to Y. Y will have to incur transport even for the 14000 units it purchases from outside. Hence it will not pay anything above ₹ 22. X will not accept anything below ₹ 13. Benefits to be shared equally between X and Y = $22 - 13 = 9$ per unit. Hence Transfer price per unit will be ₹ $13 + 4.5 = ₹ 17.5$, so that Y benefits by ₹ 4.5 and X also gets additional ₹ 4.5 contribution per unit transferred. Quantity transferred will be 36,000 units.
- (iv) For the company as a whole, it is incurring a variable cost of ₹ 22 plus transport of ₹ 3 = ₹ 25 for every unit of Y purchased. Contribution of X as per best strategy = ₹ 13. Hence, for the company, best strategy will be to transfer 50,000 units to Y and sell 50,000 units to external sales.

Contribution lost by sub optimal strategy in Div X will be 68,000 = [768000 - (50000 × 14)]

Gain by transfer

= transport of 1,50,000 + savings in purchase cost $(22 - 13) \times 50,000$
= ₹ 1,50,000 + 450,000. = ₹ 600,000.

Net gain = - 68,000 + 6,00,000 = 5,32,000.

5. (a) (i) Discuss briefly on the significance of Margin of Safety in the context of a business.

(ii) The following are the data for two business units, P and Q. You are required to find out which of the two units has a better Margin of Safety.

	Unit P (₹)	Unit Q (₹)
Sales Price per unit	100.00	250.00
Variable Cost per unit	80.00	150.00
Total Fixed Cost	1,75,000	2,25,000
Budget Sales	1,00,000	2,50,000

4+4=8

(b) Company XYZ produces two components (M and N) and is planning the allocation of its available resources for the next period.

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75 units of component M and 60 units of component N are required to be produced but machine hour capacity is restricted to a total of 300 hours. Any deficit of components produced in-house can be made up by the purchase of any quantity of either component from an outside supplier.

The objective of company XYZ is to satisfy the requirement for components at minimum total cost. The following information is available concerning each component.

Cost (₹ per unit)	M	N
Direct materials	6.20	8.70
Direct Labour	5.10	7.50
Variable production overheads	1.20	1.30
Fixed production overheads	4.80	6.40
Total	17.30	23.90
Machine hours (per unit)	2.00	3.00
Price from outside supplier (₹ per unit)	18.50	25.90

Required:

For the next period:

- (i) Calculate the variable costs of producing each component in – house.
- (ii) Calculate the extra costs of buying-in each component
- (iii) Determine which component should have production priority. Show workings clearly and justify your conclusion.
- (iv) Calculate the number of units of each component that should be manufactured by company XYZ. **2+2+2+2=8**

Answer:

5. (a) (i) The expression Margin of Safety (MOS) signifies the difference between actual sales and break even sales. In other words, all sales revenue above the break-even point represents the margin of safety. For example, if actual sales for the month of December 2015 are ₹ 50,00,000 and the break-even sales are ₹ 37,00,000, the difference of ₹ 12,50,000 is margin of safety. It can be expressed in percentage also.

Margin of safety is an important figure for any business because it tells management how much reduction in revenue will result in break-even. A higher MOS reduces the risk of business losses. Generally, the higher the margin of safety, the better the strength of business.

The formula or equation for arriving at MOS is stated as under:

Margin of safety = Actual or budgeted sales – Sales required to break-even

Margin of safety is also expressed in the form of ratio or percentage that is calculated by using the following formulae:

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$$M/S = \frac{\text{Profit}}{\text{Contribution}} \text{ or Sales over BEP / Total Sales.}$$

MOS ratio = MOS/Actual or budgeted sales

MOS percentage = (MOS/Actual or budgeted sales) × 100

- (ii) The following table shows calculation of margin of safety in units and rupees and the margin of safety ratio:

Particulars	Unit P	Unit Q
Sales Price p.u. (₹) (1)	100	250*
Variable Cost p.u. (₹)(2)	80	150
Contribution p.u. (₹)(3)=(1-2)	20	100
Fixed Cost (₹)(4)	175000	225000
Budgeted Sales (₹)(5)	100000	250000
Budgeted Sales in units (6) = (5/1)	1000	1000
B.E.P in units (7) = 4/3	8750	2250
Margin of Safety in units (8) = (6-7)	-7750	-1250
Margin of Safety Ratio (9) = 8/6×100	-77.5%	-12.5%

*This figure was stated as 225 in the suggested solution given, hence, the calculation stated was wrong.

- (b) (i) Calculation for variable cost of producing in-house

Products	M (₹)	N (₹)
Variable Cost:		
Direct material	6.20	8.70
Direct labour	5.10	7.50
Variable production cost in-house	1.20	1.30
Total	12.50	17.50

- (ii) Calculation of Extra Cost of Buying-in each component

Products	M	N
Price to be charged by outside Supplier	18.50	25.90
Variable cost of producing in-house [as per (a)]	12.50	17.50
Extra cost of buying – in	6.00	8.40

- (iii) Machine hour cost per unit

Products	M	N
Machine Hours per unit	2.00	3.00
Extra cost of buying – in per unit (₹)	6.00	8.40
Extra cost of buying (per machine hour) (₹)	3.00	2.80

Priority should be given to the In-house production of component M in order to minimize the extra cost of buying-in.

- (iv) Components to be manufactured by XYZ

M = 75 units (75 units × 2 hours) = 150 machine hours

N = 50 units [(300 – 150 machine hours)/3]

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6. (a) An agro-based farm is planning its production for next year. The following is relating to the current year:

Products/Crops	M	N	O	P
Area occupied (acres)	125	100	150	125
Yield per acre (ton)	50	40	45	60
Selling price per ton (₹)	100	125	150	135
Variable cost per acre (₹):				
Seeds	150	125	225	200
Pesticides	75	100	150	125
Fertilizers	62.50	37.50	50	62.50
Cultivations	62.50	37.50	50	62.50
Direct wages	2,000	2,250	2,500	2,850

Fixed overhead per annum ₹ 13,44,000.

The land that is being used for the production of O and P can be used for either crop. But not for M and N. the land that is being used for the production of M and N can be used for either crop, but not for O and P. In order to provide adequate market service, the company must produce each year at least 1,000 tons of each of M and N and 900 tons each of O and P.

Required:

- (i) Determine the profit for the production mix fulfilling market commitment.
- (ii) Assuming the land could be cultivated to produce any of the four products and there was no market commitment, calculate the profit amount of most profitable crop and break-even point of most profitable crop in terms of acres and sales value. 5+3=8

- (b) Nava Bharat Industries Ltd. manufactures four products (1,2,3,4) on two machines (X and Y). The time (in minutes) to process one unit of each product on each machine is shown below:

		Machine	
		X	Y
Product	1	12	26
	2	15	19
	3	18	30
	4	10	25

The profit per unit for each product (1,2,3,4) is ₹ 120, ₹ 150, ₹ 190 and ₹ 100 respectively. Product 1 must be produced on both machines X and Y but products 2, 3 and 4 can be produced on either machine.

Due to acute space constraints in the company's works, only one week's production is stored in 4,000 square feet for floor space where the floor space taken up by each product is 1.0, 1.5, 5.0 and 0.50 (square ft.) for products 1,2,3 and 4 respectively.

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As per customer requirements the output of Product 2 is related with that of Product 3 and over a week approximately twice as many units of product 2 should be produced as product 3.

Machine X is out of action (for maintenance/because of breakdown) 8% of the time and machine Y 10% of the time.

Required:

Assuming a working week 42 hours, formulate the problem of how to manufacture these products as a linear programme.

8

Answer:

6. (a) (i) Profit Statement of Recommended mix:

Product	M	N	O	P
Yield per acre (tons)	50	40	45	60
Selling price per ton	100	125	150	135
Sales revenue per acre	5000	5000	6750	8100
Variable cost per acre	2350	2550	2975	3300
Contribution per acre	2650	2450	3775	4800

Rank	1	2	2	1
Minimum sales requirement in acre		25 (1000/40)	20 (900/45)	

Recommended mix in acre	200	25	20	255	
Total Contribution	530000	61250	75500	1224000	1890750
Less – Fixed cost					1344000
Profit					546750

(ii) Most profitable crop. Production should be concentrated on P which gives highest contribution per acre of ₹ 4800.

Overall contribution if complete land is used for P = (500 × 4800) = ₹ 24,00,000
 Less: Fixed cost = ₹ 13,44,000
 Profit = ₹ 10,56,000

Break-even point in acres for P = 1344000/48000 = 280 acres

Break-even point in sales value = 280 × 135 × 60 = ₹ 22,68,000

(b) Variables:

Essentially the company is interested in the amount produced on each machine.
 Hence let:

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x_i = amount of product i ($i = 2,3,4$) produced on machine X per week
 y_i = amount of product i ($i = 2,3,4$) produced on machine Y per week
 where $x_i \geq 0$ $i = 1,2,3,4$ and $y_i \geq 0$ $i=2,3,4$

it may be stated here that as product 1 must be processed on both machines X and Y, y_1 has not been defined here.

Then objective function will be

Maximize $120x_1 + 150(x_2 + y_2) + 190(x_3 + y_3) + 100(x_4 + y_4)$ subject to constraints

➤ Floor space

$$1x_1 + 1.5(x_2 + y_2) + 5(x_3 + y_3) + 0.5(x_4 + y_4) \leq 4000$$

➤ Customer requirements

$$x_2 + y_2 = 2(x_3 + y_3)$$

➤ Available time

$$12x_1 + 15x_2 + 18x_3 + 10x_4 \leq 0.92(42)(60) \text{ (machine X)}$$

$$26y_1 + 19y_2 + 30y_3 + 25y_4 \leq 0.90(42)(60) \text{ (machine Y)}$$

With non negative constraints to be inserted: X_1, X_2, X_3, X_4 and $Y_1, Y_2, Y_3, Y_4 \geq 0$.

7. The Following table gives data on normal time & cost and crash time & cost for a project.

Activity	Normal		Crash	
	Time (days)	Cost (₹)	Time (days)	Cost (₹)
1-2	6	600	4	1,000
1-3	4	600	2	2,000
2-4	5	500	3	1,500
2-5	3	450	1	650
3-4	6	900	4	2,000
4-6	8	800	4	3,000
5-6	4	400	2	1,000
6-7	3	450	2	800

The indirect cost per day is ₹ 100.

(i) Draw the network and identify the critical path.

(ii) What are the normal project duration and associated cost?

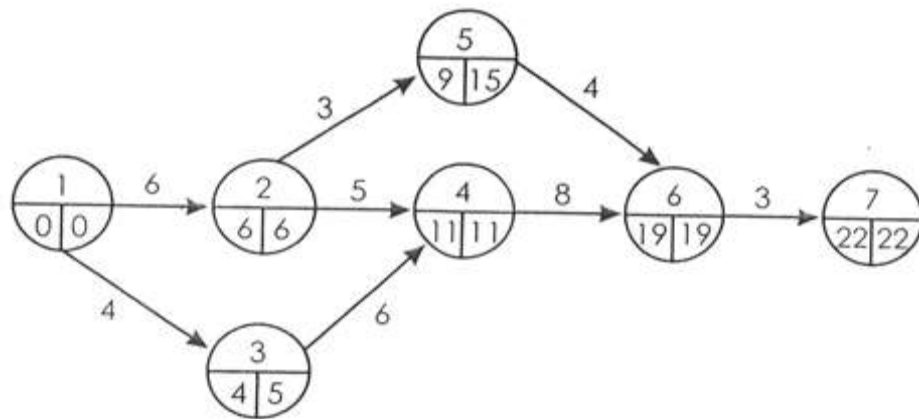
(iii) Crash the relevant activities systematically and determine the optimum project completion time and cost. 4+2+10=16

Answer:

7. (i) The network for normal activity times indicates a project time of 22 weeks with the

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critical path 1-2-4-6-7.



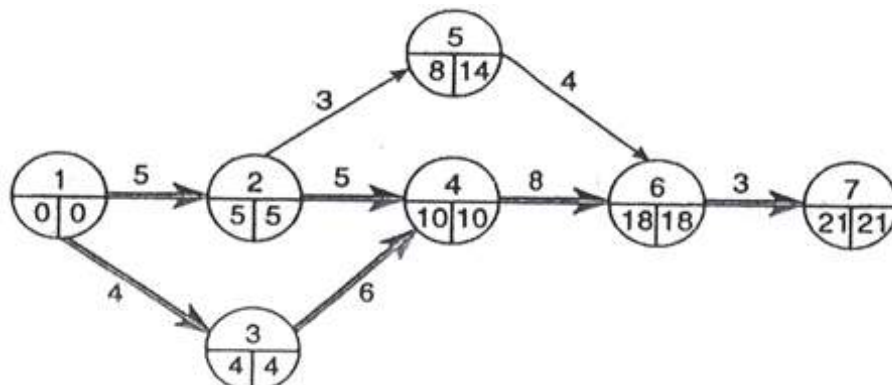
(ii) Normal project duration is 22 weeks and the associated cost is as follows: Total cost = Direct normal cost + indirect cost for 22 weeks.
 = 4,700 + 100 × 22 = ₹ 6,900.

(iii) For critical activities, crash cost – slope is given below:

Critical activity	Crash cost-slop
1-2	$\frac{1000 - 600}{6 - 4} = 200$
2-4	$\frac{1500 - 500}{5 - 3} = 500$
4-6	$\frac{3000 - 800}{8 - 4} = 550$
6-7	$\frac{800 - 450}{3 - 2} = 350$

Of the activities lying on the critical path, activity 1-2 has lowest cost slope. Therefore, we shall first crash this activity by just one day.

Duration = 21 days, and cost = 4700 + 1 × 200 + 100 × 21 = ₹ 7,000.



Other activities too have become critical. Now we have 2 critical paths:
 1→2→4→6→7 and 1→3→4→6→7.

To reduce duration of the activity further, we shall have to reduce duration of both the paths. We have following alternatives:

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Crash activity 6 - 7 by 1 day at a cost of ₹ 350.

Crash activity 4 – 6 by 4 days at the cost of ₹ 550 per day.

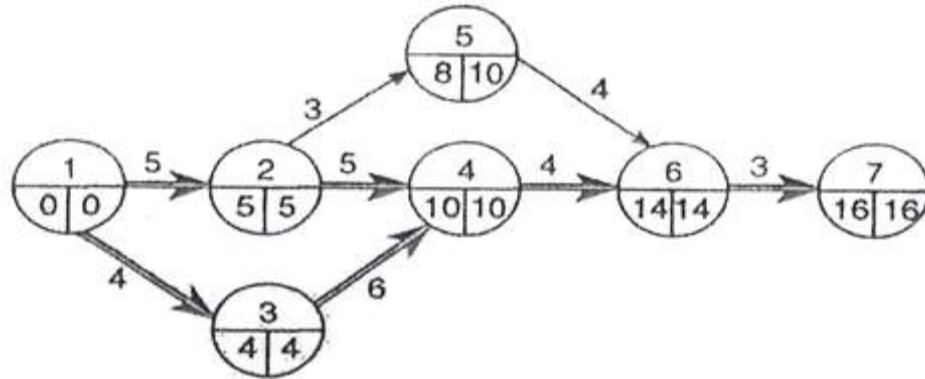
Crash activities 1-2 and 1-3 by 1 day each at a cost of ₹ (200 + 700) = ₹ 900.

Crash activities 2-4 and 3-4 by 2 day each at a cost of ₹ (500+550) = ₹ 1,050/day.

Thus, we shall first crash activities 6-7 by 1 day and then activity 4-6 by 4 days.

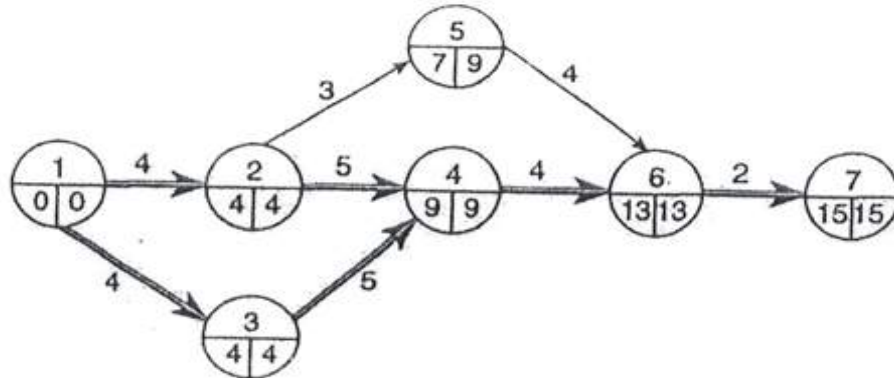
On crashing activity 6-7 by 1 day, cost = 4900 + 350 × 1 + 100 × 20 = ₹ 7,250, and duration = 20 days. Next we crash 4-6 by 4 days.

Cost = 5250 + 550 × 4 + 100 × 16 = ₹ 9,050. Duration = 16 days.



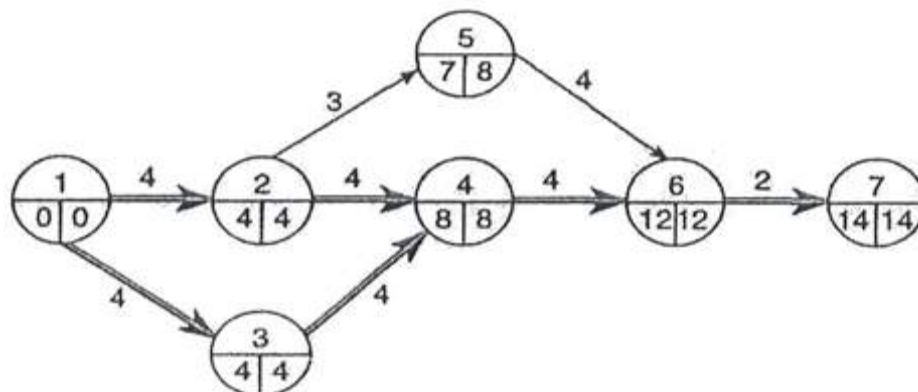
Next we crash activities 1-2 and 3-4 by 1 day each,

Cost = 7450 + 200 × 1 + 550 × 1 + 100 × 15 = ₹ 9,700.



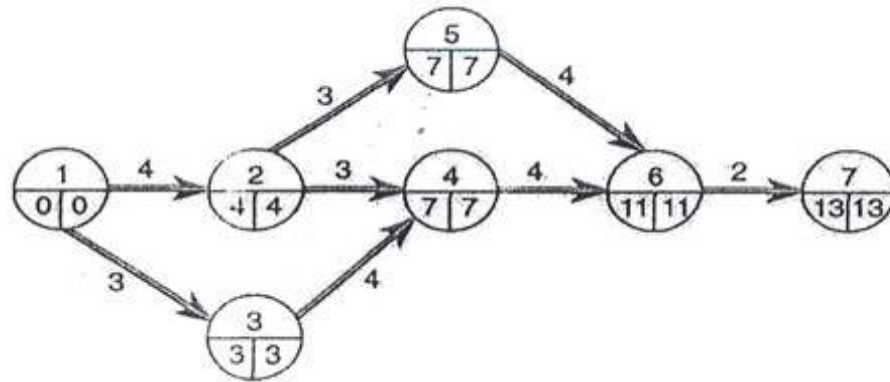
Next we crash activities 2→4 and 3→4 by 1 day each.

Cost = 8200 + 500 × 1 + 550 × 1 + 100 × 14 = ₹ 10,650. Duration = 14 days.



We crash activities 1-3 and 2-4 by 1 day each.

Cost = 9250 + 700 × 1 + 500 × 1 + 100 × 13 = ₹ 11,750. Duration = 13 days.



Now there are three critical paths:

1-2-5-6-7, 1-2-4-6-7, 1-3-4-6-7

Also, no further crashing is possible. Hence minimum duration of the project = 13 days with cost ₹ 11,750.

8. Write short notes on any four of the following:

4x4= 16

- (a) List down the situations where a product can be sold below the marginal cost.
- (b) Price sensitivity
- (c) Target costing
- (d) Six sigma in quality control process
- (e) Assignment

Answer:

8. (a) List down the situations where product can be sold below the marginal cost
 1. When one has already produced and paid for the units and:
 - There is no more market for the product at any price other than the one is below the marginal cost
 - Any organization cannot keep the business open to clear the rest of the inventory because any profit you may see is not enough to cover the cost to stay open.
 - As a loss leader to attract customers that can be up sold. Works only if the customer margin - sum of contribution margins from the basket of products and services customers buy is more than other available options.
 2. When one has produced each unit on demand (truly marginal):
 - Only case is as a loss leader
 - Any other reason not only generates a loss in the short term but also sets really bad reference price in the minds of customers. It is not going to be easy to improve prices when the seller gives it away at very low price.
 - The seller has to make sure that the cost is truly marginal cost and does not include overheads and COGS (Cost of Goods Sold) is not MC (Marginal Cost).

(b) Price sensitivity:

Price sensitivity is the degree to which the price of a product affects consumers'

purchasing behaviors. It may also be said that through price sensitivity analysis, any organization measure how it's demand changes with the change in the cost of it's products. Price sensitivity is commonly to measure of the change in demand based on its price change.

For example, some consumers are not willing to pay a few extra cents per gallon for gasoline, especially if a lower-priced station is nearby.

When they study and analyze price sensitivity, companies and product manufacturers can make sound decisions about products and services.

Price sensitivity can basically be defined as being the extent to which demand changes when the cost of a product or service changes. The price sensitivity of a product varies with the level of importance consumers place on price relative to other purchasing criteria. Some people may value quality over price, making them less susceptible to price sensitivity. For example, customers seeking top-quality goods are typically less price sensitive than bargain hunters, so they're willing to pay more for a high-quality product. By contrast, people who are more sensitive to price may be willing to sacrifice quality. These individuals will not spend more for something like a brand name, even if it has a higher quality over a generic store brand product.

Price sensitivity also varies from person to person, or from one consumer to the next. Some people are able and willing to pay more for goods and services than others. Companies and governments are also able to pay more compared to individuals.

Consumers are less sensitive to price when the total cost is low compared to their total income. Likewise, the total expenditure compared to the total cost of the end product affects price sensitivity.

(c) Target Costing:

Target Costing: This technique has been developed in Japan. It aims at profit planning. It is a device to continuously control costs and manage profit over a product's life cycle. In short, it is a part of a comprehensive strategic profit management system. For a decision to enter a market prices of the competitors' products are given due consideration. Target Costing initiates cost management at the earliest stages of product development and applies it throughout the product life cycle by actively involving the entire value chain. In the product concept stage selling price and required profit are set after consideration of the medium term profit plans, which links the operational strategy to the long term strategic plans.

$$\text{Target Cost} = \text{Planned Selling Price} - \text{Required Profit.}$$

From this, the necessary target cost can be arrived at. Target cost, then, becomes the residual or allowable sum. If it is thought that the product cannot generate the required profit, it will not be produced as such and aspects of the product would be redesigned until the target is met. Target profit is a commitment agreed by all the people in a firm, who have any part to play in achieving it.

(c) Six sigma in quality control process:

Six Sigma is a set of practices originally developed by Motorola to systematically improve processes by eliminating defects. A defect is defined as non-conformity of a product or service to its specifications. While the particulars of the methodology were originally formulated by Bill Smith at Motorola in 1986, Six Sigma was heavily inspired by six preceding decades of quality improvement methodologies such as quality control, TQM, and Zero Defects.

Like its predecessors, Six Sigma asserts the following:

- (a) Continuous efforts to reduce variation in process outputs is key to business success
- (b) Manufacturing and business processes can be measured, analyzed, improved and controlled
- (c) Succeeding at achieving sustained quality improvement requires commitment from the entire organization, particularly from top-level management.

The term "Six Sigma" refers to the ability of highly capable processes to produce output within specification. In particular, processes that operate with six sigma quality produce at defect levels below 3.4 defects per (one) million opportunities (DPMO). Six Sigma's implicit goal is to improve all processes to that level of quality or better.

(e) Assignment:

Assignment is a special linear programming problem. There are many situations where the assignment of people or machines etc. may be called for. Assignment of workers to machines, clerks to various check-out counters, salesmen to different sales areas are typical examples of these. The Assignment is a problem because people possess varying abilities for performing different jobs and therefore the costs of performing jobs by different people are different. Thus, in an assignment problem, the question is how the assignments should be made in order that the total cost involved is minimized.

There are four methods of solving an assignment problem and they are:

- (1) Complete Enumeration Method
- (2) Simplex Method
- (3) Transportation Method and
- (4) Hungarian Method.

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FINAL EXAMINATION

December, 2022

P-15(SCMD)

Syllabus 2016

Strategic Cost Management—Decision Making

Time Allowed: 3 Hours

Full Marks: 100

*The figures in the margin on the right side indicate full marks.**Working Notes should form part of the respective answers.**Wherever necessary, candidates may make appropriate assumptions and clearly state them in Answer.*

Section-A is compulsory and contains Question No. 1 for 20 marks. Section-B contains Question Nos. 2 to 8, each carries 16 marks.

Section-A

Answer all the questions. Each question carries two marks.

1. Choose the most appropriate answer to the following questions giving justification/reasonable workings: (One mark is for the correct choice and one mark is for the justification/workings.) 2×10= 20

(i) The Income statement of BOMA Ltd. is summarized as below:

	(₹ in Lakh)
Net Revenue	120
Less: Expenses (including ₹Rs.60 lakh of fixed cost)	132
Net Loss	12

The Manager (F&A) believes that an increase of ₹ 30 lakh as fixed expenditure in advertising outlays will increase the sales substantially. At what sales volume will the company have break even?

- (A) ₹ 250 lakh
- (B) ₹ 225 lakh
- (C) ₹ 200 lakh
- (D) None of the above

- (ii) SOVI Ltd., a mobile phone manufacturer, is planning to introduce a new mobile phone. The potential market over the next year is 10,00,000 units. The SOVI Ltd. has the capacity to produce 4,00,000 units and could sell 1,00,000 units at a price of ₹ 10,000. Demand would double for each ₹ 1,000 fall in the selling price. The company has a 25% profit margin on sales for the similar products. What is SOVI Ltd.'s target cost per unit to the nearest Re?
- (A) ₹ 8,000
(B) ₹ 7,000
(C) ₹ 6,000
(D) ₹ 4,000
- (iii) SIXT Ltd. has developed a new product and just completed the manufacture of the first four units of the product. The first unit took 3 hours to manufacture and the first four units together took 8.3667 hours to produce. The learning curve rate is
- (A) 83.50%
(B) 75.00%
(C) 60.65%
(D) 58.50%
- (iv) Depreciation of product testing equipment is
- (A) Internal Failure Cost
(B) Appraisal Cost
(C) Not a Quality Cost
(D) Irrelevant, but Quality Cost
- (v) AMRIT Ltd., a manufacturer of doors using a Throughput costing system, is experiencing a bottleneck in its plant. Set up time at one of its work stations has been identified as the offender. The Manager (Finance) has proposed a plan to reduce the set up time at a cost of ₹ 5,24,000. The change will result in 500 additional doors. The selling price per door is ₹ 19,300, Direct Labour costs are ₹ 2,400 per door and the cost of Direct Materials is ₹ 8,000 per door. All units produced can be sold. The change will result in an increase in the Throughput Contribution of _____.
- (A) ₹ 60,20,000
(B) ₹ 56,50,000
(C) ₹ 44,50,000
(D) None of the above

- (vi) RON Ltd., a manufacturer of product CEMO using a standard costing system provides the following information pertaining to the Direct Materials for the month of November, 2022:

1 tonne of material input yields standard output of (units)	1,00,000
Standard price of material per kg (₹)	20
The Actual quantity of material used (Tonnes)	10
Actual price of material per kg (₹)	21
Actual output obtained for the month (units)	9,00,000

Material cost variance will be-

- (A) ₹ 40,000 (Adv)
(B) ₹ 40,000 (Fav)
(C) ₹ 30,000 (Adv)
(D) ₹ 25,000 (Adv)
- (vii) The constraints in a linear programming Model are —
- (A) Included in the Objective function
(B) Costs
(C) Scarce Resources
(D) Dependent Variables
- (viii) A PERT network has only two activities on its critical Path. The Standard Deviation of these activities are 6 and 8 respectively. What is the Standard Deviation of the Project completion time?
- (A) 7
(B) 10
(C) 14
(D) 100

(ix) MN Ltd. sales for the years 2018 and 2019 were ₹ 8,00,000 and ₹ 7,92,000. The cost of goods sold correspondingly were ₹ 4,80,000 and ₹ 4,64,000. In the year 2019 selling price was reduced by 10% as compared to 2018. What was the decrease in gross profit caused by the change in selling price?

- (A) ₹ 8000
- (B) ₹ 72,000
- (C) ₹ 79,200
- (D) ₹ 88,000

(x) The Holiday Card Company, a producer of specialty cards, has asked you to complete several calculations based upon the following information:-

Income tax rate	30%
Selling price per unit	₹ 6.60
Variable cost per unit	₹ 5.28
Total fixed costs	₹ 46,200

How many cards must be sold to earn an after-tax net income of ₹ 18,480?

- (A) 60,000 units
- (B) 45,000 units
- (C) 75,000 units
- (D) 55,000 units

Section-B

(Answer any five Questions)

16×5=80

2. (a) ABC Enterprises has prepared a draft budget for the next year as follows:

Quantity	10,000 units
Sales price per unit (₹)	30
Variable costs per unit:	
Direct Materials (₹)	8
Direct Labour (₹)	6
Variable overhead(2hrs×1) (₹)	2
Contribution per unit (₹)	14
Budgeted Contribution (₹)	1,40,000
Budgeted Fixed Costs (₹)	1,25,000
Budgeted Profit (₹)	15,000

The Board of Directors are dissatisfied with this budget, and asks working party to come up with alternate budget with higher target profit figures. The working party reports back with the following suggestions that will lead to budgeted profit of ₹ 25,000. The company should spend ₹ 30,000 on advertising and set the target sales price up to ₹ 32 per unit. It is expected that the sales volume will also rise, in spite of the price rise to 12,000 units.

In order to achieve the extra production capacity, however, the workforce must be able to reduce the time taken to make each unit of the product. It is proposed to offer a pay and productivity deal in which the wage rate per hour is increased to ₹ 4. The hourly rate for variable overhead will be unaffected.

Ascertain the target labour time required to achieve the target profit. 10

2. (b) POBIX Ltd. has been approached by a customer who would like a special job to be done for him and willing to pay ₹ 22,000 for it. The job would require the following materials:

Material	Total units required	Units already in stock	Book value of units in stock ₹/Unit	Realisable value ₹/Unit	Replacement cost ₹/Unit
A	1,000	0	-	-	6
B	1,000	600	2	2.5	5
C	1,000	700	3	2.5	4
D	200	200	4	6	9

- (i) Material B is used regularly by POBIX Ltd. and if stocks are required for this job, they would need to be replaced to meet other production demand.
- (ii) Materials C and D are in stocks as the result of previous excess purchase and they have a restricted use. No other use could be found for material C but material D could be used in another job as substitute for 300 units of material E which currently cost ₹ 5 per unit (of which the company has no units in stock at the moment).
- (iii) All other expenses on the contract to be specially incurred besides the relevant cost of material is ₹ 550.

Required:

What are the relevant cost of material in deciding whether or not to accept the contract? (Show the reasons for relevancy of cost elements) 4+2=6

3. TOCON Ltd. manufactures plastic cans of a standard size. The variable cost per can is ₹ 4 and the selling price is ₹ 10 each. The factory of the company has eight machines of identical size. Any individual machine can produce 30 cans per hour. The factory works on 300 days per annum basic and the actual available hour per machine per day is 7.5. The company has an order of 4,20,000 cans from an oil company, to supply. The yearly fixed cost of the company is ₹ 20 lakhs. TOCON Ltd. has received an order from another firm for supplying 60,000 nos. of plastic moulded toys. The price of the toys is ₹ 60 each and the variable cost is ₹ 50 each. While this order would be acceptable for supplying for total quantities only on acceptance, a special mould costing ₹ 2,25,000 would be required to be acquired to manufacture the toys. The time study exercise has revealed that 15 nos. of toys can be produced per hour by any of the machines.

Required:

Advise the company, with reasons in the following situations:

- (i) Whether to accept the order of manufacturing moulded toys, in addition to supplying 4,20,000 nos. of cans or not;
- (ii) Whether to accept the order of manufacturing moulded toys, if order of cans increases to 5,40,000 nos. or not;
- (iii) While a sub-contractor is willing to supply the toys, either whole or part of the required quantities at an all-inclusive rate of ₹ 57.50 each, what would be the minimum excess capacity needed to justify the manufacturing of any portion of the toys order, instead of sub-contracting?
- (iv) The company had an understanding that the orders of the cans will be increased during the year on negotiations and planned and manufactured 4,50,000 cans during the year. For utilizing the excess capacity, they also accepted the toys order and sub-contracted only 15,000 nos. of toys. At the year's end, however, it was revealed that the order of the cans could be for 4,80,000 nos., if it was properly negotiated. How much loss has been suffered by the company due to improper prediction of demand and negotiation? 3+3+3+7=16

4. (a) The budgeted output of SAB Ltd., a single product manufacturing company for the year ending 31st March was 5,000 units. The financial results in respect of the actual output of 4,800 units achieved during the year were as under:

	₹
Direct Material	29,000
Direct Wages	45,000
Variable Overheads	72,500
Fixed Overheads	40,000
Profit	37,000
Sales	2,23,500

The standard wage rate is ₹ 4.50 per hour and the standard variable overhead rate is ₹ 7.50 per hour.

The cost accounts recorded the following variances for the year:

Variations	Favourable (₹)	Adverse (₹)
Material price		70
Material usage		130
Wage rate	450	
Labour efficiency		2,250
Variable overheads expenses	3,000	
Variable overhead efficiency		3,500
Fixed overhead expenses		2,500
Selling price	7,500	

Required:

- (i) Prepare the standard product cost sheet per unit.
 - (ii) Compute the Fixed Overhead volume variance, Sales volume variance, Sales price variance and Standard profit for the year.
 - (iii) Prepare a statement showing the reconciliation of Standard profit and the Actual profit. 5+4+3=12
4. (b) Enumerate the requisites for installation of an Uniform Costing in an organization. 4
5. (a) BON Ltd. manufactures 3 types of biscuits F,G and H in a fully mechanized factory. The company has been following conventional method of costing and wishes to shift to Activity Based Costing (ABC) System and therefore wishes to have the following data presented under both the system for the month.

	₹
Inspection Cost	73,000
Machine-Repairs & Maintenance	1,42,000
Dye Cost	10,250
Selling Overheads	1,62,000

	Products		
	F	G	H
Prime Cost (₹ Per unit)	12	9	8
Selling Price (₹ Per unit)	18	14	12
Gross Production (units/production run)	2,520	2,810	3,010
No. of defective (units/production run)	20	10	10
Inspection:			
No. of hours/Production run	3	4	4
Dye Cost/Production run (₹)	200	300	250
No. of Machine hours/Production run	20	12	30
Sales— No. of Units/Month	25,000	56,000	27,000

The following additional information is given:

- No accumulation of inventory is considered. All goods units produced are sold.
- All manufacturing and selling overheads are conventionally allocated on the basis of units sold.
- Product F needs no advertisement. Due to its nutritive value, it is readily consumed by diabetic patients of a Hospital. Advertisement costs included in the total selling overhead is ₹ 83,000.
- Product G needs to be specially packed before being sold, so that it meets competition. ₹ 54,000 was the amount spent for the month in specially packing G, and this has been included in the total selling overhead cost given.

Required:

- Present product-wise profitability of statement under the conventional system and
- Present product-wise profitability of statement under the Activity Based Costing (ABC) system and accordingly rank the products. 10

5. (b) Division Z of ZUML Ltd. is a profit centre which produces four products P,Q,R and S. Each product is sold in the external market also. Data for the period is:

	P	Q	R	S
Market price per unit (₹)	150	146	140	130
Variable cost of production per unit (₹)	130	100	90	85
Labour hours required per unit	3	4	2	3

Product S can be transferred to division M of ZUML Ltd. but the maximum quantity that may be required for transfer is 3000 units of S.

The maximum sales in the external market are:

P	3,360 units
Q	3,000 units
R	2,760 units
S	1,920 units

Division M can purchase the same product at a price of ₹ 125 per unit from outside instead of receiving transfer of product S from Division Z.

Required:

What should be the transfer price for each unit for 3,000 units of S, if the total labour hours available in division Z are 24,000 hours? 6

6. (a) In a textile sales emporium of SONTEX Ltd. four salesmen A,B,C and D are available to four counters W,X, Y and Z. Each salesman can handle any counter. Their services (in hour) of each counter, when manned by each salesman is given below:

Counter	Salesman			
	A	B	C	D
W	41	72	39	52
X	22	29	49	65
Y	27	39	60	51
Z	45	50	48	52

Required:

How should the salesmen be allocated appropriate counters so as to minimize the service time? Each salesman must handle only one counter. 8

6. (b) The output of a production line of SONPIM Ltd. is checked by an inspector for one or more of three different types of defects, called defects Major, Minor and Medium. If defect Major occurs, the item is scrapped. If defect Minor or Medium occurs, the items must be reworked. The time required for reworking for a Minor defect and a Medium defect is 15 minutes and 30 minutes respectively.

The probabilities of Major, Minor and Medium defects are 0.15, 0.20 and 0.10 respectively.

Use the following Random Numbers (RN) of three defects:

RN for Defect Major	48	55	91	40	93	01	83	63	47	52
RN for Defect Minor	47	36	57	04	79	55	10	13	57	09
RN for Defect Medium	82	95	18	96	20	84	56	11	52	03

- (i) For 10 items coming off the assembly line, you are required to present data table with Random Number assigned and the existence of defect in Major, Minor and Medium type separately.
- (ii) Determine the number of items without any defects and with defects, the number of item scrapped and the total minutes of reworked time. $(2+4)+(1+1)=8$

7. (a) Projects India Limited undertakes special contracts. The following table gives estimates of time and cost for activities involved in completing one contract which has just been offered to them:

Activity	Previous activities	Normal time (Days)	Normal cost (₹)	Minimum time	Cost of minimum time (₹)
A	-	12	10,000	8	14,000
B	-	10	5,000	10	5,000
C	A	0	0	0	0
D	A	6	4,000	4	5,000
E	B, C	16	9,000	14	12,000
F	D	16	3,200	8	8,000

- (i) Draw a network diagram and identify the critical path for normal procedures.
- (ii) Recommend the least number of days required to be crashed to achieve the minimum time and calculate the total cost. $4+6=10$

7. (b) A manufacturer of medicine is proposed to prepare a production plan for medicines A and B. There are sufficient ingredients available to make 20,000 bottles of medicine A and 40,000 bottles of medicine B. But there are 45,000 bottles into which either of the medicine can be filled. Further it takes 3 hours to prepare enough material to fill 1,000 bottles of medicine A and 1 hour to prepare enough material to fill 1,000 bottles of medicine B and there are 66 hours available for this operation. The profit is ₹ 8 per bottle of medicine A and is ₹ 7 per bottle of medicine B.

Formulate the above as a Linear Programming Problem. (Do not solve)

8. Write Short Notes on *any four* out of the following five questions:

- (a) Lean Accounting
 - (b) Pareto Analysis in Quality Management
 - (c) Areas where Backflush costing is useful
 - (d) Enumerate the situations where Fixed Costs become relevant for Decision Making
 - (e) Sealed Bid Pricing
-

SUGGESTED ANSWERS TO QUESTIONS

SECTION – A

1.

2X10 = 20 Marks

- (i) (B)
- (ii) (C)
- (iii) (A)
- (iv) (B)
- (v) (B)
- (vi) (C)
- (vii) (C)
- (viii) (B)
- (ix) (D)
- (x) (D)

SECTION –B

(Answer any five questions)

2 (a) :

10 Marks

Time required to achieve the target profit = 21,600 hours

2 (b) :

4+2 = 6 Marks

Relevant cost of Material and the Job = Rs. 16,000

Decision: Contract should be accepted since offered is Rs 22000 in relation to relevant cost of Rs 16000.

Reasons for Relevancy of Cost Elements :

- (i) Material A is not yet owned. It would have to be purchased in full at the replacement cost of Rs.6.00 per unit.
- (ii) Material B is used by the company regularly. There is already existing a stock of 600 units. If these are used in the contract, a further 600 units would have to be purchased.
Relevant cost is therefore 1000 units at the replacement.
- (iii) Material C : 1000 units of material C are, required and 700 units are already in stock. If it is used for the contract, a further 300 units will have to be purchased at a replacement cost of Rs.4.00 each. The existing stock of 700 units will not be replaced. If they are used for the contract, they cannot be used @ Rs.2.50 each unit. The realisable value these 700 @ RS. 2.50 per units represent an opportunity cost of sales revenue forgone.
- (iv) Material D is already in stock and will not be replaced. There is an opportunity cost of using D in the contract, because there are alternative opportunities either to sell the existing stock for Rs. 6 per unit (Rs.1200 in total) or avoid other purchases (of material E) which cost $300 \times 5 = \text{Rs.}1500$, since substitution for E is more beneficial. Rs 1500 is the opportunity cost.

3 :

3+3+3+7 = 16 Marks

(i)

Increase in Net Profit = Rs. 375000

Decision : It is advisable for the company to accept the order of 60000 moulded toys as it will increase its profit by Rs. 375000.

(ii)

	Rs. (Lacs)
Profit from 540000 cans	<u>12.40</u>
Alternatively, the production would be 420000 cans and 60000 moulded toys	
Profit from 420000 cans	5.20
Profit from 60000 moulded toys	<u>3.75</u>
Total profit	<u>8.95</u>

Decision:

The production of 120000 additional cans instead of 60000 moulded toys will result an additional profit of Rs. 3.45 lacs (Rs. 12.40 lacs - Rs. 8.95 lacs). Therefore, the company is advised not to accept the order of manufacturing moulded toys.

(iii)

Let the minimum excess capacity needed to justify the manufacturing of any portion of the moulded toys order be A.

If toys are manufactured, the profit is = (Rs. 60 – Rs.50) A – Rs. 225000

and, if toys are subcontracted, the profit is =(Rs.60– Rs.57.50) A indifference point would be 10A - Rs. 225000 = 2.5 A

$$\text{or } A = 30000 \text{ moulded toys}$$

Toys produced per hour = 15 toys

Therefore, 2000 (30000 toys / 15 toys) excess machine hours are required to justify manufacturing of toys by the company, instead of sub-contracting.

(iv)

Profit under existing production plan :

	Rs. (Lacs)
Contribution from 450000 Cans	27.00
Contribution from 45000 Toys	<u>4.50</u>
Total contribution	31.50
Less: Fixed cost	<u>22.25</u>
Profit	9.25
Profit from 15000 sub-contracted toys	<u>0.375</u>
Total profit	<u>9.625</u>

If demand was accurately forecasted and 480000 cans were manufactured, excess machine hour capacity available was 2000 hrs such excess being the point of indifference i.e. profit from toys order would be the same by either manufacturing 30000 toys or sub-contracting them along with the rest of 30000 toys.

Profit under properly negotiated production plan :

	(Rs. Lacs)
Contribution from 480000 Cans	28.80
Less : Fixed cost	<u>20.00</u>
Profit	8.80
Profit from toys	1.50
Total profit	<u>10.30</u>

Therefore, the loss for improper prediction and negotiation is Rs. 1030000 – Rs. 962500 = Rs. 67500

4 (a) :

5+4+3 = 12 Marks

- (i) Standard Material Cost per Unit : =Rs 6
Standard Wage rate per Unit : = Rs 9
Standard Variable overhead per unit: = Rs 15
Standard Fixed overhead rate per Unit: = Rs 7.50

- (ii) Fixed overhead Volume Variance: Rs 1500 (Adv.)
Sales Volume Variance: = Rs 9000 (Adv.)
Sales Price Variance: = Rs 7500 (Fav)
Standard Profit: = Rs 36000

- (iii) Statement Showing Reconciliation of the Standard Profit and the Actual Profit :

		Rs	
Standard Profit		36000	
Add : Sales Price Variance (Favourable)		7500	
		<u>43500</u>	
Add :Favourable Cost Variances :			
Wages Rate Variance	450		
Variable overhead expenses	3000	3450	
	<u> </u>	<u>46950</u>	
Less : Adverse Cost Variances			
Material price	70		
Material usage	130		
Labour efficiency	2250		
Variable overhead efficiency	3500		
Fixed overhead Expense	2500	8450	
		<u> </u>	38500
Less :Fixed overhead volume variance (Adverse)		1500	
Actual Profit		<u>37000</u>	

4. (b) :

4 Marks

The requisites for installation of a Uniform Costing are enumerated below:

- (i) There should be a spirit of mutual trust, co-operation and a policy of give and take amongst the participating members.
- (ii) There should be a free exchange of ideas and methods.
- (iii) The bigger units should be prepared to share with the smaller ones, improvements, achievements of efficiency, benefits of research and know-how.
- (iv) There should not be any hiding or withholding of information.
- There should be no rivalry or sense of jealousy amongst the members

5. (a) :

10 Marks

- (i) Profitability Under Conventional Accounting System.

	Products			
	Total	F	G	H
Sales – Units / Production (Goods Units)	108000	25000	56000	27000
Gross Margin (Rs)	533080	147600	278200	107280
Production Overheads (Rs)	225250	52141	116796	56313

Selling Over heads (Rs)	162000	37500	84000	40500
Sub-Total Overhead (Rs)	387250	89641	200796	96813
Net Profit (Rs)	145830	57959	77404	10467
Ranking		II	I	III

(ii) Profitability Under Activity Based Costing (ABC)

	Products		
	F	G	H
Sales – Units / Production (Goods Units)	<u>25000</u>	<u>56000</u>	<u>27000</u>
Gross Margin (Rs)	<u>147600</u>	<u>278200</u>	<u>107280</u>
Production Over head (Rs)	57000	94000	74250
Selling Overheads	5787	122963	33250
Sub-Total Overheads	62787	216963	107500
Net Profit	84813	61237	(220)
Ranking	I	II	III

5. (b) :

6 Marks

Ranking of products when availability of time is the key factor:

Products	P	Q	R	S
Market Price (Rs)	150	146	140	130
Less : Variable Cost (Rs)	130	100	90	85
Contribution per unit (Rs)	20	46	50	45
Labour hours per unit	3	4	2	3
Contribution / Labour hour (Rs)	6.66	11.5	25	15
Ranking	IV	III	I	II
Maximum demand (units)	3360	3000	2760	1920
Total no. of hours	10080	12000	5520	5760
Allocation of 24000 hours on the basis of ranking	720*	12000	5520	5760
* Balancing figure				

Transfer price = Rs 118.34

6. (a) :

8 Marks

Step : 1 Row subtraction

Sales Man \ Counter	A	B	C	D
W	2	33	0	13
X	0	7	27	43
Y	0	12	33	24
Z	0	5	3	7

Column subtraction

Sales Man \ Counter	A	B	C	D
W	2	28	0	6
X	0	2	27	36
Y	0	7	33	17
Z	0	0	3	0

Step 2 : Minimum straight lines to cover zeros.

Sales Man		A	B	C	D
Counter					
W	2	28	0	6	
X	0	2	27	36	
Y	0	7	33	17	
Z	0	0	3	0	

Step 3 : Smallest uncovered number subtracted from uncovered numbers, added to number at intersection of two lines

Sales Man		A	B	C	D
Counter					
W	4	28	0	0	
X	0	0	25	34	
Y	0	5	31	15	
Z	2	0	9	0	

In row Z, column3, should be 3 instead of 9.

Step 4 : Return to Step 2. Cover all Zeros. since the number of lines is 4, the optimality criteria is satisfied.

Sales Man		A	B	C	D
Counter					
W	4	28	0	6	
X	0	0	25	34	
Y	0	5	31	15	
Z	2	0	3	0	

It should be step 3 instead of 2.

Allocation of Sales men and Total Times

Counter	Salesmen	Times (Hours)
W	C	39
X	B	29
Y	A	27
Z	D	52
Total		147

6. (b) :

(2+4)+(1+1)= 8 Marks

The probabilities of occurrence of Major, Minor and Medium defects are 0.15, 0.20 and 0.10 respectively. So, tile numbers 00 – 99 are allocated in proportion to the probabilities associated with each of the three defects.

Defect Major		Defect Minor		Defect Medium	
Exists	RN Assigned	Exists ?	RN Assigned	Exists ?	RN Assigned
Yes	00 – 14	Yes	00 – 19	Yes	00 – 09
No	15 – 99	No	20 – 99	No	10 – 99

(i) Simulation of output of the assembly line for 10 items :

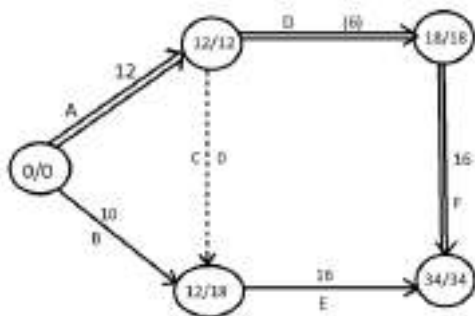
Item No.	RN : Defect Major	RN : Defect Minor	RN : Defect Medium	Defect Exist or Not	Rework time (in min.)	Scrap
1.	48	47	82	None	Nil	--
2.	55	36	95	None	Nil	--
3.	91	57	18	None	Nil	--
4.	40	04	96	Minor	15	--
5.	93	79	20	None	Nil	--
6.	01	55	84	Major	Nil	Scrap
7.	83	10	56	Minor	15	--
8.	63	13	11	Minor	15	--
9.	47	57	52	None	Nil	--
10.	52	09	03	Minor & Medium	15 + 30 = 45	--

(ii) During the simulated period, 5 items had defect and other 5 items had not defects.
One item was scrapped.

Total reworked time is required for four items = 90 minutes

7. (a) :

4+6 = 10 Marks



Critical Path with duration = A -> D -> F, 34 days

Activity	Normal time	Crash Time	Crash Cost	Normal cost	Cost Slope
	Days	Days	Rs.	Rs.	Rs.
A	12	8	14,000	10,000	1,000
B	10	10	5,000	5,000	-
C	-	-	-	-	-
D	6	4	5,000	4,000	500
E	16	14	12,000	9,000	1,500
F	16	8	8,000	3,200	600

Step	Critical Path	No of Days	Activity reduced	No of days	Cost slope	Crash cost	Cumulative Crash cost
1	A D F	34	D	2	500	1000	1000
2	A D F	32	F	4	600	2400	3400
3	A D F / A C E	28	A	2	1000	2000	5400
4	All Paths	26	F,E	2	2100	4200	9600

Revised time 24 days; Total Cost Rs.40,800.

7. (b) :

6 Marks

Let x_1 and x_2 be the no.of bottles of medicine A and B to be manufactured.

i)Objective function is Maximize $Z= 8x_1 + 7x_2$

S.T constraints:

Bottle capacity constraint= $x_1 + x_2 \leq 45,000$

Hour constraint= $(3x_1/1000) + (x_2/1000) \leq 66$

Or $3x_1 + x_2 \leq 66,000$

Ingredient constraint for Medicine A= $x_1 \leq 20,000$

Ingredient constraint for Medicine B= $x_2 \leq 40,000$

Answer any four from the following

4X4 = 16 Marks

8. (a) :

Lean Accounting :

Lean Accounting is a system of providing information in plain and simple terms for management decision-making and elimination of wasteful processes.

It supports lean manufacturing system whereby decisions are taken based on relevant parameters.

It supports value stream measurements and value based pricing.

8. (b) :

Pareto analysis in Quality Management:

Pareto analysis is based on the principle that 80% of the volume relates to 20 % value and vice - versa. In the context of problem solving, it says that 80% of the problems can be solved by taking 20% effort. The 80 - 20 rule can be modified to 70 - 30 or 75 - 25, etc., but the essence is that larger volumes are concentrated on a smaller area of attention. When resources are limited and the problems seem very large, this approach gives a good analysis for an action plan that could be effective.

The problems or say defects are arranged according to types. They are arranged in decreasing order of percentages and the cumulative is found out. When the cumulative reaches 80%, (or 70 to 80%) it is often observed that a few actions of quality control will address these issues. Then, the available resource for quality control can be applied to effectively solve most of the problems.

8. (c) :

Areas where back flush Accounting is useful:

Back flush costing is generally used by companies that keep low levels of inventory and experience high turnover in inventory. It is because costs are still recorded relatively close to the day they are incurred. Companies with slow inventory turnover tend to record costs as they are incurred, as the product may remain unsold for a longer duration of time.

The back flush costing method works particularly well, where many different costs go into the production of a good. In such an instance, it can simplify the accounting process significantly. As a result, many manufacturing companies with complex production processes use back flush costing. However, companies that sell more customized products are less suited to a back flush costing method, as the unit cost will vary.

8. (d) :

Enumerate the situations where fixed costs become relevant for decision making:

In the following circumstances, fixed costs become relevant for decision making:

- (i) When Fixed Costs are specifically incurred for any contract
- (ii) When fixed costs are incremental in nature
- (iii) When the fixed portion of semi variable cost whereas due to change in level of activity consequent to acceptance of a contract.
- (iv) When fixed costs are avoidable or discretionary.
- (v) When fixed costs are such that one cost is incurred in lieu of another (the difference in costs will be relevant for decision-making)

8. (e) :

Sealed Bid Pricing:

The competitive pricing method is adopted in situations where firms compete for jobs on the basis of bids. The bid is the firms offer price and it is a prime example of pricing based on the expectations of how competitors will price rather than on a rigid relation based on the concerns own costs or demand. The objective of the firm in bidding situation is to get the contract and therefore it tries to set its prices lower than the other bidding firms.

SUGGESTED ANSWERS TO QUESTIONS

FINAL EXAMINATION

GROUP - III

(SYLLABUS 2016)

DECEMBER – 2021

Paper-15 : STRATEGIC COST MANAGEMENT – DECISION MAKING

Time Allowed : 3 Hours

Full Marks : 100

Section A MCQ

20X1= 20 Marks

Q.1 In cost-plus pricing, the markup consists of

- Ans
1. total cost and desired ROI.
 2. selling and administrative costs.
 3. manufacturing costs.
 4. desired ROI

Q.2 A manufacturing company has the following information pertaining to a normal monthly production of 10,000 units of a product.

Standard factory overhead rates are based on a normal monthly volume of one standard direct hour per unit.

Standard factory overhead rates per direct labor hour are:

Fixed	Rs. 6.00
Variable	<u>Rs. 10.00</u>
	Rs. 16.00
Units actually produced in current month	9,000 units
Actual factory overhead costs incurred (Includes Rs. 70,000 fixed)	Rs. 156,000
Actual direct labor hours	9,000 hours

The variable overhead spending variance is

- Ans
1. Rs.0
 2. Rs.10,000 (F)
 3. Rs.4,000 (F)
 4. Rs.86,000 (A)

Q.3 A factory is setting up a special inspection at the supply point of raw materials at Rs. 80,000. Consequent to this, there is lesser number of returns from customers. These goods used to be sold for Rs. 1,00,000 and variable costs are Rs. 80,000. The change in quality costs are

- Ans
1. Decrease by Rs. 80,000
 2. Decrease by Rs. 60,000
 3. Decrease by Rs. 20,000
 4. No change

Q.4 Companies that would benefit from back-flush costing include companies

- Ans
1. None of these.
 2. whose inventories vary from period to period.
 3. which have fast manufacturing lead times.
 4. companies that require audit trails.

Q.5 A learning curve is a function

- Ans
1. where unit costs increase as productivity increases.
 2. that increases at a greater rate as workers become more familiar with their tasks.
 3. that is linear.
 4. that measures the decline in labor-hours per unit due to workers becoming better at a job.

Q.6 Which of the following is TRUE about the theory of constraints?

- Ans
1. TOC recognizes that lower inventories means slower response to customers.
 2. TOC recognizes that lowering inventory decreases carrying costs and thus decreases operating expenses and improves net income.
 3. TOC recognizes that lower inventories means more defects.
 4. TOC recognizes that EOQ is important.

Q.7 Activities required to design, develop, produce, market, distribute, and service a product are known as

- Ans
1. target activities.
 2. value-chain activities.
 3. whole life activities.
 4. overhead.

Q.8 Only direct materials, direct labor, and variable manufacturing overhead costs are considered product costs when using

- Ans
1. absorption costing.
 2. full costing.
 3. variable costing.
 4. product costing.

Q.9 When there is excess capacity, it makes sense to accept a one-time-only special order for less than the current selling price when

- Ans
1. incremental revenues exceed incremental costs.
 2. additional fixed costs need not be incurred to accommodate the order.
 3. there is a positive contribution per unit of the product under normal capacity and spare capacity
 4. the special order is from a normal customer.

Q.10 A company that is a price-taker would most likely use which of the following methods?

- Ans
1. Target costing
 2. Cost plus pricing, contribution approach
 3. Cost plus pricing, absorption approach
 4. Time-and-material pricing

Q.11 To complete the first setup on a new machine took an employee 200 minutes. Using an 80% incremental unit-time learning model indicates that the second setup on the new machine is expected to take

- Ans
1. 120 minutes.
 2. 160 minutes.
 3. 60 minutes
 4. 80 minutes.

Q.12 The following will be the appropriate action to finish a project early

- Ans
1. Crash activities on the non critical path so that they become critical
 2. Crash activities on the non critical paths so that they remain non critical
 3. Crash activities on the critical path so that they become non critical
 4. Crash activities on the critical paths such that the critical paths remain critical

Q.13 If the unit level of inventory increases during an accounting period, then

- Ans
1. operating income will be the same under absorption costing and variable costing.
 2. the exact effect on operating income cannot be determined.
 3. more operating income will be reported under absorption costing than variable costing.
 4. less operating income will be reported under absorption costing than variable costing.

Q.14 In a transportation matrix (where R_i are rows and C_j are columns), the second allocation under the North West Corner Rule can be

- Ans 1. R_1C_2
2. None of these
3. R_2C_3
4. R_1C_3

Q.15 is the difference between the sales price needed to capture a predetermined market share and the desired profit per unit.

- Ans 1. Gross profit
2. Target cost
3. Target price
4. None of these.

Q.16 Liability claims is an example of

- Ans 1. prevention costs.
2. appraisal costs.
3. external failure costs.
4. internal failure costs.

Q.17 The _____ is a period of time when sales increase at a decreasing rate.

- Ans 1. maturity stage
2. growth stage
3. introduction stage
4. decline stage

Q.18 NM paid Rs.5,30,000 for a machine used to powder wheat. The machine can be sold for Rs.1,30,000. The sale value of wheat is Rs 8,00,000 and its variable cost is Rs.4,50,000. The opportunity cost of producing wheat flour is

- Ans 1. Rs. 5,30,000
2. Rs. 3,50,000
3. Rs. 8,00,000
4. Rs. 1,30,000

Q.19 Which of the following will always be a relevant cost?

- Ans 1. Fixed cost
2. Opportunity cost
3. Variable cost
4. Sunk cost

Q.20 The operational activity of setting up equipment is classified as a

- Ans 1. unit-level activity.
2. facility-level activity.
3. batch-level activity.
4. product-level activity.

- Q.1** MK Company incurred the following costs for 60,000 units: Variable costs Rs.18,00,000 Fixed costs Rs. 24,00,000 MK has received a special order from a foreign company for 5,000 units. There is sufficient capacity to fulfill the order without jeopardizing regular sales. Filling the order will require spending an additional Rs.85000 for shipping.
If MK wants to break even on the order, what should the unit sales price be?

Answer: Rs. 47

- Q.2** At KL Company, the cost of the personnel department has always been charged to production departments based upon number of employees. Recently, opinions gathered from the department managers indicate that the number of new hires might be a better predictor of personnel costs.
Total personnel department costs are Rs.200,000.

<u>Department</u>	<u>A</u>	<u>B</u>	<u>C</u>
Number of employees	30	270	100
The number of new hires	8	12	5

If number of new hires is considered the cost driver, what amount of personnel costs will be allocated to Department A?

Answer: Rs. 64,000

- Q.3** Spoilage is an example of _____ quality cost

Answer: Internal failure

- Q.4** During the lockdown days, a hospital that was running to capacity in terms of medical staff available on regular shifts proposes to share profits with staff that are willing to work extra time. Can this be termed lean management?

Answer: Yes. Planning from a lean perspective-invest in people

- Q.5** A hand crafted product is produced in a factory taking 8 hours per unit against the standard set at 9 hours. The production manager is trying to find means of reducing the standard to lesser hours by improving material handling, etc. This measure is considered as (Cost Reduction/ Cost Control)

Answer: Cost Reduction

- Q.6** Hardware Company reported the following results from the sale of 5,000 hammers in May: sales Rs. 200,000, variable costs Rs.120,000, fixed costs Rs.60,000, and net income Rs.20,000. Assume that Hardware increases the selling price of hammers by 10% on June 1. How many hammers will have to be sold in June to maintain the same level of net income?

Answer: 4,000

- Q.7** A factory is trying to establish standard time for a certain job. Workers arrive at 8:00am, during the day take tea and lunch breaks for 1 ½ hours, machines need set up for ½ an hour and workers leave by 4 p.m A worker can ideally produce a unit of output if he is at his job for two hours. How much is the standard labour hour per unit?

Answer: 2.67 hours

- Q.8** The average demand per day of cars from a travel company by past weeks observation is 4, whereas, by a simulation for 7 days using random numbers, the average demand is 7 per day. Should you advise the company to go by the simulation result?

Answer: No. Simulation is required for a large no. of days in order to arrive at a reasonable conclusion for taking action.

Q.9

<u>Activities</u>	<u>Total Costs Rs.</u>	<u>Activity – cost drivers</u>
Account inquiry hours	400000	10.000 hours
Account billing lines	280000	40,00,000 lines
Account verification accounts	150000	40,000 accounts
Correspondence letters	50000	4,000 letters
Total cost	8,80,000	

M provides the above ABC information. The above activities are used by Departments A and B as follows:

	<u>Dept A</u>	<u>Dept B</u>
Account inquiry hours	2,000	4,000
Account billing lines	400,000	200,000

How much of the account inquiry cost will be assigned to Department A?

Answer: Rs. 80,000

Q.10 At the breakeven point of 200 units, variable costs total Rs. 400 and fixed costs total Rs.600. The 201st unit sold will contribute-----to profits.

Answer: Rs. 3

Q.11 In a network, can you have nodes 1 and 2 to be starting nodes, so that the activities 1-3 and 2-3 have no predecessors?

Answer: Yes. 1-2 is a dummy

Q.12 Kraft Kay sells a single product. 7,000 units were sold resulting in Rs.70,000 of sales revenue, Rs.28,000 of variable costs and Rs.12,000 of fixed costs. Contribution margin per unit is?

Answer: Rs. 6 per unit

Q.13 Activity 1-2 lies on the critical path which has three other activities, each of the same duration of 1 week. If the project can be completed in 4 weeks, what is the earliest finish time of 1-2?

Answer: 1 week

Q.14 How many separate cost pools should be formed given the following information:

<u>Cost</u>	<u>Cost driver</u>
Postage costs	No. of brochures mailed
Printing and paper costs	No. of brochures mailed
Quality control costs	No. of inspections
Customer service costs	No. of customers served

Answer: 3 different cost pools

Q.15 If there were 60,000 kgs of raw materials on hand on January 1, 120,000 kgs are desired for inventory at January 31, and 360,000 kgs are required for production in January after a normal loss of 10% of input, how many kgs of raw materials should be purchased in January?

Answer: 4,60,000 kgs

Q.16 Hefty Company produces A and B with contribution margins per unit of Rs.40 and Rs.30, respectively. Only 500 labor hours and 300 machine hours are available for production.

Time requirements to produce two unit of A and three units of B are as follows:

	A	B
Labour hours	5	2
Machine hours.	1	4

Write the constraint on labour in a linear programming model considering x units of A and y units of B before simplifying the coefficients.

Answer: $5/2x+2/3y \leq 500$

Q.17 Oasis Ltd. Wants to produce and sell a new mineral water. In order to penetrate the market, the product will hav to sell at Rs. 20,00 per bottle. The following data has been collected:

Answer: Rs. 16

Q.18 P Ltd. has old inventory on hand that cost Rs.12,000. Its scrap value is Rs.16,000. The inventory could be sold for Rs.40,000 if manufactured further at an additionalcost of Rs.12,000. What should P Ltd. do?

Answer: Manufacture further and sell it for Rs. 40,000

Q.19 GI can produce 100 units of a necessary component part with the following costs:Direct Materials Rs.40,000

Direct Labor Rs. 18,000 Variable

Overhead Rs.42,000 Fixed

Overhead Rs.16,000

If GI purchases the component externally, Rs.4,000 of the fixed costs can be avoided. Below what external price for the 100 units would GI choose to buy insteadof make?

Answer: Rs. 1,04,000

Q.20 In a 4 x 4 assignment algorithm carried out by a student, the number of lines used to cover the zeroes was 4, though he could have covered them in three lines. Whatwill he face in the next step?

Answer: 3 allotments and zeros will be exhausted

Section : C
(12X4= 48 Marks)

One LAQ

Q.1 Manton Moulders is operating at 70% capacity and presents the following information: 9 Marks

BEP= Rs.200 lakhs, PV Ratio= 40% and Margin of Safety= Rs.50 lakhs

The management has decided to increase production to 95% capacity level with the following changes:

Selling price will be reduced by 8%

Variable cost will be reduced by 5% on sales

Fixed cost will increase by Rs.20 lakhs, including depreciation on additions but excluding interest on additional capital.

Additional capital of Rs.50 lakhs will be needed for capital expenditure and working capital

i) Calculate the present profit at 70% capacity [3]

ii) Calculate the sales that will be required to earn Rs.10 lakhs over and above the present profit and also meet 20% interest on the additional capital. [3]

iii) What will be the revised Break Even Point? [2]

iv) What will be the new Margin of Safety? [1]

Answer:

(i) Computation of present profit at 70% capacity:

= Rs. 20 lakhs

(ii) Sales required to earn target profit:

= Rs. 311.12 lakhs

(iii) New BEP = Rs. 244.45 lakhs.

(iv) New MOS = Rs. 66.67 lakhs

Q.2 Write a brief note on Pricing in Service sector.

3 Marks

Answer:

- Supply and labour billing.

- Pure labour billing

Cost plus pricing

Service overhead based billing

- Q.1** X Ltd is a diversified corporation with separate and distinct operating divisions. Each division's performance is evaluated on the basis of total profits and return on division investment. The Division A manufactures and sells table top air cooler units. Division A currently produces 15,000 units. Division A's manager believes that sales can be increased if the unit selling price of the table top air cooler is reduced. A market research study conducted by an independent firm at the request of the manager indicates that a 15% reduction in the selling price (Rs.60) would increase volume by 16% or 2,400 units, the reduced price applying to all the units. Division A has sufficient production capacity to manage this increased volume with no increase in fixed costs. At present, Division A uses a filter in each of its units that it purchases from an outside supplier at a cost of Rs.70 per filter. The manager of Division A has approached the manager of the Division B regarding the sale of a filter unit to Division A. The Division B currently manufactures and sells exclusively to outside firms a filter that is similar to the one used by Division A. The specifications of the Division A filter are slightly different which would reduce the Division B's direct material cost by Rs.5 per unit. In addition, the Division B would not incur any variable selling costs in the units sold to Division A. The manager of Division A wants all of the filters it uses to come from one supplier, and has offered to pay B Rs.50 for each filter unit. Division B has the capacity to produce 75,000 units and currently sells 64,000 units in the market.

(Rs.)

Particulars	Division A	Division B
Selling Price per unit	400	100
Manufacturing Costs:		
Filter	70	-
Variable Manufacturing Cost	112	30
Variable Marketing Cost	18	6

- i) Should Division A go for the increased volume of sales from a financial perspective? Justify your recommendation with appropriate figures. [2]
- ii) If B should supply the entire requirement of A after considering i) above, what is the minimum transfer price that B will agree to, given that a single transfer price applies to all units transferred to A? Is B likely to accept A's proposed transfer price? [3]
- iii) In the interest of X Ltd. as a whole, what should be the best strategy in terms of sourcing and selling the filters? Work out a suitable transfer price for the management to convince A and B. Assume that X Ltd. is not constrained about avoiding partial supply. [3]

Answer:

- (i) Sales revenue for 15000 units = $15000 \times 400 = \text{Rs. } 60,00,000$
 Sales Revenue for 17400 units = $17400 \times 0.85 \times 400 = 17400 \times 340 = \text{Rs. } 59,16,000$
 A should not go for the increased sales at that discount since there is no incremental revenue or contribution.
 Alternatively, Contribution per unit 200, for 15000 units = Rs. 30,00,000
 Contribution per unit 140, for 17400 units = Rs. 24,36,000
 The volume of 15000 units of air coolers is more profitable for A.
- (ii) B has spare capacity of $75000 - 64000 = 11000$ units. This can be supplied at variable cost less selling and material saving, i.e. 11000 units at 25 Rs. per unit. = Rs. 2,75,000
 4000 units have to be supplied by diverting market sales at Rs. 100 = Rs. 4,00,000
 Transfer price for 15000 units = Rs. 6,75,000
 $\text{Rs/unit} = 675000/15000 = 45$
 A has offered Rs. 50. It will be in B's interest to accept the offer.
- (iii) For every unit of B sold outside, the company earns a contribution of Rs. 64, whereas, if it transfers to A, the cost saved is just Rs. 70-25, which is Rs. 45 per unit.
 For X Ltd's best strategy, B should supply 11000 units to A out of its spare capacity and not divert from the market. X Ltd should convince A to accept partial supply from B. A also stands to gain since instead of paying Rs. 70 outside for the entire requirement of 15000 units, A will incur only Rs. 50, which is also acceptable by B for its spare capacity. A should buy 4000 units from the market at Rs. 70 and 11000 units from B at Rs. 50 which it offered earlier. B will not sell below Rs. 25 per unit (its variable cost to A) even from its spare capacity.

Q.2 The following data of manufacture and sale is obtained from ABC Ltd. for the year ending 31st March,2021

4 Marks

Product	A	B	C	D	E	F	Total
Contribution (Rs.)	500	200	1500	75	100	125	2500

Prepare a Pareto product contribution chart and comment on the sales.

Answer:

Rearrange the products in descending order of contribution and find out the cumulative contribution percentage.

Product	Contribution Rs.	Cumulative Contribution Rs.	Cumulative Contribution(%)
C	1500	1500	60%
A	500	2000	80%
B	200	2200	88%
F	125	2325	93%
E	100	2425	97%
D	75	2500	100%
Total	2500		

On analysis it is found that 80% of the total contribution is earned by C and A. Hence these two products should be carefully monitored and nurtured. The other products should be investigated for improvement of contribution.

Q.1 A company has four territories open, and four salesmen available for assignment. The territories are not equally rich in their sales potential; it is estimated that typical salesman operating in each territory would bring in the following annual sales.

8 Marks

Territory	1	2	3	4
Annual Sales (Rs. In 000's)	60	50	40	30

The four salesmen are also considered to differ in their ability; it is estimated that, working under the same conditions, their yearly sales would be proportionately as follows:

Salesman	A	B	C	D
Proportion	6	4	3	8

- i) If the criterion is maximum expected sales, the cost minimization matrix is
- ii) Matrix for Column minimum operation is
- iii) If the criterion is maximum expected sales, final assignment of salesman to the territories that result in optimum expected sales is

Answer:

Maximisation matrix				
T/S	6	5	4	3
6	36	30	24	18
4	24	20	16	12
3	18	15	12	9
8	48	40	32	24

(i) Cost Minimisation matrix			
12	18	24	30
24	28	32	36
30	33	36	39
0	8	16	24

Row Minimum Operation			
0	6	12	18
0	4	8	12
0	3	6	9
0	8	16	24

(ii) Column Minimum operation			
0	3	6	9
0	1	2	3
0	0	0	0
0	5	10	15

Minimum uncovered element operation			
0	2	5	8
0	0	1	2
1	0	0	0
0	4	9	14

Minimum uncovered element operation			
0	2	4	7
0	0	0	1
2	1	0	0
0	4	8	13

Minimum uncovered element operation			
0	0	2	5
2	0	0	1
4	1	0	0
0	2	6	11

S \ T	1	2	3	4
A		0		
B			0	
C				0
D	0			

(iii) Optimal assignment. Optimum Sales Value is as follows :

Sales Man	Territory	Sales (Rs 000)
A	2	30
B	3	16
C	4	9
D	1	48
	Total	103

Q.2 Define Value Engineering(VE).What are the issues considered during a VE review?

Answer:

4 Marks

Value engineering involves searching for opportunities to modify the design of each component or part of a product to reduce cost, but without reducing the functionality and quality of the product.

The Issues are as follows :

- Elimination of unnecessary functions from the production process.
- Elimination of unnecessary product qualities
- Design minimisation
- Substitution of parts
- Search for better way of doing things.

Q.1 ST Ltd. uses a standard costing system. The following data relating to a single product for the month of September has been furnished to you. The Standard cost per unit was:

8 Marks

Direct Material: Standard Price Rs.10 per kg, Standard quantity 20 kgs per unit

Direct Labour : Standard Rate of pay Rs.5.50 per hour, Standard Time 12 hours per unit

Production OH Costs, all classified as fixed, were budgeted at Rs.9,00,000 p.a. The standard time for producing one unit is 12 machine hours and normal capacity is 60,000 machine hours p.a. Production OH is absorbed on machine hours. The costs incurred and other relevant information for the month is given below:

Direct Material used-1,00,000 kgs at a cost of Rs.10,50,000

Direct Wages paid-Rs.3,10,000 for 62,000 hours

Production Overhead-Rs.9,26,000

Machine capacity used-60,000 hours

Actual output-4,800 units. Assume no stocks of WIP or Finished Goods at the yearend.

- i) The standard product cost for one unit is
- ii) Variance for Material (Usage and Price) are
- iii) Variance for Labour (Rate and Efficiency) are:
- iv) Variance for Fixed OH (Volume and Expenditure) are

Answer:

- i) Standard Product Cost for one unit = Rs. 446
- ii) Material Usage Variance:= Rs. 40,000 (A)
Material Price Variance:= Rs. 50,000 (A)
- iii) Labour Efficiency Variance:= Rs. 24,200 (A)
Labour Rate Variance:= Rs. 31,000(F)
- iv) Fixed OH Volume Variance: = Rs. 36,000(A)
Fixed OH Expenditure Variance: = Rs. 26,000(A)

Q.2 What is the impact of Just-in-time on Product Prices?

4 Marks

Answer:

When a company achieves a higher level of product quality, along with ability to deliver products on the dates required, customers may be willing to pay a premium. This is particularly true in industries where quality or delivery reliability is low. If customers are highly sensitive to these two factors, it may be possible to increase the price substantially. Alternatively, if these factors are not of great importance, if customers place a higher degree of importance on other factors, then there will be no opportunity for a price increase.

In industries where many companies are adopting JIT systems at the same time or have already installed them, an improvement in product quality and delivery times does not differentiate a company from its peers. Instead, since everybody else is offering the same level of quality and service it just keeps a company from losing sales to its competitors. In such a situation it is more likely that all companies remaining in the industry will use their new-found lower costs to initiate a price war that will result in a drop in prices. Consequently, the impact of a JIT system on product pricing is primarily driven by customers' perceived need for higher product quality and reliable delivery times, as well as the presence of competitors with JIT system, the same installation, and operational base.

Q.1 A project consists of 7 activities and the time estimates of the activities are furnished as under:

7 Marks

Activity	Optimistic days	Most likely days	Pessimistic days
1-2	4	10	16
1-3	3	6	9
1-4	4	7	16
2-5	5	5	5
3-5	8	11	32
4-6	3	6	9
5-6	2	5	8

- i) Possible paths of the project are
- ii) Identify the critical path and its duration
- iii) Variance of the critical path is:[1]
- iv) What project duration will provide 95% confidence level of completion ($Z_{0.95}=1.65$)?

Answer:

$$(i) te = (t_0 + 4t_m + t_p) / 6$$

Possible paths are = 1 - 3 - 5 - 6 = 6 + 14 + 5 = 25 days

1 - 2 - 5 - 6 = 10 + 5 + 5 = 20 days

1 - 4 - 6 = 8 + 6 = 14 days

(ii) Critical path is 1 - 3 - 5 - 6 = 6 + 14 + 5 = 25 days

(iii) Variance of Critical path is: $[(t_p - t_0) / 6]^2 = 1 + 16 + 1 = 18$ days

(iv) Given that $Z = 1.65$ for probability of 95%

$$\text{So } [Tr - T_{cp}] / SD = [Tr - 25] / 4.24 = 1.65$$

$$\text{Hence } Tr = 25 + 6.996 = 32 \text{ days}$$

Q.2 (i) State the major reasons for using Simulation technique to solve management problem.

5 Marks

- ii) Outline the limitations of Simulation.

Answer:

(i) - A simulation model is easier to explain to management.

- Model experimentation. Experimenting with the actual system itself would be too costly.

- Suitable in cases of large complex problems.

- Cost savings.

(ii) Limitation of Simulation :

- Simulation is not precise.

- Only situations involving uncertainty can be measured.

- Simulation generates only a way to evaluate solutions but does not generate the solution techniques.

- Choice of random numbers is subjective.

Six LAQ
(4X3 = 12 Marks)

Q.1 Write short note on advantages of Target costing

3 Marks

Answer:

Advantage of Target Costing :

- (i) Innovation
- (ii) Competitive advantage
- (iii) Market driven management
- (iv) Real cost reduction

Q.2 Write short note on Rate of return pricing. What are the issues that may arise due to adoption of this pricing?

3 Marks

Answer:

Rate of Return Pricing :

Determination of return on capital employed is one of the most crucial aspects of price fixation process. In this process instead of arbitrarily adding a percentage on cost of profit, the firm determines an average mark up on cost necessary to produce a desired rate of return on its investment. Under this method three issues arise:

- The basis on which the capital employed is computed.
- Which items should be covered on the return on capital.
- What rate of return can be regarded as fair?

Q.3 Write short note on Lean Accounting

3 Marks

Answer:

Lean Accounting :

It is the general term used for the changes required to a company's accounting, control, measurement and management processes to support lean manufacturing and lean thinking. Lean manufacturing breaks the rules of mass production and so the traditional accounting and management methods are at best unsuitable and usually activity hostile to the lean changes the company is making.

Q.4 Write short note on Project crashing

3 Marks

Answer:

Project Crashing :

Project crashing is a network technique with a focus on reducing the project duration to the optimum level. Reduction in project duration may involve extra costs. Hence, project crashing seeks to determine the optimum duration of the project, i.e. time that corresponds to the minimum costs. The activity cost slope indicates the additional cost incurred per unit of time saved in reducing the duration of an activity.

Q.5 Write short note on concept and aim of Theory of Constraints

3 Marks

Answer:

Concept and aim of theory of Constraints :

TOC analyses the Bottlenecks and constraints within the firm that restrict output and hinder speedy production. Through put is related directly to the ability to cope with the constraint and to manage the bottle neck. This focus on throughput enables management to examine both constraints and bottlenecks in order to increase Throughput contribution.

Q.1 Getwell Hospitals is a recently constructed multi speciality hospital and has been operating for the last three years quite successfully. A group of doctors who were founders of this hospital could not use the entire facility by itself to recover costs and make profits. They rented out the hospital facilities to different expert groups like pediatrics, cardiology etc. and collected amounts consisting of two elements—the variable portion relating to the number of patient days and a fixed portion irrespective of the number of beds occupied. Apart from common facilities, the respective expert groups had to engage its own nurses, aides and supervisory nurses on a full time basis. This is being done carefully after assessing the ability to attend on the requirements of patients.

During COVID, the number of patients who came for regular check-ups and undertook consequent preventive medical treatments dwindled drastically and therefore the whole hospital saw the necessity and opportunity to function as a COVID Care hospital. Now the facilities were rented to Covid treatment groups and all groups had a hundred per cent occupancy.

One such group called Covid Sure Cure (CSC) that rented this facility had the following figures for the past year: It had taken up 60 beds for 365 days. It was charged by Getwell a sum of Rs. 9,31,80,000 as the fixed charge and Rs. 9000 per patient day as the variable charge. CSC in turn charged its patients Rs. 15000 per bed per day.

The range of requirements beginning from the minimum relating to nursing staff is given below: 4+2+2+4= 12 Marks

Annual patient days	Aides (A)	Nurses (N)	Supervising Nurses (SN)
10,000 - 14,000	20	10	3
14001-17000	21	11	3
17001- 20000	21	12	3
20001-23000	22	13	4
23001-25000	23	14	5
25001-27000	24	15	7

Salaries that had to be paid annually to each person under these categories was the following

	Rs.3,60,000	Rs.4,80,000	Rs.5,40,000
--	-------------	-------------	-------------

CSC was comfortable during the pandemic as all the beds were occupied all the time and there was a growing demand for more. But in the coming year, as the number of patients has come down and some beds are now being given for post- covid complication care patients, CSC wants to look at its cost structure to be able to negotiate a different pricing with Getwell.

- Under the given conditions of outflows to salaries and to Getwell, how many patient days will be required by CSC for the earliest break-even?
- How many beds does this figure translate to, on an average?
- Will it be substantially worthwhile for CSC to consider trimming its requirement on the number of nursing staff?
- If CSC expects an 80 % level of occupancy during the current period, what should be the amount to be paid to Getwell with a 25 % margin of safety? It feels it cannot increase the charge to patients.

Answer:

- BEP patient days = 18020.
- This translates to about 49.36, say 50 beds occupancy. (18020 ÷ 365)
- The staffing cost is very low considering the huge bulk of fixed cost to Getwell. As seen above, one level of pruning will only save 230 patient days, which is not even one bed occupancy. Hence it is not worthwhile for CSC to trim its staff. Another aspect is that trimmed workforce may be stressed and may not render adequate quality. Further, it is stated that the staffing is already done carefully. Hence there is no likelihood of a substantial reduction in nursing staff cost.
- Amount to be paid to Getwell towards fixed and variable component = Rs. 18,21,60,000.

18537

FINAL EXAMINATION

December, 2022

P-15(SCMD)

Syllabus 2016

Strategic Cost Management—Decision Making

Time Allowed: 3 Hours

Full Marks: 100

*The figures in the margin on the right side indicate full marks.**Working Notes should form part of the respective answers.**Wherever necessary, candidates may make appropriate assumptions and clearly state them in Answer.*

Section-A is compulsory and contains Question No. 1 for 20 marks. Section-B contains Question Nos. 2 to 8, each carries 16 marks.

Section-A

Answer all the questions. Each question carries two marks.

1. Choose the most appropriate answer to the following questions giving justification/reasonable workings: (One mark is for the correct choice and one mark is for the justification/workings.) 2×10= 20

(i) The Income statement of BOMA Ltd. is summarized as below:

	(₹ in Lakh)
Net Revenue	120
Less: Expenses (including ₹Rs.60 lakh of fixed cost)	132
Net Loss	12

The Manager (F&A) believes that an increase of ₹ 30 lakh as fixed expenditure in advertising outlays will increase the sales substantially. At what sales volume will the company have break even?

- (A) ₹ 250 lakh
- (B) ₹ 225 lakh
- (C) ₹ 200 lakh
- (D) None of the above

- (ii) SOVI Ltd., a mobile phone manufacturer, is planning to introduce a new mobile phone. The potential market over the next year is 10,00,000 units. The SOVI Ltd. has the capacity to produce 4,00,000 units and could sell 1,00,000 units at a price of ₹ 10,000. Demand would double for each ₹ 1,000 fall in the selling price. The company has a 25% profit margin on sales for the similar products. What is SOVI Ltd.'s target cost per unit to the nearest Re?
- (A) ₹ 8,000
(B) ₹ 7,000
(C) ₹ 6,000
(D) ₹ 4,000
- (iii) SIXT Ltd. has developed a new product and just completed the manufacture of the first four units of the product. The first unit took 3 hours to manufacture and the first four units together took 8.3667 hours to produce. The learning curve rate is
- (A) 83.50%
(B) 75.00%
(C) 60.65%
(D) 58.50%
- (iv) Depreciation of product testing equipment is
- (A) Internal Failure Cost
(B) Appraisal Cost
(C) Not a Quality Cost
(D) Irrelevant, but Quality Cost
- (v) AMRIT Ltd., a manufacturer of doors using a Throughput costing system, is experiencing a bottleneck in its plant. Set up time at one of its work stations has been identified as the offender. The Manager (Finance) has proposed a plan to reduce the set up time at a cost of ₹ 5,24,000. The change will result in 500 additional doors. The selling price per door is ₹ 19,300, Direct Labour costs are ₹ 2,400 per door and the cost of Direct Materials is ₹ 8,000 per door. All units produced can be sold. The change will result in an increase in the Throughput Contribution of _____.
- (A) ₹ 60,20,000
(B) ₹ 56,50,000
(C) ₹ 44,50,000
(D) None of the above

- (vi) RON Ltd., a manufacturer of product CEMO using a standard costing system provides the following information pertaining to the Direct Materials for the month of November, 2022:

1 tonne of material input yields standard output of (units)	1,00,000
Standard price of material per kg (₹)	20
The Actual quantity of material used (Tonnes)	10
Actual price of material per kg (₹)	21
Actual output obtained for the month (units)	9,00,000

Material cost variance will be-

- (A) ₹ 40,000 (Adv)
(B) ₹ 40,000 (Fav)
(C) ₹ 30,000 (Adv)
(D) ₹ 25,000 (Adv)
- (vii) The constraints in a linear programming Model are —
- (A) Included in the Objective function
(B) Costs
(C) Scarce Resources
(D) Dependent Variables
- (viii) A PERT network has only two activities on its critical Path. The Standard Deviation of these activities are 6 and 8 respectively. What is the Standard Deviation of the Project completion time?
- (A) 7
(B) 10
(C) 14
(D) 100

(ix) MN Ltd. sales for the years 2018 and 2019 were ₹ 8,00,000 and ₹ 7,92,000. The cost of goods sold correspondingly were ₹ 4,80,000 and ₹ 4,64,000. In the year 2019 selling price was reduced by 10% as compared to 2018. What was the decrease in gross profit caused by the change in selling price?

- (A) ₹ 8000
- (B) ₹ 72,000
- (C) ₹ 79,200
- (D) ₹ 88,000

(x) The Holiday Card Company, a producer of specialty cards, has asked you to complete several calculations based upon the following information:-

Income tax rate	30%
Selling price per unit	₹ 6.60
Variable cost per unit	₹ 5.28
Total fixed costs	₹ 46,200

How many cards must be sold to earn an after-tax net income of ₹ 18,480?

- (A) 60,000 units
- (B) 45,000 units
- (C) 75,000 units
- (D) 55,000 units

Section-B

(Answer any five Questions)

16×5=80

2. (a) ABC Enterprises has prepared a draft budget for the next year as follows:

Quantity	10,000 units
Sales price per unit (₹)	30
Variable costs per unit:	
Direct Materials (₹)	8
Direct Labour (₹)	6
Variable overhead(2hrs×1) (₹)	2
Contribution per unit (₹)	14
Budgeted Contribution (₹)	1,40,000
Budgeted Fixed Costs (₹)	1,25,000
Budgeted Profit (₹)	15,000

The Board of Directors are dissatisfied with this budget, and asks working party to come up with alternate budget with higher target profit figures. The working party reports back with the following suggestions that will lead to budgeted profit of ₹ 25,000. The company should spend ₹ 30,000 on advertising and set the target sales price up to ₹ 32 per unit. It is expected that the sales volume will also rise, in spite of the price rise to 12,000 units.

In order to achieve the extra production capacity, however, the workforce must be able to reduce the time taken to make each unit of the product. It is proposed to offer a pay and productivity deal in which the wage rate per hour is increased to ₹ 4. The hourly rate for variable overhead will be unaffected.

Ascertain the target labour time required to achieve the target profit. 10

2. (b) POBIX Ltd. has been approached by a customer who would like a special job to be done for him and willing to pay ₹ 22,000 for it. The job would require the following materials:

Material	Total units required	Units already in stock	Book value of units in stock ₹/Unit	Realisable value ₹/Unit	Replacement cost ₹/Unit
A	1,000	0	-	-	6
B	1,000	600	2	2.5	5
C	1,000	700	3	2.5	4
D	200	200	4	6	9

- (i) Material B is used regularly by POBIX Ltd. and if stocks are required for this job, they would need to be replaced to meet other production demand.
- (ii) Materials C and D are in stocks as the result of previous excess purchase and they have a restricted use. No other use could be found for material C but material D could be used in another job as substitute for 300 units of material E which currently cost ₹ 5 per unit (of which the company has no units in stock at the moment).
- (iii) All other expenses on the contract to be specially incurred besides the relevant cost of material is ₹ 550.

Required:

What are the relevant cost of material in deciding whether or not to accept the contract? (Show the reasons for relevancy of cost elements) 4+2=6

3. TOCON Ltd. manufactures plastic cans of a standard size. The variable cost per can is ₹ 4 and the selling price is ₹ 10 each. The factory of the company has eight machines of identical size. Any individual machine can produce 30 cans per hour. The factory works on 300 days per annum basic and the actual available hour per machine per day is 7.5. The company has an order of 4,20,000 cans from an oil company, to supply. The yearly fixed cost of the company is ₹ 20 lakhs. TOCON Ltd. has received an order from another firm for supplying 60,000 nos. of plastic moulded toys. The price of the toys is ₹ 60 each and the variable cost is ₹ 50 each. While this order would be acceptable for supplying for total quantities only on acceptance, a special mould costing ₹ 2,25,000 would be required to be acquired to manufacture the toys. The time study exercise has revealed that 15 nos. of toys can be produced per hour by any of the machines.

Required:

Advise the company, with reasons in the following situations:

- (i) Whether to accept the order of manufacturing moulded toys, in addition to supplying 4,20,000 nos. of cans or not;
- (ii) Whether to accept the order of manufacturing moulded toys, if order of cans increases to 5,40,000 nos. or not;
- (iii) While a sub-contractor is willing to supply the toys, either whole or part of the required quantities at an all-inclusive rate of ₹ 57.50 each, what would be the minimum excess capacity needed to justify the manufacturing of any portion of the toys order, instead of sub-contracting?
- (iv) The company had an understanding that the orders of the cans will be increased during the year on negotiations and planned and manufactured 4,50,000 cans during the year. For utilizing the excess capacity, they also accepted the toys order and sub-contracted only 15,000 nos. of toys. At the year's end, however, it was revealed that the order of the cans could be for 4,80,000 nos., if it was properly negotiated. How much loss has been suffered by the company due to improper prediction of demand and negotiation? 3+3+3+7=16

4. (a) The budgeted output of SAB Ltd., a single product manufacturing company for the year ending 31st March was 5,000 units. The financial results in respect of the actual output of 4,800 units achieved during the year were as under:

	₹
Direct Material	29,000
Direct Wages	45,000
Variable Overheads	72,500
Fixed Overheads	40,000
Profit	37,000
Sales	2,23,500

The standard wage rate is ₹ 4.50 per hour and the standard variable overhead rate is ₹ 7.50 per hour.

The cost accounts recorded the following variances for the year:

Variations	Favourable (₹)	Adverse (₹)
Material price		70
Material usage		130
Wage rate	450	
Labour efficiency		2,250
Variable overheads expenses	3,000	
Variable overhead efficiency		3,500
Fixed overhead expenses		2,500
Selling price	7,500	

Required:

- (i) Prepare the standard product cost sheet per unit.
 - (ii) Compute the Fixed Overhead volume variance, Sales volume variance, Sales price variance and Standard profit for the year.
 - (iii) Prepare a statement showing the reconciliation of Standard profit and the Actual profit. 5+4+3=12
4. (b) Enumerate the requisites for installation of an Uniform Costing in an organization. 4
5. (a) BON Ltd. manufactures 3 types of biscuits F,G and H in a fully mechanized factory. The company has been following conventional method of costing and wishes to shift to Activity Based Costing (ABC) System and therefore wishes to have the following data presented under both the system for the month.

	₹
Inspection Cost	73,000
Machine-Repairs & Maintenance	1,42,000
Dye Cost	10,250
Selling Overheads	1,62,000

	Products		
	F	G	H
Prime Cost (₹ Per unit)	12	9	8
Selling Price (₹ Per unit)	18	14	12
Gross Production (units/production run)	2,520	2,810	3,010
No. of defective (units/production run)	20	10	10
Inspection:			
No. of hours/Production run	3	4	4
Dye Cost/Production run (₹)	200	300	250
No. of Machine hours/Production run	20	12	30
Sales— No. of Units/Month	25,000	56,000	27,000

The following additional information is given:

- (i) No accumulation of inventory is considered. All goods units produced are sold.
- (ii) All manufacturing and selling overheads are conventionally allocated on the basis of units sold.
- (iii) Product F needs no advertisement. Due to its nutritive value, it is readily consumed by diabetic patients of a Hospital. Advertisement costs included in the total selling overhead is ₹ 83,000.
- (iv) Product G needs to be specially packed before being sold, so that it meets competition. ₹ 54,000 was the amount spent for the month in specially packing G, and this has been included in the total selling overhead cost given.

Required:

- (i) Present product-wise profitability of statement under the conventional system and
- (ii) Present product-wise profitability of statement under the Activity Based Costing (ABC) system and accordingly rank the products. 10

5. (b) Division Z of ZUML Ltd. is a profit centre which produces four products P,Q,R and S. Each product is sold in the external market also. Data for the period is:

	P	Q	R	S
Market price per unit (₹)	150	146	140	130
Variable cost of production per unit (₹)	130	100	90	85
Labour hours required per unit	3	4	2	3

Product S can be transferred to division M of ZUML Ltd. but the maximum quantity that may be required for transfer is 3000 units of S.

The maximum sales in the external market are:

P	3,360 units
Q	3,000 units
R	2,760 units
S	1,920 units

Division M can purchase the same product at a price of ₹ 125 per unit from outside instead of receiving transfer of product S from Division Z.

Required:

What should be the transfer price for each unit for 3,000 units of S, if the total labour hours available in division Z are 24,000 hours? 6

6. (a) In a textile sales emporium of SONTEX Ltd. four salesmen A,B,C and D are available to four counters W,X, Y and Z. Each salesman can handle any counter. Their services (in hour) of each counter, when manned by each salesman is given below:

Counter	Salesman			
	A	B	C	D
W	41	72	39	52
X	22	29	49	65
Y	27	39	60	51
Z	45	50	48	52

Required:

How should the salesmen be allocated appropriate counters so as to minimize the service time? Each salesman must handle only one counter. 8

6. (b) The output of a production line of SONPIM Ltd. is checked by an inspector for one or more of three different types of defects, called defects Major, Minor and Medium. If defect Major occurs, the item is scrapped. If defect Minor or Medium occurs, the items must be reworked. The time required for reworking for a Minor defect and a Medium defect is 15 minutes and 30 minutes respectively.

The probabilities of Major, Minor and Medium defects are 0.15, 0.20 and 0.10 respectively.

Use the following Random Numbers (RN) of three defects:

RN for Defect Major	48	55	91	40	93	01	83	63	47	52
RN for Defect Minor	47	36	57	04	79	55	10	13	57	09
RN for Defect Medium	82	95	18	96	20	84	56	11	52	03

- (i) For 10 items coming off the assembly line, you are required to present data table with Random Number assigned and the existence of defect in Major, Minor and Medium type separately.
- (ii) Determine the number of items without any defects and with defects, the number of item scrapped and the total minutes of reworked time. $(2+4)+(1+1)=8$

7. (a) Projects India Limited undertakes special contracts. The following table gives estimates of time and cost for activities involved in completing one contract which has just been offered to them:

Activity	Previous activities	Normal time (Days)	Normal cost (₹)	Minimum time	Cost of minimum time (₹)
A	-	12	10,000	8	14,000
B	-	10	5,000	10	5,000
C	A	0	0	0	0
D	A	6	4,000	4	5,000
E	B, C	16	9,000	14	12,000
F	D	16	3,200	8	8,000

- (i) Draw a network diagram and identify the critical path for normal procedures.
- (ii) Recommend the least number of days required to be crashed to achieve the minimum time and calculate the total cost. $4+6=10$

7. (b) A manufacturer of medicine is proposed to prepare a production plan for medicines A and B. There are sufficient ingredients available to make 20,000 bottles of medicine A and 40,000 bottles of medicine B. But there are 45,000 bottles into which either of the medicine can be filled. Further it takes 3 hours to prepare enough material to fill 1,000 bottles of medicine A and 1 hour to prepare enough material to fill 1,000 bottles of medicine B and there are 66 hours available for this operation. The profit is ₹ 8 per bottle of medicine A and is ₹ 7 per bottle of medicine B.

Formulate the above as a Linear Programming Problem. (Do not solve)

8. Write Short Notes on *any four* out of the following five questions:

- (a) Lean Accounting
 - (b) Pareto Analysis in Quality Management
 - (c) Areas where Backflush costing is useful
 - (d) Enumerate the situations where Fixed Costs become relevant for Decision Making
 - (e) Sealed Bid Pricing
-

SUGGESTED ANSWERS TO QUESTIONS

SECTION – A

1.

2X10 = 20 Marks

- (i) (B)
- (ii) (C)
- (iii) (A)
- (iv) (B)
- (v) (B)
- (vi) (C)
- (vii) (C)
- (viii) (B)
- (ix) (D)
- (x) (D)

SECTION –B

(Answer any five questions)

2 (a) :

10 Marks

Time required to achieve the target profit = 21,600 hours

2 (b) :

4+2 = 6 Marks

Relevant cost of Material and the Job = Rs. 16,000

Decision: Contract should be accepted since offered is Rs 22000 in relation to relevant cost of Rs 16000.

Reasons for Relevancy of Cost Elements :

- (i) Material A is not yet owned. It would have to be purchased in full at the replacement cost of Rs.6.00 per unit.
- (ii) Material B is used by the company regularly. There is already existing a stock of 600 units. If these are used in the contract, a further 600 units would have to be purchased.
Relevant cost is therefore 1000 units at the replacement.
- (iii) Material C : 1000 units of material C are, required and 700 units are already in stock. If it is used for the contract, a further 300 units will have to be purchased at a replacement cost of Rs.4.00 each. The existing stock of 700 units will not be replaced. If they are used for the contract, they cannot be used @ Rs.2.50 each unit. The realisable value these 700 @ RS. 2.50 per units represent an opportunity cost of sales revenue forgone.
- (iv) Material D is already in stock and will not be replaced. There is an opportunity cost of using D in the contract, because there are alternative opportunities either to sell the existing stock for Rs. 6 per unit (Rs.1200 in total) or avoid other purchases (of material E) which cost $300 \times 5 = \text{Rs.}1500$, since substitution for E is more beneficial. Rs 1500 is the opportunity cost.

3 :

3+3+3+7 = 16 Marks

(i)

Increase in Net Profit = Rs. 375000

Decision : It is advisable for the company to accept the order of 60000 moulded toys as it will increase its profit by Rs. 375000.

(ii)

	Rs. (Lacs)
Profit from 540000 cans	<u>12.40</u>
Alternatively, the production would be 420000 cans and 60000 moulded toys	
Profit from 420000 cans	5.20
Profit from 60000 moulded toys	<u>3.75</u>
Total profit	<u>8.95</u>

Decision:

The production of 120000 additional cans instead of 60000 moulded toys will result an additional profit of Rs. 3.45 lacs (Rs. 12.40 lacs - Rs. 8.95 lacs). Therefore, the company is advised not to accept the order of manufacturing moulded toys.

(iii)

Let the minimum excess capacity needed to justify the manufacturing of any portion of the moulded toys order be A.

If toys are manufactured, the profit is = (Rs. 60 – Rs.50) A – Rs. 225000

and, if toys are subcontracted, the profit is =(Rs.60– Rs.57.50) A indifference point would be 10A - Rs. 225000 = 2.5 A

$$\text{or } A = 30000 \text{ moulded toys}$$

Toys produced per hour = 15 toys

Therefore, 2000 (30000 toys / 15 toys) excess machine hours are required to justify manufacturing of toys by the company, instead of sub-contracting.

(iv)

Profit under existing production plan :

	Rs. (Lacs)
Contribution from 450000 Cans	27.00
Contribution from 45000 Toys	<u>4.50</u>
Total contribution	31.50
Less: Fixed cost	<u>22.25</u>
Profit	9.25
Profit from 15000 sub-contracted toys	<u>0.375</u>
Total profit	<u>9.625</u>

If demand was accurately forecasted and 480000 cans were manufactured, excess machine hour capacity available was 2000 hrs such excess being the point of indifference i.e. profit from toys order would be the same by either manufacturing 30000 toys or sub-contracting them along with the rest of 30000 toys.

Profit under properly negotiated production plan :

	(Rs. Lacs)
Contribution from 480000 Cans	28.80
Less : Fixed cost	<u>20.00</u>
Profit	8.80
Profit from toys	1.50
Total profit	<u>10.30</u>

Therefore, the loss for improper prediction and negotiation is Rs. 1030000 – Rs. 962500 = Rs. 67500

4 (a) :

5+4+3 = 12 Marks

- (i) Standard Material Cost per Unit : =Rs 6
Standard Wage rate per Unit : = Rs 9
Standard Variable overhead per unit: = Rs 15
Standard Fixed overhead rate per Unit: = Rs 7.50

- (ii) Fixed overhead Volume Variance: Rs 1500 (Adv.)
Sales Volume Variance: = Rs 9000 (Adv.)
Sales Price Variance: = Rs 7500 (Fav)
Standard Profit: = Rs 36000

- (iii) Statement Showing Reconciliation of the Standard Profit and the Actual Profit :

		Rs	
Standard Profit		36000	
Add : Sales Price Variance (Favourable)		7500	
		<u>43500</u>	
Add :Favourable Cost Variances :			
Wages Rate Variance	450		
Variable overhead expenses	3000	3450	
	<u> </u>	<u>46950</u>	
Less : Adverse Cost Variances			
Material price	70		
Material usage	130		
Labour efficiency	2250		
Variable overhead efficiency	3500		
Fixed overhead Expense	2500	8450	
		<u> </u>	38500
Less :Fixed overhead volume variance (Adverse)		1500	
Actual Profit		<u>37000</u>	

4. (b) :

4 Marks

The requisites for installation of a Uniform Costing are enumerated below:

- (i) There should be a spirit of mutual trust, co-operation and a policy of give and take amongst the participating members.
- (ii) There should be a free exchange of ideas and methods.
- (iii) The bigger units should be prepared to share with the smaller ones, improvements, achievements of efficiency, benefits of research and know-how.
- (iv) There should not be any hiding or withholding of information.
- There should be no rivalry or sense of jealousy amongst the members

5. (a) :

10 Marks

- (i) Profitability Under Conventional Accounting System.

	Products			
	Total	F	G	H
Sales – Units / Production (Goods Units)	108000	25000	56000	27000
Gross Margin (Rs)	533080	147600	278200	107280
Production Overheads (Rs)	225250	52141	116796	56313

Selling Over heads (Rs)	162000	37500	84000	40500
Sub-Total Overhead (Rs)	387250	89641	200796	96813
Net Profit (Rs)	145830	57959	77404	10467
Ranking		II	I	III

(ii) Profitability Under Activity Based Costing (ABC)

	Products		
	F	G	H
Sales – Units / Production (Goods Units)	<u>25000</u>	<u>56000</u>	<u>27000</u>
Gross Margin (Rs)	<u>147600</u>	<u>278200</u>	<u>107280</u>
Production Over head (Rs)	57000	94000	74250
Selling Overheads	5787	122963	33250
Sub-Total Overheads	62787	216963	107500
Net Profit	84813	61237	(220)
Ranking	I	II	III

5. (b) :

6 Marks

Ranking of products when availability of time is the key factor:

Products	P	Q	R	S
Market Price (Rs)	150	146	140	130
Less : Variable Cost (Rs)	130	100	90	85
Contribution per unit (Rs)	20	46	50	45
Labour hours per unit	3	4	2	3
Contribution / Labour hour (Rs)	6.66	11.5	25	15
Ranking	IV	III	I	II
Maximum demand (units)	3360	3000	2760	1920
Total no. of hours	10080	12000	5520	5760
Allocation of 24000 hours on the basis of ranking	720*	12000	5520	5760
* Balancing figure				

Transfer price = Rs 118.34

6. (a) :

8 Marks

Step : 1 Row subtraction

Sales Man \ Counter	A	B	C	D
W	2	33	0	13
X	0	7	27	43
Y	0	12	33	24
Z	0	5	3	7

Column subtraction

Sales Man \ Counter	A	B	C	D
W	2	28	0	6
X	0	2	27	36
Y	0	7	33	17
Z	0	0	3	0

Step 2 : Minimum straight lines to cover zeros.

Sales Man		A	B	C	D
Counter					
W	2	28	0	6	
X	0	2	27	36	
Y	0	7	33	17	
Z	0	0	3	0	

Step 3 : Smallest uncovered number subtracted from uncovered numbers, added to number at intersection of two lines

Sales Man		A	B	C	D
Counter					
W	4	28	0	0	
X	0	0	25	34	
Y	0	5	31	15	
Z	2	0	9	0	

In row Z, column3, should be 3 instead of 9.

Step 4 : Return to Step 2. Cover all Zeros. since the number of lines is 4, the optimality criteria is satisfied.

Sales Man		A	B	C	D
Counter					
W	4	28	0	6	
X	0	0	25	34	
Y	0	5	31	15	
Z	2	0	3	0	

It should be step 3 instead of 2.

Allocation of Sales men and Total Times

Counter	Salesmen	Times (Hours)
W	C	39
X	B	29
Y	A	27
Z	D	52
Total		147

6. (b) :

(2+4)+(1+1)= 8 Marks

The probabilities of occurrence of Major, Minor and Medium defects are 0.15, 0.20 and 0.10 respectively. So, tile numbers 00 – 99 are allocated in proportion to the probabilities associated with each of the three defects.

Defect Major		Defect Minor		Defect Medium	
Exists	RN Assigned	Exists ?	RN Assigned	Exists ?	RN Assigned
Yes	00 – 14	Yes	00 – 19	Yes	00 – 09
No	15 – 99	No	20 – 99	No	10 – 99

(i) Simulation of output of the assembly line for 10 items :

Item No.	RN : Defect Major	RN : Defect Minor	RN : Defect Medium	Defect Exist or Not	Rework time (in min.)	Scrap
1.	48	47	82	None	Nil	--
2.	55	36	95	None	Nil	--
3.	91	57	18	None	Nil	--
4.	40	04	96	Minor	15	--
5.	93	79	20	None	Nil	--
6.	01	55	84	Major	Nil	Scrap
7.	83	10	56	Minor	15	--
8.	63	13	11	Minor	15	--
9.	47	57	52	None	Nil	--
10.	52	09	03	Minor & Medium	15 + 30 = 45	--

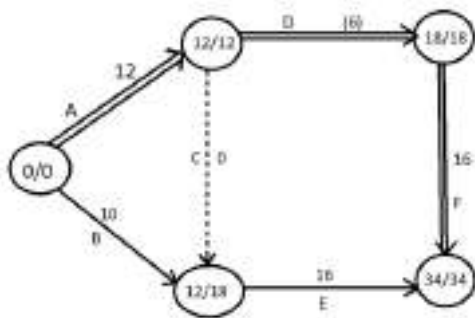
(ii) During the simulated period, 5 items had defect and other 5 items had not defects.

One item was scrapped.

Total reworked time is required for four items = 90 minutes

7. (a) :

4+6 = 10 Marks



Critical Path with duration = A -> D -> F, 34 days

Activity	Normal time	Crash Time	Crash Cost	Normal cost	Cost Slope
	Days	Days	Rs.	Rs.	Rs.
A	12	8	14,000	10,000	1,000
B	10	10	5,000	5,000	-
C	-	-	-	-	-
D	6	4	5,000	4,000	500
E	16	14	12,000	9,000	1,500
F	16	8	8,000	3,200	600

Step	Critical Path	No of Days	Activity reduced	No of days	Cost slope	Crash cost	Cumulative Crash cost
1	A D F	34	D	2	500	1000	1000
2	A D F	32	F	4	600	2400	3400
3	A D F / A C E	28	A	2	1000	2000	5400
4	All Paths	26	F,E	2	2100	4200	9600

Revised time 24 days; Total Cost Rs.40,800.

7. (b) :

6 Marks

Let x_1 and x_2 be the no.of bottles of medicine A and B to be manufactured.

i)Objective function is Maximize $Z= 8x_1 + 7x_2$

S.T constraints:

Bottle capacity constraint= $x_1 + x_2 \leq 45,000$

Hour constraint= $(3x_1/1000) + (x_2/1000) \leq 66$

Or $3x_1 + x_2 \leq 66,000$

Ingredient constraint for Medicine A= $x_1 \leq 20,000$

Ingredient constraint for Medicine B= $x_2 \leq 40,000$

Answer any four from the following

4X4 = 16 Marks

8. (a) :

Lean Accounting :

Lean Accounting is a system of providing information in plain and simple terms for management decision-making and elimination of wasteful processes.

It supports lean manufacturing system whereby decisions are taken based on relevant parameters.

It supports value stream measurements and value based pricing.

8. (b) :

Pareto analysis in Quality Management:

Pareto analysis is based on the principle that 80% of the volume relates to 20 % value and vice - versa. In the context of problem solving, it says that 80% of the problems can be solved by taking 20% effort. The 80 - 20 rule can be modified to 70 - 30 or 75 - 25, etc., but the essence is that larger volumes are concentrated on a smaller area of attention. When resources are limited and the problems seem very large, this approach gives a good analysis for an action plan that could be effective.

The problems or say defects are arranged according to types. They are arranged in decreasing order of percentages and the cumulative is found out. When the cumulative reaches 80%, (or 70 to 80%) it is often observed that a few actions of quality control will address these issues. Then, the available resource for quality control can be applied to effectively solve most of the problems.

8. (c) :

Areas where back flush Accounting is useful:

Back flush costing is generally used by companies that keep low levels of inventory and experience high turnover in inventory. It is because costs are still recorded relatively close to the day they are incurred. Companies with slow inventory turnover tend to record costs as they are incurred, as the product may remain unsold for a longer duration of time.

The back flush costing method works particularly well, where many different costs go into the production of a good. In such an instance, it can simplify the accounting process significantly. As a result, many manufacturing companies with complex production processes use back flush costing. However, companies that sell more customized products are less suited to a back flush costing method, as the unit cost will vary.

8. (d) :

Enumerate the situations where fixed costs become relevant for decision making:

In the following circumstances, fixed costs become relevant for decision making:

- (i) When Fixed Costs are specifically incurred for any contract
- (ii) When fixed costs are incremental in nature
- (iii) When the fixed portion of semi variable cost whereas due to change in level of activity consequent to acceptance of a contract.
- (iv) When fixed costs are avoidable or discretionary.
- (v) When fixed costs are such that one cost is incurred in lieu of another (the difference in costs will be relevant for decision-making)

8. (e) :

Sealed Bid Pricing:

The competitive pricing method is adopted in situations where firms compete for jobs on the basis of bids. The bid is the firms offer price and it is a prime example of pricing based on the expectations of how competitors will price rather than on a rigid relation based on the concerns own costs or demand. The objective of the firm in bidding situation is to get the contract and therefore it tries to set its prices lower than the other bidding firms.

SUMIT RASTOGI CLASSES

CMA FINAL (Paper-15)

By CMA SUMIT RASTOGI

ALL MTP

(JUNE-2017 TO DEC-2023)

Paper 15 – Strategic Cost Management and Decision Making

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 1

Paper 15 - Strategic Cost Management And Decision Making

Time Allowed: 3 hours

Full Marks: 100

Section A

1. Answer the following and each question carries 2 marks. [10×2= 20]
- (i) A company has the capacity of production of 80,000 units and presently sells 20,000 units at ₹ 100 each. The demand is sensitive to selling price and it has been observed that with every reduction of ₹ 10 in selling price the demand is doubled. What should be the target cost at full capacity if profit margin on sale is taken as 25%?
- (a) ₹ 75 (b) ₹ 90 (c) ₹ 60 (d) ₹ 25
- (ii) If the direct labour cost is reduced by 20% with every doubling of output, what will be the cost of labour for the sixteenth unit produced as an approximate percentage of the cost of the first unit produced?
- (a) 51.2% (b) 40.96% (c) 62% (d) None of these
- (iii) A company determines its selling price by marking up variable costs 60%. In addition, the company uses frequent selling price mark down to stimulate sales. If the mark down average 10%, what is the company's contribution margin ratio?
- (a) 30.6% (b) 44% (c) 86.4% (d) None of these
- (iv) B Ltd. Has earned net profit of ₹ 1 lakh, and its overall P/V ratio and margin of safety are 25% and 50% respectively. What is the total fixed cost of the company?
- (a) ₹ 2,50,000 (b) ₹ 2,00,000 (c) ₹ 3,00,000 (d) ₹ 1,00,000
- (v) A company has 2,000 units of an obsolete item which are carried in inventory at the original purchase price of ₹ 30,000. If these items are reworked for ₹ 10,000, they can be sold for ₹ 18,000. Alternatively, they can be sold as scrap for ₹ 3,000 in the market. In a decision model used to analyze the reworking proposal, the opportunity cost should be taken as:
- (a) ₹ 8,000 (b) ₹ 12,000 (c) ₹ 3,000 (d) ₹ 10,000
- (vi) The total cost of manufacturing a component is as under at a capacity of 50,000 units of production:

	₹
Prime cost	10.00
Variable overheads	2.40
Fixed Overheads	4.00
	16.40

The selling price is ₹ 21 per unit. The variable selling and administrative expenses is 60 paise per component extra. During the next quarter only 10,000 units can be produced and sold. Management plans to shut down the plant estimating that the fixed manufacturing cost can be reduced to ₹ 74,000 per quarter. When the plant is operating, the fixed overheads are incurred at a uniform rate throughout the year. Additional costs of plant shutdown for the quarter are estimated at ₹ 14,000.

The shut down pint for the quarter in units of product will be :

- (a) ₹ 25,000 (b) ₹ 14,000 (c) ₹ 11,000 (d) ₹ 20,000
- (vii) A company manufactures two products using common material handling facility. The total budgeted material handling cost is ₹ 60,000. The other details are:

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 1

	Product X	Product Y
Number of units produced	30	30
Material moves per product line	5	15
Direct labour hour per unit	200	200

Under activity based costing system the material handling cost to be allocated to product X (per unit) would be:

- (a) ₹ 1,000 (b) ₹ 500 (c) ₹ 1,500 (d) ₹ 2,500

(viii) A company operates throughput accounting system. The details of product X per unit are as under.

Selling Price	₹ 50
Material Cost	₹ 20
Conversion cost	₹ 15
Time on bottleneck resources	10 minutes

The return per hour for product X is:

- (a) ₹ 210 (b) ₹ 300 (c) ₹ 180 (d) ₹ 90

(ix) The information relating to the direct material cost of a company is as under:

	₹
Standard price per unit	3.60
Actual quantity purchased in units	1,600
Standard quantity allowed for actual production in units	1,450
Material price variance on purchase (favourable)	240

What is the actual purchase price per unit?

- (a) ₹ 3.45 (b) ₹ 3.75 (c) ₹ 3.20 (d) ₹ 3.25

(x) If the time taken to produce the first unit of a product is 4000 hrs, what will be the total time taken to produce the 5th to 8th unit of the product, when a 90% learning curve applies?

- (a) 10,500 hours (b) 12,968 hours (c) 9,560 hours (d) 10,368 hours

Answer:

(i) (c)

Demand	Price (₹)
20,000	100
40,000	90
80,000	80

$$\text{Target Cost} = ₹80 - (25\% \text{ of } 80) = ₹ 80 - 20 = ₹ 60$$

(ii) (b)

1 st	100%
2 nd	80% x 100%
4 th	80% of 2 nd
8 th	80% of 4 th
16 th	80% of 8 th = 0.80 x 0.80 x 0.80 x 0.80 = 40.96%

Say, 41% of the time required for the 1st unit.

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(iii) (a)
 When V (Var. cost) = 100, SP = 160, M.Cost/SP = 60/100
 SP after 10% mark down of SP = 144, Cost = 60-16=44
 Contribution Margin Ratio = 44/144=0.3056=30.6%

(iv) (d)
 MS=Profit/PV Ratio = ₹4 Lakh: MS=50%; BE Sales = (1-0.50) = 0.50
 Hence BES = ₹4 lakh
 Fixed Cost 25% of ₹4,00,000 = ₹1,00,000

(v) (c)
 Original price is not relevant

Rework income	₹18,000	
Deduct cost of rework	10,000	
Net inflow	₹8,000	It is relevant

The other alternative relevant cash flow is from sale as scrap = ₹3,000 Hence, the opportunity cost is ₹3,000.

(vi) (b)

Contribution per unit of component	₹	₹
Variable Prime cost	10.00	
Variable overhead	2.40	
Selling/Administrative expenses	0.60	13.00
Contribution		Rs. 8.00

Avoidable fixed cost per quarter
 = total fixed cost-(unavoidable fixed cost + additional shut down cost)
 =(50,000 x ₹4) - (₹74,000 + ₹14,000) = ₹1,12,000.
 The required shut down point for the quarter = ₹1,12,000 / ₹8 = 14,000 units.

(vii) (b)
 Total moves in material handling = 5+15=20
 Percentage move for Product A = 5/20=25%
 Material handling cost to be allocated to Product A = ₹60,000/25%=Rs.15,000
 i.e., ₹. 15,000/30=₹500 per unit.

(viii) (c)
 (Selling Price - Material Cost)/ Time of bottleneck resource
 = [(₹50 - ₹20)/10 minutes] x 60 = ₹180 per hour.

(ix) (a)
 Actual quantity bought x standard price
 = 1,600 x ₹3.60 = Rs. 5,760
 Deduct favorable price variance 240
 Actual quantity x actual price = 5,520
 Or, 1,600 x actual price = ₹5,520 So,
 Actual price ₹5,520/1,600 = ₹3.45

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 1

(x) (d)

Units	Average Time (hours)	Total Time (hours)
1	4000	4000
2	3600	7200
4	3240	12960
8	2916	23328

Total time for 5th to 8 units = 23328 - 12960 = 10368 hrs.

Section B

Answer any five questions from Question No. 2 to 8

Each question carries 16 marks. $5 \times 16 = 80$

2. (a)

A2Z p.l.c supports the concept of zero technology or life cycle costing for new investment decisions covering its engineering activities. The financial side of this philosophy is now well established and its principles extended to all other areas of decision making. The company is to replace a number of its machines and the Production Manager is torn between the Exe Machine, a more expensive machine with a life of 12 years, and the Wye machine with an estimated life of 6 years. If the Wye machine is chosen it is likely that it would be replaced at the end of 6 years by another Wye machine.

The pattern of maintenance and running costs differs between the two types of machine and relevant data are shown below:

	Exe	Wye
Purchase price	₹ 19,000	₹ 13,000
Trade-in value/breakup/scrap	₹ 3,000	₹ 3,000
Annual repair costs	₹ 2,000	₹ 2,600
Overhaul costs	(at year 8) ₹ 4,000	(at year 4) ₹ 2,000
Estimated financing costs averaged over machine life	10%p.a	10% p.a.

You are required to: recommend with supporting figures, which machine to purchase, stating any assumptions made. [8]

(b) (i)

A machine which originally cost ₹12,000 has an estimated life of 10 years and it depreciated at the rate of ₹1,200 per year. It has been unused for some time, however, as expected production orders did not materialise.

A special order has now been received which would require the use of the machine for two months.

The current net realisable value of the machine is ₹ 8,000. If it is used for the job, its value is expected to fall to ₹ 7,500. The net book value of the machine is ₹ 8,400. Routine maintenance of the machine currently costs ₹ 40 per month. With use, the cost of maintenance and repairs would increase to ₹ 60 per month.

What would be the relevant cost of using the machine for the order so that it can be charged as the minimum price for the order?

(ii) X Ltd. has been approached by a customer who would like a special job to be done for him and is willing to pay ₹ 22,000 for it. The job would require the following materials:

Materials	Total units required	Units already in stock	Book Value of units in stock	Realizable Value	Replacement Cost
			₹/unit	₹/unit	₹/unit
A	1,000	0	—	—	6

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 1

B	1,000	600	2	2.5	5
C	1,000	700	3	2.5	4
D	200	200	4	6	9

- A. Material B is used regularly by X Ltd. and if stocks were required for this job, they would need to be replaced to meet other production demand.
- B. Materials C and D are in stock as the result of previous excess purchase and they have a restricted use. No other use could be found for material C but material D could be used in another job as substitute for 300 units of material which currently cost ₹ 5 per unit (of which the company has no units in stock at the moment.)

What are the relevant costs of material, in deciding whether or not to accept the contract? Assume all other expenses on this contract to be specially incurred besides the relevant cost of material is ₹ 550. [2 + 6 = 8]

Answer:

(a)

Computation of present value of outflows and equivalent annual

		Exe machine		Wye machine
Initial cost (₹)		19,000.00		13,000.00
Less : scrap at the end of the life (₹)	(3000 × 0.32)	960.00	(3000 × 0.56)	1,680.00
		18,040.00		11,320.00
Present value of total annual cost (₹)	(2000 × 6.81)	13,620.00	(2600 × 4.36)	11,336.00
overhaul cost (₹)	(4000 × .47)	1,880.00	(2000 × 0.68)	1,360.00
		33,540.00		24,016.00
capital recovery factor	(1/6.81)	0.15	(1/4.36)	0.23
equivalent annual cost (₹)		4,925.00		5,508.00

As the equivalent annual cost is less for exe machine, it is better to purchase the same.

(b)

(i) Computation of relevant cost of using the machine for the order

		₹
Fall in sale value, if used	(8000- 7500)	500.00
incremental maintenance cost	[(60 - 40) × 2]	40.00
		540.00

(ii) Computation of relevant cost of the job

		₹
A	(1000 × 6)	6,000.00
B	(1000 × 5)	5,000.00
C	[(700 × 2.5) + (300 × 4)]	2,950.00
D	(300 × 5)	1,500.00
		15,450.00
Add : other expenses		550.00
		₹1,6000.00

As the revenue from the order, which is more than the relevant cost of ₹ 16000 the order should be accepted

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 1

3. A small-scale manufacturing unit has employed skilled persons for doing pressing and welding operations on various products. The welders produce two different products, W₁ and W₂. The press operators also produce two products, P₁ and P₂. Due to specific skill requirements, the press operators can't do welding job and vice-versa. The labour hours and cost data in respect of the above 4 products are as under.

	W ₁	W ₂	P ₁	P ₂
Hours per unit	4	4	5	2
Price per unit (₹)	50	50	80	65
Direct Material per unit (₹)	18	22	35	45
Direct Labour Rate per hour	₹ 4	₹ 4	₹ 4	₹ 4
Variable Overheads per unit	₹ 2	₹ 2	₹ 3	₹ 3

The unit incurs ₹ 50,000 per annum on fixed costs for producing the above products. The available labour hours for welding are 20,000 and for pressing 16,000.

The unit has also observed that the market can absorb minimum 2,000 units of W₁, 2,500 units of W₂, 1,800 units of P₁ and 2,200 units of P₂. The demand keeps on fluctuating. The manager of the shop has, therefore suggested that the workers should be trained to do either of welding or pressing job so that any excess demand can be fulfilled. It is estimated that this decision will increase the burden of fixed costs by ₹ 5,000 p.a.

Required:

- (a) Present the figures of optimum product mix assuming that the minimum marketable quantity is produced before the workers are trained and after they are trained.
- (b) Prepare profitability statement for optimum product mix under both the above conditions and recommend whether it is advisable to train employees. [16]

Answer:

Statement showing computation per hour and determination of priority

	W ₁	W ₂	P ₁	P ₂
	₹	₹	₹	₹
i) selling price	50.00	50.00	80.00	65.00
ii) Variable cost				
a. direct material	18.00	22.00	35.00	45.00
b. direct wages	16.00	16.00	20.00	8.00
c. variable overheads	2.00	2.00	3.00	3.00
	36.00	40.00	58.00	56.00
iii) contribution	14.00	10.00	22.00	9.00
iv) contribution per hour	3.50	2.50	4.40	4.50
v) Priority	III	IV	II	I

Statement showing calculation of profit before workers are trained

	W ₁	W ₂	P ₁	P ₂	Total
Minimum units	2,000.00	2,500.00	1,800.00	2,200.00	
Units in remaining time	500.00			1,300.00	
i) Total units	2,500.00	2,500.00	1,800.00	3,500.00	
ii) contribution per unit	14.00	10.00	22.00	9.00	
iii) Total contribution	35,000.00	25,000.00	39,600.00	31,500.00	131,100.00
iv) Fixed cost					50,000.00
v) Profit					81,100.00

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 1

Working Notes:

	W ₁ hours	P ₂ hours
Available hours	20,000.00	16,000.00
Less : used for minimum	18,000.00	13,400.00
	2,000.00	2,600.00
units (2000/4)	500.00 (2600/2)	1,300.00

Statement showing calculation of profit after conversion

		W ₁	W ₂	P ₁	P ₂	
Minimum units		2,000.00	2,500.00	1,800.00	2,200.00	
Units in remaining time					2,300.00	
i) Total units		2,000.00	2,500.00	1,800.00	4,500.00	
ii) Contribution per unit	₹	14.00	10.00	22.00	9.00	
iii) Total contribution	₹	28,000.00	25,000.00	39,600.00	42,500.00	133,100.00
iv) Fixed cost	₹					55,000.00
v) Profit	₹					78,100.00

From the above, it is not advisable to convert the machines into versatile machines.

4. (a) The budgeted output of a single product manufacturing company for 2016-17 was 5,000 units. The financial results in respect of actual output of 4,800 units achieved during the year were as under:

Direct Material	₹ 29,700
Direct Wages	44,700
Variable overheads	72,750
Fixed overheads	39,000
Profit	36,600
Sales	2,22,750

The standard direct wage rate is ₹ 4.50 per hour and the standard variable overhead rate is ₹ 7.50 per hour.

The cost accounts recorded the following variances for the year.

Variances	Favourable	Adverse
Material Price	₹ —	₹ 300
Material usage	—	600
Wage rate	750	—
Labour efficiency	—	2,250
Variable overhead expense	3,000	—
Variable overhead efficiency	—	3,750
Fixed overhead expense	—	1,500
Selling price	6,750	—

Required to:

- (i) Prepare a statement showing the original budget.
 - (ii) Prepare the standard product cost sheet per unit.
 - (iii) Prepare a statement showing the reconciliation of originally budgeted profit and actual profit. [4 + 4 + 4 = 12]
- (b) Distinguish between Standard Costing from Budgetary Control. [4]

Answer:

(a)

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 1

Statement showing original budget and standard cost per unit:

Element	Actual (₹)	Variance (₹)	Standard Cost 4800 (₹)	Standard Cost Per unit (₹)	Original Budget 5000 units (₹)
Material	29700	300A	28800	6.00	30000
Direct Wags	44700	750	46200	9.00	45000
		2250A			
Value Overhead	75750	3000	72000	15.00	75000
		3750A			
Fixed Overhead	39000	1500A	37500	7.50	37500
	186150	3750F	181500	37.50	187500
Profit (b/f)	36600	8400A	34500	7.50	37500
		2100F			
Sales	222750	6750F	216000	45.00	225000

Statement showing reconciliation of budgeted profit with Actual profit:

	(₹)
Budgeted Profit	37,500
Add: All favorable variances	10,500
	48,000
Less All adverse variance	8,400
	39,600
Less: (5000-4800) 7.5 profit variances	1,000
Less: (5000-4800) 7.5 profit variances	1,500
Actual Profit	36,600
(or)	
Standard Profit	34,500
Add	10,500
	45,000
Less:	8,400
Actual Profit	36,600
Budgeted Profit	37,500
Less: 8400 + 9000	17,400
	20,100
Add:	3,750
Variable Cost	6,000
Sales price variance	6,750
	36,600

(b)

Despite the similarity in the basic principles of Standard Costing and Budgetary Control, the two systems vary in scope and in the matter of detailed techniques. The difference may be summarized as follows:

1. A system of Budgetary Control may be operated even if no Standard Costing system is in use in the concern.

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 1

2. While standard is an unit concept, budget is a total concept.
3. Budgets are the ceilings or limits of expenses above which the actual expenditure should not normally rise; if it does, the planned profits will be reduced. Standards are minimum targets to be attained by actual performance at specified efficiency.
4. Budgets are complete in as much as they are framed for all the activities and functions of a concern such as production, purchase, selling and distribution, research and development, capital utilisation, etc. Standard Costing relates mainly to the function of production and the related manufacturing costs.
5. A more searching analysis of the variances from standards is necessary than in the case of variations from the budget.
6. Budgets are indices, adherence to which keeps a business out of difficulties. Standards are pointers to further possible improvements.

[Any Four Points]

5. (a) Division A is a profit centre which produces three products X, Y and Z. Each product has an external market.

	X	Y	Z
External market price per unit	₹ 48	₹ 46	₹ 40
Variable cost of production in division A	₹ 33	₹ 24	₹ 28
Labour hours required per unit in division A	3	4	2

Product Y can be transferred to Division B, but the maximum quantity that might be required for transfer is 300 units of Y.

	X	Y	Z
The maximum external sales are:	800 units	500 units	300 units

Instead of receiving transfers of Product Y from Division A, Division B could buy similar product in the open market at a slightly cheaper price of ₹ 45 per unit.

What should the transfer price be for each unit for 300 units of Y, if the total labour hours available in Division A are?

- (i) 3800 hours (ii) 5600 hours. [5 + 5 = 10]

- (b) What is Bench trending and how does it differ from Bench Marking? [6]

Answer:

(a)

Computation of contribution per labour hour from external sales:

	X	Y	Z
Market price (₹)	48	46	40
Variable cost (₹)	33	24	28
Contribution (₹)	15	22	12
Labour hours required	3	4	2
Contribution per labour hour (₹)	5	5.50	6
Priority	III	II	I

Computation of transfer price when

(i) The capacity is 3800 hours:

Hours required for Z = $300 \times 2 = 600$

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 1

$$\begin{array}{rcl}
 Y = 500 \times 4 & = & \underline{2000} \\
 & & 2600 \\
 X = 800 \times 3 & & \underline{2400} \\
 & & \underline{5000}
 \end{array}$$

The existing capacity is not sufficient to produce the units to meet the external sales. In order to transfer 300 units of Y, 1200 hours are required in which division A will give up the production of X to this extent.

Variable cost of Y	₹
(+) contribution lost by giving up production of X to the extent of 1200 hours	24
= 1200 × 5 = 6000	
∴ Opportunity cost per unit = (6000/300)	<u>20</u>
Required transfer price	<u>44</u>

(ii) If the capacity is 5600 hours:

Variable cost	24
Contribution cost of giving up x to extent of 600 hours = 600 × 5 = 3000	
Opportunity cost per unit = (3000/300)	<u>10</u>
	<u>34</u>

(b)

Bench Trending: Continuous monitoring of specific process performance with a selected group of benchmarking is a systematic and continuous measurement process of comparing through measuring an organization business processes against business leaders (role models) anywhere in the world, to gain information that will help organization take action to improve its performance. The continuous process of enlisting the best practices in the world for the processes, goals and objectives leading to world class levels of achievement.

Benchmarking is the process of comparing the cost, time or quality of what one organization does against what another organization does. The result is often a business case for making changes in order to make improvements.

Benchmarking is a powerful management tool because it overcomes "paradigm blindness". Paradigm Blindness can be summed up as the mode of thinking, "the way we do it is the best because this is the way we've always done it". Bench Marking opens organizations to new methods, ideas and tools to improve their effectiveness. It helps crack through resistance to change by demonstrating other methods of solving problems than the one currently employed and demonstrating that they work, because they are being used by others.

- (a) Identify your problem areas.
- (b) Identify other industries that have similar processes.
- (c) Identify organizations that are leaders in these areas.
- (d) survey companies for measures and practices
- (e) Visit the "best practice" companies to identify leading edge practices.
- (f) Implement new and improved business practices.

6. (a) A Small retailer has studied the weekly receipts and payments over the past 200 weeks and has developed the following set of information:

Weekly Receipts	Probability	Weekly Payments	Probability
(₹)		(₹)	
3000	0.20	4000	0.30
5000	0.30	6000	0.40
7000	0.40	8000	0.20

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12000	0.10	10000	0.10
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Using the following set of random numbers, simulate the weekly pattern of receipts and payments for the 12 weeks of the next quarter, assuming further that the beginning bank balance is ₹8000. What is the estimated balance at the end of the 12 weekly period? What is the highest weekly balance during the quarter? What is the average weekly balance for the quarter?

Random Numbers

For Receipts	03	91	38	55	17	46	32	43	69	72	24	22
For payment	61	96	30	32	03	88	48	28	88	18	71	99

According to the given information, the random number interval is assigned to both the receipts and the payments. [8]

- (b) A captain of a cricket team has to allot five middle batting positions to five batsmen. The average runs scored by each batsman at these positions are as follows:

		Batting Position				
		III	IV	V	VI	VII
Batsmen	A	40	40	35	25	50
	B	42	30	16	25	27
	C	50	48	40	60	50
	D	20	19	20	18	25
	E	58	60	59	55	53

Make the assignment so that the expected total average runs scored by these batsmen are maximum. [8]

Answer:

- (a)

Range of random numbers							
Receipt (₹)	Probability	Cumulative probability	Range	Payments (₹)	Probability	Cumulative probability	Range
3000	0.20	0.20	0-19	4000	0.30	0.30	0-29
5000	0.30	0.50	20-49	6000	0.40	0.70	30-69
7000	0.40	0.90	50-89	8000	0.20	0.90	70-89
12000	0.10	1.00	90-99	10000	0.10	1.00	90-99

Simulation of data for a period of 12 weeks					
Week	Random No. for receipt	Expected Receipt (₹)	Random No. for payment	Expected Payment (₹)	Week end Balance (₹)
Opening Balance					8000
1	03	3000	61	6000	5000 (8000 + 3000 – 6000)
2	91	12000	96	10000	7000
3	38	5000	30	6000	6000
4	55	7000	32	6000	7000
5	17	3000	03	4000	6000
6	46	5000	88	8000	3000
7	32	5000	48	6000	2000

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 1

8	43	5000	28	4000	3000
9	69	7000	88	8000	2000
10	72	7000	18	4000	5000
11	24	5000	71	8000	2000
12	22	5000	99	10000	(3000)

Estimated balance at the end of 12th week = ₹ (3,000)
 Highest balance = ₹ 7,000
 Average balance during the quarter = $45,000/12 = ₹ 3,750$

(b)

	III	IV	V	VI	VII
A	40	40	35	25	50
B	42	30	16	25	27
C	50	48	40	60	50
D	20	19	20	18	25
E	58	60	59	55	53

Loss Matrix

20	20	25	35	10
18	30	44	35	33
10	12	20	0	10
40	41	40	42	35
2	0	1	5	7

Row Operation

M₃

10	10	14	25	0
0	12	25	17	15
10	12	19	0	10
5	6	4	7	0
2	0	0	5	7

Column operation

10	10	15	25	0
0	12	26	17	15
10	12	20	0	10
5	6	5	7	0
2	0	1	5	7

Improved Matrix

10	6	10	25	0
10	8	21	17	15
5	8	15	0	10
6	2	0	7	0
6	0	0	9	11

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Maximum Average Runs

A	->	VII	- 50
B	->	II	- 42
C	->	VI	- 60
D	->	V	- 20

7. (a) A civil engineering firm has to bid for the construction of a dam. The activities and time estimates are given below:

Activity	DURATION		
	Optimistic	Most likely	Pessimistic
1 – 2	14	17	25
2 – 3	14	18	21
2 – 4	13	15	18
2 – 8	16	19	28
3 – 4 (dummy)			
3 – 5	15	18	27
4 – 6	13	17	21
5 – 7 (dummy)			
5 – 9	14	18	20
6 – 7 (dummy)			
6 – 8 (dummy)			
7 – 9	16	20	41
8 – 9	14	16	22

The policy of the firm with respect to submitting bids is to bid the minimum amount that will provide a 95% of probability of at best breaking even. The fixed costs for the project are 8 lakhs and the variable costs are ₹ 9,000 everyday spent working on the project. The duration is in days and the costs are in terms of rupees.

What amount should the firm bid under this policy? (You may perform the calculations on duration etc. upto two decimal places). [10]

- (b) A firm manufacturers and sells two products Alpha and Beta. Each unit of Alpha requires 1 hour of machining and 2 hours of skilled labour, whereas each unit of Beta uses 2 hours of machining and 1 hour of labour. For the coming month the machine capacity is limited to 720 machine hours and the skilled labour is limited to 780 hours. Not more than 320 units of Alpha can be sold in the market during a month. Unit contribution from Alpha is ₹ 6 and from Beta is ₹ 4.

Develop a suitable model that will enable determination of the optimal product mix to maximize the contribution. [6]

Answer:

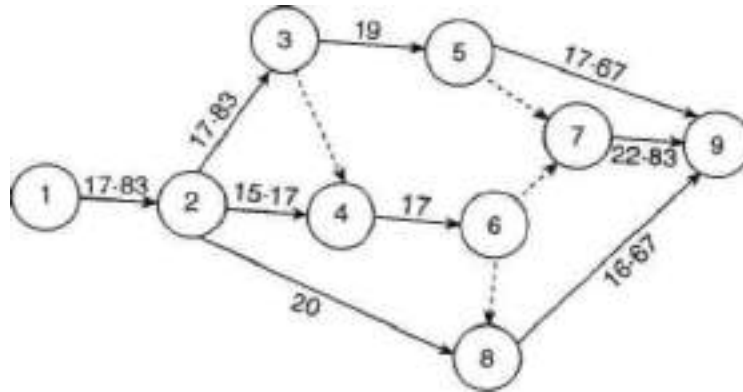
(a)

The expected duration and variance of each activity is computed in the following table:

Activity	optimistic (t _o)	Time most likely (t _m)	Pessimistic (t _p)	Expected duration $t_e = \frac{1}{6}(t_o + 4t_m + t_p)$	Variance $\left[\frac{1}{6}(t_p - t_o)\right]^2$
1—2	14	17	25	17.83	3.36
2—3	14	18	21	17.83	1.36
2—4	13	15	18	15.17	
2—8	16	19	28	20.00	
3—4	—	—	—	—	

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3—5	15	18	27	19.00	4
4—6	13	17	21	17.00	
5—7	—	—	—	—	
5—9	14	18	20	17.67	
6—7	—	—	—	—	
6—8	—	—	—	—	
7—9	16	20	41	22.83	17.36
8—9	14	16	22	16.67	



The various paths and their lengths are as follows:

	Path	duration
I.	1-2-3-5-7-9	77.49*
II.	1-2-3-5-9	72.33
III.	1-2-3-4-6-7-9	75.49
IV.	1-2-3-4-6-8-9	69.33
V.	1-2-8-9	54.50
VI.	1-2-4-6-8-9	66.67
VII.	1-2-4-6-7-9	72.83

Thus, the critical path is 1—2—3—5—7—9 with project duration of 77.49 days. Project variance is obtained by summing variances of critical activities, $\sigma^2 = 3.36 + 1.36 + 4 + 17.36 = 26.08$.

\therefore Standard duration of project length, $\sigma = \sqrt{26.08} = 5.11$

To calculate the project duration which will have 95% chances of its completion, we find the value of Z corresponding to 95% area from normal distribution area table which is 1.645. Thus

$$P(X \leq T_s) = P\left(Z \leq \frac{T_s - 77.49}{5.11}\right) = 0.95$$

$$\frac{T_s - 77.49}{5.11} = 1.645 \text{ or } T_s = 1.645 \times 5.11 + 77.49 = 86 \text{ days}$$

Since the fixed cost of the project is ₹8 lakhs and the variable cost is ₹9,000 per day, amount to bid = ₹8 lakhs + ₹9,000 × 86 = ₹15,74,000.

(b)

Products	Machining	Skilled Labour	Contribution
Alpha	1 hr	2 hr	6/-
Beta	2 hr	1 hr	4/-
Available hours	720 hr	780 hr	

Let x_1 be the no. of units of Alpha produced

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x_2 be the no. of units of Beta produced.

Objective function:

$$\text{Max. } Z = 6x_1 + 4x_2 .$$

Subject to constraints

$$x_1 + 2x_2 \leq 720$$

$$2x_1 + x_2 \leq 780$$

$$x_1 \leq 320 \text{ and}$$

$$x_1, x_2 \geq 0$$

$$x_1 + 2x_2 + S_1 = 720$$

$$2x_1 + x_2 + S_2 = 780$$

$$x_1 + S_3 = 320$$

$$\text{Max. } Z = 6x_1 + 4x_2 + 0.S_1 + 0.S_2 + 0.S_3$$

8. Write short notes on any four out of the following five questions.

[4 × 4 = 16]

- (a) Six Sigma**
- (b) Kaizen Costing**
- (c) Value Analysis**
- (d) Business Process Re-engineering.**
- (e) Socio Economic Costing**

Answer:

- (a)** Six Sigma has two key methodologies: DMAIC and DMADV, both inspired by W. Edwards Deming's Plan-Do-Check-Act Cycle: DMAIC is used to improve an existing business process, and DMADV is used to create new product or process designs for predictable, defect-free performance.

DMAIC

- ◆ Basic methodology consists of the following five (5) steps:
- ◆ Define the process improvement goals that are consistent with customer demands and enterprise strategy.
- ◆ Measure the current process and collect relevant data for future comparison.
- ◆ Analyze to verify relationship and causality of factors. Determine what the relationship is, and attempt to ensure that all factors have been considered.
- ◆ Improve or optimize the process based upon the analysis using techniques like Design of Experiments.
- ◆ Control to ensure that any variances are corrected before they result in defects. set up pilot runs to establish process capability, transition to production and thereafter continuously measure the process and institute control mechanisms.

DMADV

Basic methodology consists of the following five steps:

- ◆ Define the goals of the design activity that are consistent with customer demands and enterprise strategy.
- ◆ Measure and identify CTQs (critical to qualities), product capabilities, production process capability, and risk assessments.
- ◆ Analyze to develop and design alternatives, create high-level design and evaluate design capability to select the best design.
- ◆ Design details, optimize the design, and plan for design verification. This phase may

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require simulations.

- ◆ Verify the design, set up pilot runs, implement production process and handover to process owners.

Some people have used dmaicr (Realize). Others contend that focusing on the financial gains realized through Six Sigma is counter-productive and that said financial gains are simply byproducts of a good process improvement.

- (b) **introduction:** The initial VE review may not be complete and perfect in all cost aspects. there may be further chances of waste reduction, cost and time reduction and product improvement. such continuous cost reduction technique is called as kaizen costing.

The review of product costs under the target costing methodology is not reserved just for the period up to the completion of design work on a new product. there are always opportunities to control costs after the design phase is completed, though these opportunities are fewer than during the design phase.

Meaning: kaizen costing refers to the ongoing continuous improvement program that focuses on the reduction of waste in the production process, thereby further lowering costs below the initial targets specified during the design phase. it is a Japanese term for a number of cost reduction steps that can be used subsequent to issuing a new product design to the factory floor.

Process of Kaizen Costing: activities in kaizen costing include elimination of waste in production, assembly, and distribution processes, as well as the elimination of unnecessary work steps in any of these areas. thus kaizen Costing is intended to repeat many of the value engineering steps, continuously and constantly refining the process, thereby eliminating out extra costs at each stage.

Kaizen Costing Vs Value Engineering: cost reductions resulting from kaizen costing are much smaller than those achieved with value engineering. But these are still significant since competitive pressures are likely to force down the price of a product over time, and any possible cost savings allow a Company to still attain its targeted profit margins.

Multiple Versions of Products - Continuous Kaizen Costing: multiple improved versions of products can be introduced to meet the challenge of gradually reducing costs and prices. the market price of products continues to drop over time, which forces a company to use both target and kaizen costing to reduce costs and retain its profit margin.

- (c) Value analysis (VA) or Value engineering (VE) is a function-oriented, structured, multi-disciplinary team approach to solving problems or identifying improvements. the goal of any Va study is to:

-improve value by sustaining or improving performance attributes

(of the project, product, and/or service being studied)

-while at the same time reducing overall cost

(including lifecycle operations and maintenance expenses).

Value Analysis can be defined as a process of systematic review that is applied to existing product designs in order to compare the function of the product required by a customer to meet their requirements at the lowest cost consistent with the specified performance and reliability needed.

This is a rather complicated definition and it is worth reducing the definition to key points and elements:

- (i) Value analysis (and Value engineering) is a **systematic, formal and organized process of analysis and evaluation**. it is not haphazard or informal and it is a management activity that requires planning, control and co-ordination.
- (ii) the analysis concerns the **function of a product** to meet the demands or application needed by a customer. to meet this functional requirement the review process must include an understanding of the purpose to which the product is used.

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- (iii) Understanding the **use of a product** implies that specifications can be established to assess the level of fit between the product and the value derived by the customer or consumer.
- (iv) To succeed, the **formal management process must meet these functional specification** and performance criteria consistently in order to give value to the customer.
- (v) In order to yield a benefit to the company, the formal review process must result in a **process of design improvements** that serve to lower the production costs of that product whilst maintaining this level of value through function.

(d) Characteristics of Re-engineering Process

- (i) Several jobs are combined into one
- (ii) Often workers make decisions
- (iii) The steps in the process are performed in a logical order
- (iv) Work is performed, where it makes most sense
- (v) Quality is built in.
- (vi) Manager provides a single point of contact
- (vii) Centralized and decentralized operations are combined.

(e) Socio Economics (also known as **social economics**) is the social science that studies how economic activity affects and is shaped by social processes. in general it analyzes how societies progress, stagnate, or regress because of their local or regional economy, or the global economy.

socioeconomics is sometimes used as an umbrella term with different usages. the term 'social economics' may refer broadly to the "use of economics in the study of society.

in many cases, socioeconomics focus on the social impact of some sort of economic change. such changes might include a closing factory, market manipulation, the signing of international trade treaties, new natural gas regulation, etc. such social effects can be wide-ranging in size, anywhere from local effects on a small community to changes to an entire society. examples of causes of socioeconomic impacts include new technologies such as cars or mobile phones, changes in laws, changes in the physical environment (such as increasing crowding within cities), and ecological changes (such as prolonged drought or declining fish stocks). these may affect patterns of consumption, the distribution of incomes and wealth, the way in which people behave (both in terms of purchase decisions and the way in which they choose to spend their time), and the overall quality of life.

Companies are increasingly interested in measuring socio-economic impact as part of maintaining their license to operate, improving the business enabling environment, strengthening their value chains, and fuelling product and service innovation.

Paper 15 – Strategic Cost Management and Decision Making

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 2

Paper 15 - Strategic Cost Management and Decision Making

Time Allowed: 3 hours

Full Marks: 100

Section A

1. Answer the following and each question carries 2 marks. [10 × 2 = 20]

(i) A company has forecast sales and cost of sales for the coming year as ₹ 25 lakhs and ₹ 18 lakhs respectively.

The inventory turnover has been taken as 9 times per year. In case the inventory turnover increases to 12 times and the short term interest rate on working capital is taken as 10%, what will be saving in cost?

(a) ₹ 10,000 (b) ₹ 20,000 (c) ₹ 15,000 (d) ₹ 5,000

(ii) Which of the following would decrease unit contribution margin the most?

(a) 15% decrease in selling price (b) 15% increase in variable costs
(c) 15% decrease in variable costs (d) 15% decrease in fixed costs

(iii) When allocating service department costs to production departments, the method that does not consider different cost behavior patterns is the

(a) Step method (b) Reciprocal method
(c) Single-rate method (d) Dual-rate method.

(iv) A company produces two joint products, P and V. In a year, further processing costs beyond split-off point spent were ₹ 8,000 and ₹ 12,000 for 800 units of P and 400 units of V respectively. P sells at ₹ 25 and V sells at ₹ 50 per unit. A sum of ₹9,000 of joint cost were allocated to product P based on the net realization method. What were the total joint cost in the year?

(a) ₹ 20,000 (b) ₹10,000 (c) ₹ 15,000 (d) None of these

(v) A company is to market a new product. It can produce up to 1,50,000 units of this product. The following are the estimated cost data:

	Fixed Cost	Variable Cost
For production up to 75,000 units	₹ 8,00,000	60%
Exceeding 75,000 units	₹ 12,00,000	50%

Sale price is expected to be ₹ 25 per unit.

How many units must the company sell to break even?

(a) 1,00,000 units (b) 1,11,000 units (c) 1,27,000 units (d) 75,000 units

(vi) The following details relate to two competing companies, Alps and Himalayas, for identical projects:

I. The net present value (NPV) of Alps is ₹ 20,000 and its internal rate of return (IRR) is 18%.

II. For the same life period, Himalayas' estimated cash flows are:

Year	₹ '000
0	(450)
1	300
2	200
3	100

And its cost of capital is 15%.

Which one of the following combinations is correct concerning the NPV and the IRR of the two projects?

Projects	
Alps	Himalayas

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 2

A) Higher NPV	Higher IRR
B) Higher NPV	Lower IRR
C) Lower NPV	Higher IRR
D) Lower NPV	Lower IRR

(vii) Nulook Ltd. Uses a JIT system and back flush accounting. It does not use a raw material stock control account During May, 8000 units were produced and sold. The standard cost per unit is ₹100; this includes materials of ₹45. During May, ₹4,80,000 of conversion costs were incurred.

The debit balance on cost of goods sold account for May was

- (a) ₹ 8,00,000 (b) ₹ 8,40,000 (c) ₹ 8,80,000 (d) ₹ 9,20,000

(viii) A company has estimated the selling prices and the variable costs of one of its products as under:

Probability	Selling price (per unit)	Probability	Variable cost (per unit)
0.25	60	0.25	30
0.45	75	0.40	45
0.30	90	0.35	60

The company will be able to produce and sell 4,000 units in a month irrespective of the selling price. The selling price and variable cost per unit are independent of each other. The specific fixed cost relating to this product is ₹ 20,000. The probability that the monthly net profit of the product will be \geq ₹ 1,20,000 is

- (a) 0.2525 (b) 0.4512 (c) 0.3825 (d) 0.3075

(ix) In calculating the life cycle costs of a product, which of the following items would be included?

- A. Planning and concept design costs
 B. Preliminary and detailed design costs
 C. Testing costs
 D. Production costs
 E. Distribution costs

- (a) All of the above (b) D and E (c) B, D and E (d) D

(x) Back flush costing is most likely to be used when

- (a) Management desires sequential tracking of costs
 (b) A Just-in-Time inventory philosophy has been adopted
 (c) The company carries significant amount of inventory
 (d) Actual production costs are debited to work-in-progress.

Answer:

(i) (d)

$$\text{Saving Cost} = \frac{18,00,000}{9} \times \frac{10}{100} - \frac{18,00,000}{12} \times \frac{10}{100}$$

(ii) (a)

A given percentage change in unit sale price must have greater effect on contribution margin than any other factor affected by the same percentage change.

(iii) (c)

The single rate method combines fixed and variable costs without regard to cost behaviour patterns. A and B do not exactly fit in with the given question as they can be used on a single or dual rate; and Ans D allows variable costs to be allocated on different basis from fixed costs.

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(iv) (c)

Products	P	V	Total
Units	800	400	
S.P. (₹)	25	50	
Sales (₹)	20,000	20,000	
Further costs (₹)	8,000	12,000	
NRV (₹)	12,000	8,000	20,000

Joint cost appropriated ₹ 9,000

Total Joint Cost = $(9,000/12,000) \times 20,000 = ₹ 15,000$

(v) (b)

At a production of 75,000 units or less the fixed costs amount to ₹8 lakh Contribution is ₹10 per unit (₹25 - 60% of ₹ 25). Production will however, be more than this level. Total fixed cost is then ₹ 12 lakh.

Contribution for first 75,000 units = ₹7,50,000

Hence, to meet ₹12 lakh fixed cost, further ₹4,50,000 contribution is required.

Contribution beyond 75,000 units is ₹ 12.5 (₹ 25 - 50% of ₹25).

Additional units to be sold = $₹4,50,000 / ₹12.50 = 36,000$ units = 1,11,000 units.

(vi) (c)

Working for Himalayas

Year	CF Rs	DF at 15%	PV Rs	DF at 20%	PV Rs
0	(450)	1.000	(450)	1.000	(450)
1	300	0.870	261	0.833	250
2	200	0.756	151	0.694	139
3	100	0.658	66	0.57	58
		NPV	28		(3)

Hence IRR = 20% (approx.)

Projects

Alpas	Himalayas
Lower NPV	Higher IRR

(vii) (b)

	₹
Cost of goods sold	8,00,000
(Less) Material cost	(3,60,000)
Conversion cost allocated	4,40,000
Conversion cost incurred	4,80,000
Excess charged to cost of goods sold account	40,000

Total debit on cost of goods sold account = Rs. 8,00,000 + Rs. 40,000 = Rs. 8,40,000

(viii) (d)

The sales demand is 4,000 units per month. The monthly contribution must absorb the fixed costs of ₹20,000 and leave at least a surplus of ₹1,20,000 profit. So, the contribution per unit must be $₹1,40,000/4,000$ units = ₹ 35 in the minimum.

The following selling price and variable cost pairs will produce a contribution of more than ₹35.

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 2

Selling Price	Variable Cost	Contribution	Joint Probability of SP & VC
₹	₹	₹	
75	30	45	$0.45 \times 0.25 = 0.1125$
90	30	60	$0.30 \times 0.25 = 0.0750$
90	45	45	$0.30 \times 0.40 = 0.1200$
			0.3075

- (ix) (a)
All the costs mentioned in the question are parts of the total life cycle costs.
- (x) (b)

Section B

Answer any five questions from Question No. 2 to 8
Each question carries 16 marks. [5 × 16 = 80]

2. (a) Desktop Co. manufactures and sells 7,500 units of a product. The full Cost per unit is ₹ 100. The Company has fixed its price so as to earn a 20% return on an investment of ₹ 9,00,000.
- Required:
- (i) Calculate the Selling Price per unit from the above. Also, calculate the mark-up % on the Full Cost per unit.
 - (ii) If the Selling Price as calculated above represents a mark-up % of 40% on Variable Cost per unit. Calculate the Variable Cost per unit.
 - (iii) Calculate the Company's Income if it had increased the Selling Price to ₹ 115. At this price, the Company would have sold 6,750 units. Should the company have increased the Selling price to ₹ 230? [2+2+2=6]
- (b) A local Government authority owns and operates a leisure centre with numerous sporting facilities, residential accommodation, a cafeteria and a sports shop. The summer season lasts for 20 weeks including a peak period of 6 weeks corresponding to the school holidays. The following budgets have been prepared for the next summer season:
- Accommodation:**
- 60 single rooms let on a daily basis.
 - 35 double rooms let on a daily basis at 160% of the single room rate.
- Room rate:**
- Fixed costs ₹ 29,900.
 - Variable costs ₹ 4 per single room per day and ₹ 6.40 per double room per day
- Sports centre:**
- Residential guests each pay ₹ 2 per day and casual visitors ₹ 3 per day for the use of facilities. Fixed costs ₹ 15,500.
- Sports Shop:**
- Estimated contribution ₹ 1 per person per day.
 - Fixed costs ₹ 8,250.
- Cafeteria:**
- Estimated contribution ₹ 1.50 per person per day.
 - Fixed costs ₹ 12,750.
- During the summer season the centre is open 7 days a week and the

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Following activity levels are anticipated.

Double rooms fully booked for the whole season.

Single rooms fully booked for the peak period but at only 80% of Capacity during the rest of the season.

30 casual visitors per day on average.

You are required to:

- i) Calculate the charges for single and double rooms assuming that the authority wishes to make a ₹ 10,000 profit on accommodation.
- ii) Calculate the anticipated total profit for the leisure centre as a whole for the season.

[5+5=10]

Answer:

- (a) (i) **Computation of selling price and mark – up % on the full Cost per unit**

Target Sale Price per unit = Full Cost + Target Profit = ₹100 +	₹124
So, mark – up price is	24%

- (ii) **Computation of variable Cost per unit:**

Above sale Price ₹124 = VC + 40% thereon, i.e. 140% on Vc. so, Var. cost $\frac{₹124}{140\%} = ₹89$

- (iii) **Calculate the company's income if selling price are increased**

Present contribution at 7,500 units = (₹124 – ₹ 89) × 7,500 units =	₹ 2,62,500
Revised contribution at 6,750 units = (₹115 – ₹89) × 6,750 units =	₹ 1,75,500
	₹87,000

Hence, Increase in Sale Price is not beneficial due to reduction in Contribution by ₹87,000

- 2 (b) (i) **Computation of usage of room days**

		₹
single room		
(60 × 7 × 6)	2,520.00	
(60 × 7 × 14 × 80%)	4,704.00	
		7,224.00
Double room (35 × 7 × 20)		4,900.00
i) total sale value of accommodation		
Variable cost		
Single room (7224 × 4)	28,896.00	
Double room (4900 × 4)	31,360.00	60,256.00
Fixed cost		29,900.00
Required profit		10,000.00
		100,156.00

Let 'S' be the room rent of single room and 1.6'S' is the rent of double room Therefore

$$7224S + 4900(1.6S) = 100516$$

$$7224s + 7840s = 100516 = s = 6.65$$

$$\text{Double room rent} = (6.65 \times 1.6) = 10.64$$

- (ii) **Statement showing computation of total profit to leisure centre**

			₹
a. Accommodation			10,000.00
b. Sports centre:			
Total	[(7224 × 2) + (4900 × 2 × 2) + (30 × 7 × 20 × 3)]	46,648.00	

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III	Contribution	18	35	50	60
IV	Contribution per hour	18	28	40	75
V	Priority	IV	III	II	I

Statement showing optimum product mix under the given condition & computation of profit before conversion of machines into Versatile:

		A	B	X	Y	Total
	Minimum units to be produced	1500	1500	1200	1200	
	Units in remaining hours	--	900	--	3300	
I	No. of units	1500	2400	1200	4500	
II	Contribution per unit	18	35	50	60	
III	Total contribution	27000	84000	60000	270000	441000
IV	Fixed Cost					400000
V	Profit					41000

Working Notes

		P		Q
	Available Hours	4,500	1500	5,100
A	1,500 × 1		1,200 × 1.25	
B	1,500 × 1.25	3,375	1,200 × 0.8	2,460
		1,125		2,640
	No. of Units = 1125/1.25	900	2,640/0.8	3,300

Statement showing optimum mix under the given condition & computation of profit at that mix after conversion of machines into Versatile:

		A	B	X	Y	Total
	minimum units to be produced	1500	1500	1200	1200	
	Units in remaining hours	--	--	--	4706.25	
I	No. of units	1500	1500	1200	5906.25	
II	Contribution per unit	₹ 18	35	50	60	
III	Total contribution	₹ 27000	52500	60000	354375	493875
IV	Fixed Cost	₹				425000
V	Profit	₹				68875

Working Notes:

$$\text{Total No. of hours} = 9,600$$

$$\text{Hours utilized (3,375 + 2,460)} = 5,835$$

$$\underline{3,765}$$

$$\text{Units of Y} = 3,765/0.8 = 4,706 \text{ Units}$$

As the profit is increased by ₹27,875 it is advised to convert the machines into versatile centers.

4. (a) Despite the increase in the sales price of its sole product to the extent of 20%, a company finds that it has incurred a loss during the year 2012-13 to the extent of ₹4 lakhs as against a profit of ₹5 lakhs made in 2011-12. This adverse situation is attributed mainly to the increase in prices of materials and overheads, the increase over the previous year being on the average, 15% and 10% respectively.

The following figures are extracted from the books of the company:

	31-3-2012	31-3-2013
Sales	1,20,00,000	1,29,60,000

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Cost of Sales:		
Material	80,00,000	91,10,000
Variable overhead	20,00,000	24,00,000
Fixed overhead	15,00,000	18,50,000

Required: Analyze the variances over the year in order to bring out the reasons for the fall in profit. [12]

(b) What is inter-firm comparison? [4]

Answer:

(a)

Statement of figures extracted from the books of the company

Year	2011-12	2012-13 (based on 2011-12 prices)	Difference
(a)	(b)	(c)	(b) - (c)
Sales (W.N. 1)	120	*108.00	12
Cost of sales:			
Material (W.N. 2)	80	79.22	
Variable overhead (W.N. 3)	20	21.82	
Fixed overhead (W.N. 4)	15	16.82	

*Decrease in sales = ₹ 120 - ₹ 108 = ₹ 12 lakhs or 10% of 2011-12 sales figure at 2012-13 rate

$$\begin{aligned} \text{Contribution to sales ratio during 2011-12} &= \frac{\text{Sales} - \text{variable costs}}{\text{Sales}} \\ &= \frac{\text{₹}120 - \text{₹}100}{\text{₹}120} \text{ or } (1/6) \text{ of per rupee sale} \end{aligned}$$

Loss of contribution during 2012-13 on the sale of 12 lakhs = ₹12 lakhs × 1/6 = ₹2 lakhs

Computation of Variances

Sales Price Variance

$$\begin{aligned} &= \text{Actual sales} - \text{Standard sales} \\ &= \text{₹}129.60 - \text{₹}108 = \text{₹}21.60 \text{ lakhs (F)} \end{aligned}$$

Material Price Variance

$$\begin{aligned} &= \text{Standard cost of actual quantity} - \text{Actual cost} \\ &= \text{₹}79.22 - \text{₹}91.10 = \text{₹}11.88 \text{ lakhs (A)} \end{aligned}$$

Variable Overhead Expenditure Variance

$$\begin{aligned} &= \text{Budgeted variable overhead for actual hours} - \text{Actual variable overhead} \\ &= (\text{₹}21.82 - \text{₹}24) = \text{₹}2.18 \text{ lakhs (A)} \end{aligned}$$

Variable Overhead Efficiency Variance

$$\begin{aligned} &= \text{Std. variable overhead for standard hours} - \text{Std. variable overhead for actual hours} \\ &= \text{₹}18 - \text{₹}21.62 = \text{₹}3.62 \text{ lakhs (A)} \end{aligned}$$

* Variable overhead in 2011-12 was ₹ 20 lakhs. Since there was a decrease in sales in 2012-13 to the extent of 10% of 2011-12 sales figure (based on 2011-12 prices). Therefore, the standard variable overhead for standard hours at this reduced sales in 2012-13 would be equal to (₹ 20 lakhs minus 10% of 20 lakhs) i.e. (₹ 20 lakhs - ₹ 2 lakhs) = ₹ 18 lakhs.

Fixed Overhead Expenditure Variance

$$\begin{aligned} &= \text{Budgeted fixed overhead} - \text{Actual fixed overhead} \\ &= \text{₹}16.82 - \text{₹}18.50 = \text{₹}1.68 \text{ lakhs (A)} \end{aligned}$$

Fixed Overhead Volume Variance

$$\begin{aligned} &= \text{Std. fixed overhead for actual output} - \text{Std. fixed overhead for budgeted output} \\ &= (16.82 - 15) = \text{₹}1.82 \text{ lakhs (A)} \end{aligned}$$

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Reconciliation Statement

Particulars		(₹)
Profit during 2011 -12		5,00,000
Add: Net increase in profit due to the sales of 2011-12 [after taking into account increase in sales price but decrease in contribution margin due to decrease in quantum (vol. of sales)] (Refer to working note 5)		19,60,000
		24,60,000
Less: Usage/Efficiency variance		
Material	7,22,000	
Variable overhead	3,82,000	
Fixed overhead volume variance	1,82,000	12,86,000
Less: Price variances		
Material price variance	11,88,000	
Variable overhead expenditure variance	2,18,000	
Fixed overhead expenditure variance	1,68,000	15,74,000
Loss during 2012-13 (Difference figure)		4,00,000

Conclusion:

The reasons for the decrease in the total profit figure of the year 2012-13 (inspire of the increase in sales price) are due to adverse - (i) Usage/efficiency variances to the extent of? 12,86,000 and (ii) Price variances to the extent of ₹15,74,000.

(1) Sales during 2010-11 at 2009-10 price level	$= \frac{129.60}{120} \times 100$	= ₹108 lakhs
(2) Material cost of 2010-11 at 2009-10 price level	$= \frac{91.10}{115} \times 100$	= ₹79.22 lakhs
(3) Variable overhead of 2010-11 at 2009-10 price level	$= \frac{24}{110} \times 100$	= ₹21.82 lakhs
(4) Fixed overhead of 2010-11 at 2009-10 price level	$= \frac{18.50}{110} \times 100$	= ₹16.82 lakhs
(5) Net increase in profit due to rise of 20% of S.P. and reduction in contribution due to reduction in sales	$= 129.6 - 108.2$	= ₹19.6 lakhs

4 (b)

Inter-firm comparison as the name denotes means the techniques of evaluating the performances, efficiencies, deficiencies, costs and profits of similar nature of firms engaged in the same industry or business. It consists of exchange of information, voluntarily of course, concerning production, sales cost with various types of break-up, prices, profits, etc., among the firms who are interested of willing to make the device a success. The basic purposes of such comparison are to find out the work points in an organisation and to improve the efficiency by taking appropriate measures to wipe out the weakness gradually over a period of time.

5. (a) A Company with two manufacturing divisions is organised on profit centre basis. Division 'A' is the only source for the supply of a component that is used in Division B in the manufacture of a product KLIM. One such part is used each unit of the product KLIM. As the demand for the product is not steady. Division B can obtain orders for increased quantities only by spending more on sales promotion and by reducing the selling prices. The Manager of Division B has accordingly prepared the following forecast of sales quantities and selling prices.

Sales units per day	Average Selling price per unit of KLIM (₹)
1,000	5.25

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2,000	3.98
3,000	3.30
4,000	2.78
5,000	2.40
6,000	2.01

The manufacturing cost of KLIM in Division B is ₹ 3,750 first 1,000 units and ₹ 750 per 1,000 units in excess of 1,000 units.

Division A incurs a total cost of ₹1,500 per day for an output to 1,000 components and the total costs will increase by ₹900 per day for every additional 1,000 components manufactured. The Manager of Division A states that the operating results of his Division will be optimised if the transfer price of the component is set at ₹1.20 per unit and he has accordingly set the aforesaid transfer price for his supplies of the component to Division A

You are required:

- (i) Prepare a schedule showing the profitability at each level of output for Division A and Division B.
- (ii) Find the profitability of the company as a whole at the output level which
 - A. Division A's net profit is maximum.
 - B. Division B's net profit is maximum.
- (iii) If the Company is not organised on profit centre basis, what level of output will be chosen to yield the maximum profit. [3+(1+1)+3= 8]

(b) The budgeted overheads and cost driver volumes of XYZ are as follows.

Cost Pool	Budgeted Overheads (₹)	Cost Driver	Budgeted Volume
Material procurement	5,80,000	No. of orders	1,100
Material handling	2,50,000	No. of movements	680
Set-up	4,15,000	No. of set ups	520
Maintenance	9,70,000	Maintenance hours	8,400
Quality control	1,76,000	No. of inspection	900
Machinery	7,20,000	No. of machine hours	24,000

The company has produced a batch of 2,600 components of AX-15, its material cost was ₹1,30,000 and labor cost ₹2,45,000. The usage activities of the said batch are as follows.

Material orders – 26, maintenance hours – 690, material movements – 18, inspection – 28, set ups – 25, machine hours – 1,800

Calculate – cost driver rates that are used for tracing appropriate amount of overheads to the said batch and ascertain the cost of batch of components using activity Based Costing. [8]

Answer:

(a)

- (i) Statement showing profit of division A:

Sale per day(units)	sale value ₹	cost ₹	Profit/(loss) ₹
1000	1200	1500	(300)
2000	2400	2400	-
3000	3600	3300	300
4000	4800	4200	600
5000	6000	5100	900
6000	7200	6000	1200

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Profit of Division B:

no of units	sales	transfer price	other manufacturing cost	total cost	Profit/(loss)
	₹	₹	₹	₹	₹
1000	5250	1200	3750	4950	300
2000	7960	2400	4500	6900	1060
3000	9900	3600	5250	8850	1050
4000	11120	4800	6000	10800	320
5000	12000	6000	6750	12750	(750)
6000	12060	7200	7500	14700	(2640)

(ii) Profitability of the company at the output level where division A's net profit is maximum :

	₹
Profit of division A at 6000units	1,200
Profit of division B at 6000units	(2,640)
Profit /(loss)	(1,440)
Division B's net profit is maximum:	
Profit of division A at 2000 units	-
Profit of division B at 2000units	1060
	1,060

(iii) When the company is not organized on profit centre basis

Profit at different levels of output

units	Division A	Division B	Total
	₹	₹	₹
1000	(300)	300	—
2000	—	1060	1060
3000	300	1050	1350
4000	600	320	920
5000	900	(750)	150
6000	1200	(2640)	(1440)

Best output level is 3,000 units

5 (b)

Computation of Cost Driver rates

	Particulars		Amount (₹)
1.	Material procurement	580000/1100	527
2.	Material handing	250000/680	368
3.	Set-up	415000/520	798
4.	Maintenance	970000/8400	115
5.	Quality control		196
6.	Machinery	720000/24000	30

Computation of batch cost of 2,600 units of AX- 15

	₹
Material cost	1,30,000

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Labour cost		2,45,000
Prime cost		3,75,000
Add: overheads		
Material orders 26 x 527	13,702	
Material handling 18 x 368	6,624	
Set-up 25 x 798	19,950	
Maintenance 690 x 115	79,350	
Quality Control 28 x 196	5,488	
Machinery 1800 x 30	54,000	1,79,114
Total Cost		5,54,114

6. (a) A firm received an order to make and supply eight units of standard product which involves intricate labor operations. The first unit was made in 10 hours. It is understood that this type of operations is subject to 80% learning rate. The workers are getting a wages rate of ₹ 12 per hour.

- (i) What is the total time and labour cost required to execute the above order?
 (ii) If a repeat order of 24 units is also received from the same customer, what is the labour cost necessary for the second order? [3+3=6]

(b) A Company has 4 factories F₁, F₂, F₃ and F₄, manufacturing the same product. Production and raw material costs differ from factory to factory and are given in the table below in the first two rows. The transportation costs from the factories to the sales depots S₁, S₂ and S₃ are also given. The last two columns in the table below give the sales price and total requirements at each depot and the production capacity of each factory is given in the last row.

	F ₁	F ₂	F ₃	F ₄	Sales Price/Unit (₹)	Requirement
Production Cost/Unit (₹)	15	18	14	13		
Raw Materials Cost/Unit (₹)	10	9	12	9		
Transportation Cost/Unit (₹)						
S ₁	3	9	5	4	34	80
S ₂	1	7	4	5	32	120
S ₃	5	8	3	6	31	150
Production capacity	10	150	50	100		

Determine the optimal solution and the associated profit by using the Vogel's Approximation Method (VAM). [10]

Answer:

(a)

80% Learning Curve results are given below:

Production (Units)	Cumulative Average Time (hours)	Total Time (hours)
1	10	10
2	8	16
4	6.4	25.6
8	5.12	40.96
16	4.096	65.54
32	3.2768	104.86

Labour time required for first eight units = 40.96 hours

Labour cost required for 8 units = 40.96 hours × ₹ 12/hr = ₹ 491.52

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Labour time for 32 units = 104.86 hours

Labour time for first eight units = 40.96 hours

Labour time required for 2nd order for 24 units = 36.90 hours

Labour cost for 24 units = 63.90 hours × ₹ 12/hr = ₹ 766.80

6 (b)

Loss Matrix

	2	10	5	0	8	
				80		80/0 2/0/0/0
	2	10	6	3	8	120/110/90/0 1/1/3*/2
	10	90		20		
	7	12	6	5	8	150/90/40/0 1/1/1/2*
		60	50		15	
	10	150	30	100	30	
	0	6	60	0	20	0
	0	1	0	1	3	0
	5*	1	0	1	0	0
		2	0	0	0	0

	2	10	5	0	8	
				80		-3
	2	10	6	3	8	0
	10	90	2	20		
	7	12	6	5	8	2
		60	50		40	
	2	10	4	3	6	

As $\Delta_{ij} \geq 0$, the solution is optimum

			Qty				Maximum Profit
S ₁	F ₄	→	80 × 8	=			640
S ₂	F ₁		10 × 6	=			60
	F ₂		90 × (-2)	=	(-)		180
F ₄			20 × 5	=			100
F ₃	F ₂		60 × -4	=	(-)		240
	F ₃		50 × 2	=			100
	Dummy		60 × 0	=			0
			350				₹ 480

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 2

7. (a) The following table gives data on normal time & cost and crash time & cost for a project.

Activity	Normal		Crash	
	Time (days)	Cost (₹)	Time (days)	Cost (₹)
1 – 2	6	600	4	1,000
1 – 3	4	600	2	2,000
2 – 4	5	500	3	1,500
2 – 5	3	450	1	650
3 – 4	6	900	4	2,000
4 – 6	8	800	4	3,000
5 – 6	4	400	2	1,000
6 – 7	3	450	2	800

The indirect cost per day is ₹ 100

(i) Draw the network and identify the critical path.

(ii) What are the normal project duration and associated cost?

[8]

- (b) A Factory manufactures 3 products which are processed through 3 different production stages. The time required to manufacture one unit of each of the three products and the daily capacity of the stages are given in the following table:

State	Time/unit in minutes			Stage capacity (minutes)
	Product 1	Product 2	Product 3	
1	1	2	1	430
2	3	-	2	460
3	1	4	-	420
Profit/unit	₹ 3	₹ 2	₹ 5	

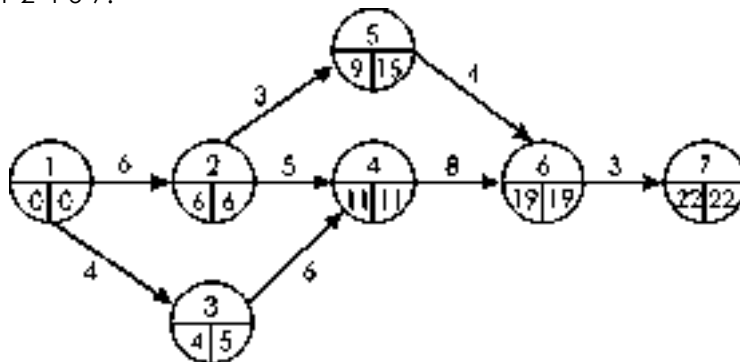
Formulate LPP.

[8]

Answer:

(a)

- (i) The network for normal activity times indicates a project time of 22 weeks with the critical path 1-2-4-6-7.



- (ii) Normal project duration is 22 weeks and the associated cost is as follows: Total cost = Direct normal cost + Indirect cost for 22 weeks. = 4,700 + 100 x 22 = ₹ 6,900.

7 (b)

Let x_1 be the no. of units of product 1

Let x_2 be the no. of units of product 2

Let x_3 be the no. of units of product 3

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 2

Objective function: $\text{Max } Z = 3x_1 + 2x_2 + 5x_3$

Subject to constraints:

$$x_1 + 2x_2 + x_3 \leq 430$$

$$3x_1 + 2x_3 \leq 460$$

$$x_1 + 4x_2 \leq 420$$

$$\text{And } x_1, x_2, x_3 \geq 0$$

$$x_1 + 2x_2 + x_3 + S_1 = 430$$

$$3x_1 + 2x_3 + S_2 = 460$$

$$x_1 + 4x_2 + S_3 = 420$$

$$\text{Max } Z = 3x_1 + 2x_2 + 5x_3 + 0.S_1 + 0.S_2 + 0.S_3$$

$$x_1 = 0$$

$$x_2 = 100$$

$$x_3 = 230$$

$$z = 1350$$

8. Write short notes on any four out of the following 5 questions.

[4 ×4=16]

- (a) **Throughput Accounting**
- (b) **Lean Accounting**
- (c) **Cost Control Vs. Cost Reduction**
- (d) **Total Quality Management (TQM)**
- (e) **Benefits of ERP.**

Answer:

(a) Throughput accounting:

Throughput accounting is a management accounting technique used as a performance measure in the theory of constraints. It is the business intelligence used for maximizing profits. It focuses importance on generating more throughputs. It seeks to increase the velocity or speed of production of products and services keeping in view of constraints. It is based on the concept that a company must determine its overriding goal and then it should create a system that clearly defines the main capacity constraint that allows it to maximize that goal. The changes that this concept causes are startling.

Throughput accounting is a system of performance measurement and costing which traces costs to throughput time. It is claimed that it complements JIT principles and forces attention to the true determinants of profitability. Throughput accounting is defined as follows:

Throughput Concepts:

a few new terms are used in throughput accounting. they are explained as below:

Throughput:

Throughput is the excess of sales value over the totally variable cost. that is nothing but contribution margin left after a product's price is reduced by the amount of its totally variable cost.

Totally Variable Cost:

Answer to MTP_Final_Syllabus 2016_Jun2017_Set 2

This cost is incurred only if a product is produced. In many cases only direct materials are considered as totally variable cost. Direct labour is not totally variable, unless piece rate wages are paid.

Capacity Constraints:

It is a resource within a company, that limits its total output. For example, it can be a machine that can produce only a specified amount of a key component in a given time period, thereby keeping overall sales from expanding beyond the maximum capacity of that machine. There may be more than one capacity constraint in a company, but rarely more than one for a specified product or product line.

Throughput (or Cycle) Time:

Throughput (or cycle) time is the average time required to convert raw materials into finished goods ready to be shipped to customer. It includes the time required for activities such as material handling, production processing, inspecting and packaging.

Throughput Time Ratio:

It is the ratio of time spent adding customer value to products and services divided by total cycle time. It is also known as the 'ratio of work content to lead time'.

Total factory Cost:

With the exception of material costs, in the short run, most factory costs (including direct labour) are fixed. These fixed costs can be grouped together and called total factory costs (TFC).

(b) Lean Accounting:

What we now call lean manufacturing was developed by Toyota and other Japanese companies. Toyota executives claim that the famed Toyota Production System was inspired by what they learned during visits to the Ford Motor Company in the 1920s and developed by Toyota leaders such as Taiichi Ohno and consultant Shigeo Shingo after World War II. As pioneer American and European companies embraced lean manufacturing methods in the late 1980s, they discovered that lean thinking must be applied to every aspect of the company including the financial and management accounting processes.

Lean Accounting is the general term used for the changes required to a company's accounting, control, measurement, and management processes to support lean manufacturing and lean thinking. Most companies embarking on lean manufacturing soon find that their accounting processes and management methods are at odds with the lean changes they are making. The reason for this is that traditional accounting and management methods were designed to support traditional manufacturing; they are based upon mass production thinking. Lean manufacturing breaks the rules of mass production, and so the traditional accounting and management methods are (at best) unsuitable and usually actively hostile to the lean changes the company is making.

(c) Cost Control Vs. Cost Reduction:

Both cost reduction and cost control are efficient tools of management but their concepts and procedure are widely different. The differences are summarized below:

Cost Control	Cost Reduction
(a) Cost control represents efforts made towards achieving target or goal.	(a) Cost reduction represents the achievement in reduction of cost
(b) The process of cost control is to set up a target, ascertain the actual performance and compare it with the target, investigate the variances, and	(b) cost reduction is not concern with maintenance of performance according to standard

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take remedial measures.	
(c) cost control assumes the existence of standards or norms which are not challenged	(c) cost reduction assumes the existence of concealed potential savings in standards or norms which are therefore subjected to a constant challenge with a view to improvement by bringing out savings
(d) Cost control is a preventive function. costs are optimized before they are incurred	(d) Cost reduction is a corrective function. It operates even when an efficient cost control system exists. there is room for reduction in the achieved costs under controlled conditions
(e) cost control lacks dynamic approach	(e) Cost reduction is a continuous process of analysis by various methods of all the factors affecting costs, efforts and functions in an organization. the main stress is upon the why of a thing and the aim is to have continual economy in costs

(d) Total Quality management:

Total Quality management is a philosophy of continuously improving the quality of all the products and processes in response to continuous feedback for meeting the customers' requirements. It aims to do things right the first time, rather than need to fix problems after they emerge (A company should avoid defects rather than correct them). Its basic objective is customer satisfaction.

The elements of TQM are:

Total	Quality involves everyone and all activities in the company (Mobilizing the whole organization to achieve quality continuously and economically)
Quality	Understanding and meeting the customers' requirements. (Satisfying the customers first time every time)
Management	Quality can and must be managed (Avoid defects rather than correct them)

TQM is a vision based, customer focused, prevention oriented, continuously improvement strategy based on scientific approach adopted by cost conscious people committed to satisfy the customers first time every time. It aims at Managing an organization so that it excels in areas important to the customer.

The underlying principles of TQM:

The philosophy of TQM rest on the following principles which are enlisted below:

- Clear exposition of the benefits of a project.
- Total Employee involvement (TEI).
- Process measurement.
- Involvement of all customers and contributors.
- Elimination of irrelevant data.
- Understanding the needs of the whole process.

- Use of graphical and pictorial techniques to achieve understanding.
- Establishment of performance specifications and targets.
- Use of errors to prompt continuous improvement.

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- Use of statistics to tell people how well they are doing

(e) Benefits of Enterprise Resource Planning:

The benefits accruing to any business enterprise by implementing an ERP package are unlimited.

- **Product Costing:** determination of cost of products correctly, is quite critical for every industry. ERP supports advance costing methods, including standard costing, actual costing and activity –based costing. Additionally, all costing methods and information can be fully integrated with finance. This provides the company with essential financial information for monitoring controlling costs.
- **Inventory Management:** ERP can be used in multi-national, multi – company, and multi—site manufacturing and distribution environments. This system simplifies complicated logistics by allowing one to plan and manage companies in different countries as a single unit and its advanced functionality allows one to process product and financial information flows in several different ways.
- **Distribution & delivery :** Delivery and distribution in ERP lets one to define logistics processes, flexibly and efficiently to deliver the right product from the right warehouse to the right customer at the right time –every time. to the customer, the most important element of quality is one-time delivery. it doesn't matter how well a product is made if arrives late. Processing distribution or acquisition orders involves several closely related activities.
- **E – Commerce:** Internet enables ERP offers Internet, Intranet and extranet solutions for business, business to consumer, employee self-service and more.
- **Automatic Control:** it ensure automatic quality control procedure.
- **After Sales Service:** it ensures better after sales service.
- **Improvement in Production Planning:** it improved production planning.
- **Quick response:** It enables quick response to change in business operations & market conditions.
- **Cumulative Edge's:** it helps to achieve competitive advantages by improving business process.

Paper 15 – Strategic Cost Management and Decision Making

Answer_MTP_Final_Syllabus 2016_Dec2017_Set 1

Paper 15 - Strategic Cost Management and Decision Making

Time Allowed: 3 hours

Full Marks: 100

Section A

1. Answer the following and each question carries 2 marks. [10×2= 20]

(i) A Ltd., developing a new product, makes a model for testing and goes for regular production. From past experience of similar models, it is known that a 90% learning curve applies. If the time taken to make the model is 300 hours, what will be the total time taken to produce 3rd to 4th unit of the product?

- (a) 540 hours (b) 486 hours (c) 432 hours (d) None of the above

(ii) ABC Ltd., has current PBIT of ₹19.20 Lakhs on total assets of ₹96 Lakhs. The company proposes to increase assets by ₹24 Lakhs, which is estimated to increase operating profit before depreciation by ₹8.40 lakhs-a net increase in Depreciation by ₹4.80 Lakhs. This will result in ROI.

- (a) To decrease by 1 % (b) To increase by 1%
(c) To remain same (d) None of the above

(iii) The selling price of the single product manufactured by a company is fixed at ₹1500 per unit. In the coming year, 500 units of the product are likely to be sold. If the total value of investments of the company is ₹15 lakhs and it has a target ROI of 15%, the target cost would be:

- (a) ₹9.30 (b) ₹9.50 (c) ₹1050 (d) None of these

(iv) A particular job required 800 kgs of material – P.

500 kgs. of the particular material is currently in stock.

The original price of the material – P was ₹300 but current resale value of the same has been determined as ₹200. If the current replacement price of the material – P is ₹0.80 per kg., the relevant cost of the material – P required for the job would be:

- (a) ₹640 (b) ₹440 (c) ₹300 (d) None of these

(v) A company determines its selling price by making up variable costs 60%. In addition, the company uses frequent selling price mark down to stimulate sales. If the mark down average 10%, what is the company's contribution margin ratio?

- (a) 30.6% (b) 44% (c) 86.4% (d) None of these

(vi) A company has 2000 units of an obsolete item which are carried in inventory at the original purchase price of ₹30,000. If these items are reworked for ₹10,000, they can be sold for ₹18,000. Alternatively, they can be sold as scrap for ₹3,000 in the market. In a decision model used to analyze the reworking proposal, the opportunity cost should be taken as:

- (a) ₹ 8,000 (b) ₹ 12,000 (c) ₹ 3,000 (d) ₹ 10,000

(vii) A company has estimated the selling prices and the variable costs of one of its products as under :

Probability	Selling price (per unit)	Probability	Variable cost (per unit)
0.25	60	0.25	30
0.45	75	0.40	45
0.30	90	0.35	60

The company will be able to produce and sell 4,000 units in a month irrespective of the selling price. The selling price and variable cost per unit are independent of each other. The specific fixed cost relating to this product is ₹20,000. The probability that the monthly net profit of the product will be \geq ₹1,20,000 is

- (a) 0.2525 (b) 0.4512 (c) 0.3825 (d) 0.3075

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(v) (a) 30.6%

When V (Var. Cost) = 100, SP = 160, M. Cost / SP = 60/100
 SP after 10% mark down of SP = 144, Cost = 60 – 16 = 44
 Contribution Margin Ratio = 44 / 144 = 0.3056 = 30.6%

(vi) (c) ₹ 8,000

Original price is not relevant

Rework income	₹ 18,000
Deduct cost of rework	10,000
New inflow	₹ 8,000 It is relevant

The other alternative relevant cash flow is from sale as scrap = ₹ 3,000. Hence, the opportunity cost is ₹ 3,000.

(vii) (d) 0.3075

The sales demand is 4,000 units per month. The monthly contribution must absorb the fixed costs of ₹ 20,000 and leave at least a surplus of ₹ 1,20,000 profit. So the contribution per unit must be ₹ 1,40,000/4,000 units = ₹ 35 in the minimum. The following selling price and variable cost pairs will produce a contribution of more than ₹ 35.

Selling Price (₹)	Variable Cost (₹)	Contribution (₹)	Joint Probability of SP & VC
75	30	45	0.45 × 0.25 = 0.1125
90	30	60	0.30 × 0.25 = 0.0750
90	45	45	0.30 × 0.40 = 0.1200
			0.3075

(viii) (c) The single rate method

The single rate method combines fixed and variable costs without regard to cost behavior patterns. A and B do not exactly fit in with the given question as they can be used on a single or dual rate; and answer D allows variable costs to be allocated on different basis from fixed costs.

(ix) (b) 80%

Let the learning rate be x.
 Since the first unit took 2 hours, average time for the first two units = 2x and
 The average time for the first 4 units = 2x × x = 2x².

$$\therefore 2x^2 = 5.12 \div 4 = 1.28.$$

$$\begin{aligned} \text{Or, } x &= \sqrt{1.28 \div 2} \\ &= \sqrt{0.64} \\ &= 0.80 \quad \text{i.e. 80\%.} \end{aligned}$$

(x) (a) ₹ 270

$$\begin{aligned} &(\text{Selling Price} - \text{Material Cost}) / \text{Time on bottleneck resources.} \\ &= [(\text{₹ } 75 - \text{₹ } 30) / 10 \text{ minutes}] \times 60 \\ &= \text{₹ } 270 \end{aligned}$$

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Section B

Answer any five questions from Question No. 2 to 8
Each question carries 16 marks. $5 \times 16 = 80 M$

2. (a) K & Co. manufactures and sells 15,000 units of a product. The Full Cost per unit is ₹200. The Company has fixed its price so as to earn a 20% Return on an Investment of ₹18,00,000.

Required:

1. Calculate the Selling Price per unit from the above. Also, calculate the Mark-up % on the Full Cost per unit.
2. If the Selling Price as calculated above represents a Mark-up % of 40% on Variable cost per unit, calculate the Variable cost per unit.
3. Calculate the Company's Income if it had increased the Selling Price to ₹230. At this price, the company would have sold 13,500 units. Should the Company have increased the Selling price to ₹230?
4. In response to competitive pressures, the Company must reduce the price to ₹210 next year, in order to achieve sales of 15,000 units. The Company also plans to reduce its investment to ₹16,50,000. If a 20% Return on Investment should be maintained, what is the Target Cost per unit for the next year? [8]

- (b) M Ltd. has been approached by a customer who would like a special job to be done for him and is willing to pay ₹22,000 for it. The job would required the following materials.

Materials	Total units required	Units already in stock	Book value of units in stock (₹/unit)	Realisable value (₹/unit)	Replacement cost (₹/unit)
A	1,000	0	-	-	6
B	1,000	600	2	2.5	5
C	1,000	700	3	2.5	4
D	200	200	4	6	9

- (i) Material B is used regularly by X Ltd., and if stocks were required for this job, they would need to be replaced to meet other production demand.
- (ii) Materials C and D are in stock as the result of previous excess purchase and they have a restricted use. No other use could be found for material C but material D could be used in another job as substitute for 300 units of material, which currently cost ₹5 per unit (of which the company has no units in stock at the moment). What are the relevant costs of material, in deciding whether or not to accept the contract? Assume all other expenses on this contract are to be specially uncured besides the relevant cost of material is ₹550.

Answer:

2. (a)

1. Target Sale Price per unit = Full Cost + Target Profit = ₹200 + $\frac{₹18,00,000 \times 20\%}{15,000 \text{ units}}$	₹224
So, Mark-up on Full Cost = ₹24 ÷ ₹200	12%
2. Above Sale Price ₹224 = VC + 40% thereon, i.e. 140% on VC. So, Var. Cost = $\frac{₹224}{140\%}$	₹160
3. Present Contribution at 15,000 units = (₹224 – ₹160) x 15,000 units =	₹9,60,000
Revised Contribution at 13,500 units = (₹230 – ₹160) x 13,500 units =	₹9,45,000
Hence, Increase in Sale Price is not beneficial, due to reduction in	₹15,000

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contribution by	
4. Target Profit for next year = $\frac{₹16,50,000 \times 20\%}{15,000 \text{ units}} = ₹22$	
So, Target Cost for next year = New Sale Price less Target Profit = ₹210 – ₹22	₹188
Since Revised Contribution is less than Target Contribution above, rent reduction is not advisable.	

(b) Computation of relevant cost of the job:

A	(1000 x 6)	6000.00
B	(1000 x 5)	5000.00
C	[(700 x 2.5) + (300 x 4)]	2950.00
D	(300 x 5)	1500.00
		15,450.00
Add: Other expenses		550.00
		16,000.00

Conclusion: As the revenue from the order, which is more than the relevant cost of ₹16,000, the order should be accepted.

3. (a) S. H. Ltd., a cycle manufacturing company, has drawn up a programme for the manufacture of a new product for the purpose of fuller utilization of its capacity. The scheme envisages the manufacture of baby tricycle fitted with a bell. The company estimates the sales of tricycles at 10,000 during the first year and expects that from the second year onwards the sales estimates will stabilize at 20,000 tricycles. Since the company has no provision for the manufacture of the small bells specially required for the tricycles, the requirement of the bells is initially proposed to be met by way of purchase from the market at ₹8 each. However, if the company desires to manufacture the bell in its factory by installation of new equipment, it has two alternative proposals as under:

	Installation of Super X Machine	Installation of Janta Machine
Initial cost of machine	₹3,00,000	₹2,00,000
Life	10 Years	10 Years
Fixed overheads other than depreciation on machines (per annum)	₹54,000	₹28,000
Variable expenses per bell	₹4.00	₹5.00
Depreciation on machine should be charged on straight line basis.		

Required:

- (i) For each of the two levels of output namely 10,000 and 20,000 bells state with suitable workings whether the company should purchase the bells from market or install new equipment for manufacture of bells. If your decision is in favour of the installation of new equipment, which of the two new machines should be installed?
 - (ii) What would be your decision in case the forecast of requirement from the second year onwards is estimated at 40,000 bells instead of 20,000 bells.
 - (iii) At what volume of bells will the installation of the two machines break even.
- (b) Company A can manufacture 1,000 units bicycles in a month for a fixed cost of ₹3,00,000. The variable cost is ₹500 per unit. Its current demand is 600 units which it sales at ₹1,000 per unit. It is approached by Company B for an order of 200 units of ₹700 per unit.
Should the Company A accept the order? Give your views as a CMA.

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Answer:

3. (a) (i) Cost-Benefit Analysis of Two machines at Output Level of 10,000 and 20,000 units

Output Details	10,000 units		20,000 units	
	Super – X	Janta	Super – x	Janta
Cost of Buying	₹	₹	₹	₹
@ 8% from the Market	80,000	80,000	1,60,000	1,60,000
Cost of Manufacturing				
Variable Cost	40,000	50,000	80,000	1,00,000
Depreciation on Machine	30,000	20,000	30,000	20,000
Fixed Overhead	54,000	28,000	54,000	28,000
Total Cost	1,24,000	98,000	1,64,000	1,48,000
Decision	Buy from the market		Install Janata Machine	

(ii) Buy/Manufacture Decision at Level of 40,000 Units

	Super – X	Janata
Cost of Buying @ ₹8	₹3,20,000	₹3,20,000
Manufacturing Cost		
Variable Cost	1,60,000	2,00,000
Depreciation on Machinery	30,000	20,000
Fixed Overhead	54,000	28,000
Total Cost Manufacture	2,44,000	2,48,000
Cost Saving on Manufacture	76,000	72,000

Decision: As Super - X Machine results in higher cost saving. It should be installed at an estimated volume of 40,000 units.

(iii) Break – even volume of two machines

It is that volume of production at which a manufacturer is indifferent as to which machine he should install as total cost on both machine is the same. This point is known as cost indifference point.

$$\begin{aligned} \text{Let Break-even volume} &= x \text{ units} \\ \text{Cost on super-X Machine for } x \text{ units} &= 54,000 + 30,000 + 4x = 84,000 + 4x \quad \dots(1) \\ \text{Cost on Janata Machine for 'x' units} &= 20,000 + 28,000 + 5x = 48,000 + 5x \quad \dots(2) \end{aligned}$$

At cost indifference point total cost under two alternatives will be equal. Therefore,

$$84,000 + 4x = 48,000 + 5x \quad \text{or} \quad x = 36,000 \text{ units.}$$

So at 36,000 units, the installation of the two machines will break even.

(b) The CMA will go ahead with the order because in his opinion the special order will yield ₹200 per unit. He knows that the fixed cost ₹3,00,000 is irrelevant because it is going to be incurred regardless of whether the order is accepted or not. Effectively, the additional cost which Company A would have to incur is the variable cost of ₹500 per unit. Hence, the order will yield ₹200 per unit (i.e. ₹700 - ₹500 of variable cost).

4. (a) A factory has a key resource (bottleneck) of Facility A which is available for 31,300 minutes per week. Budgeted factory costs and data on two products, X and Y, are shown below:

Product	Selling Price/Unit	Material Cost/Unit	Time in Facility A
X	₹35	₹20.00	5 minutes
Y	₹35	₹17.50	10 minutes

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Budgeted factory costs per week:

	₹
Budgeted labour	25,000
Indirect labour	12,500
Power	1,750
Depreciation	22,500
Space costs	8,000
Engineering	3,500
Administration	5,000

Actual production during the last week is 4,750 units of product X and 650 units of product Y. Actual factory cost was ₹78,250.

Calculate:

- (i) Total factory costs (TFC)
- (ii) Cost per Factory Minute
- (iii) Return per Factory Minute for both products
- (iv) TA ratios for both products
- (v) Throughput cost per the week
- (vi) Efficiency ratio

(b) What is inter firm comparison?

Answer:

4. (a) (i) Total Factory Costs = Total of all costs except materials.
= ₹25,000 + ₹12,500 + ₹1,750 + ₹22,500 + ₹8,000 + ₹3,500 + ₹5,000.
= ₹78,250

(ii) Cost per Factory Minute = Total Factory Cost ÷ Minutes available
= ₹78,250 ÷ 31,300 = ₹2.50

(iii) (a) Return per bottleneck minute for product X = $\frac{\text{Selling Price} - \text{Material Cost}}{\text{Minutes in bottleneck}}$
= (35 - 20) / 5 = ₹3

(b) Return per bottleneck minute for product Y = $\frac{\text{Selling Price} - \text{Material Cost}}{\text{Minutes in bottleneck}}$
= (35 - 17.5) / 10 = ₹1.75

(iv) Throughput accounting (TA) Ratio for Product X = $\frac{\text{Return per Minute}}{\text{Cost per Minute}}$
= (3 / 2.5) = ₹1.2

Throughput Accounting (TA) Ratio for Product Y = $\frac{\text{Return per Minute}}{\text{Cost per Minute}}$
= (1.75 / 2.5) = ₹0.7

Based on the review of the TA ratios relating to two products, it is apparent that if we only made product Y, the enterprise would suffer a loss, as its TA ratio is less than 1. Advantage will be achieved, when product X is made.

(v) Standard minutes of throughput for the week:
= [4,750 x 5] + [650 x 10] = 23,750 + 6,500 = 30,250 minutes

Throughput cost per week:
= 30,250 x ₹2.5 per minutes
= ₹75,625

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$$\begin{aligned} \text{(vi) Efficiency \%} &= (\text{throughput cost} / \text{Actual TFC}) \% \\ &= (\text{₹75,625} / \text{₹78,250}) \times 100 \\ &= 96.6\% \end{aligned}$$

The bottleneck resource of Facility A is available for 31,300 minutes per week but produced only 30,250 standard minutes. This could be due to:

- (a) The process of a 'wandering' bottleneck causing facility A to be underutilized.
- (b) Inefficiency in facility A.

(b) Inter-firm comparison as the name denotes means the techniques of evaluating the performances, efficiencies, deficiencies, costs and profits of similar nature of firms engaged in the same industry or business. It consists of exchange of information, voluntarily of course, concerning production, sales cost with various types of break-up, prices, profits, etc., among the firms who are interested or willing to make the device a success. The basic purposes of such comparison are to find out the work points in an organization and to improve the efficiency by taking appropriate measures to wipe out the weakness gradually over a period of time.

5. (a) A Company with two manufacturing division is organised on profit centre basis. Division 'A' is the only source for the supply of a component that is used in Division B in the manufacture of a product KLIM. One such part is used each unit of the product KLIM. As the demand for the product is not steady. Division B can obtain order for increased quantities only by spending more on sales promotion and by reducing the selling prices. The manager of Division B has accordingly prepared the following forecast of sales quantities and selling prices.

Sales units per day	Average Selling price per unit of KLIM (₹)
1,000	5.25
2,000	3.98
3,000	3.30
4,000	2.78
5,000	2.40
6,000	2.01

The manufacturing cost of KLIM in Division B is ₹3,750 first 1,000 units and ₹750 per 1,000 units in excess of 1,000 units.

Division A incurs a total cost of ₹1,500 per day for an output to 1,000 components and the total costs will increase by ₹900 per day for every additional 1,000 components manufactured. The Manager of Division A states that the operating results of Division will be optimised if the transfer price of the component is set at ₹1.20 per unit and he has accordingly set the aforesaid transfer price for his supplies of the component to Division A.

You are required:

- (i) Prepare a schedule showing the profitability at each level of output for Division A and Division B
- (ii) Find the profitability of the company as a whole at the output level which
 - (A) Division A's net profit is maximum.
 - (B) Division B's net profit is maximum.
- (iii) If the company is not organised on profit centre basis, what level of output will be chosen to yield the maximum profit.

- (b) Trimake Limited makes three main products, using broadly the same production methods and equipment for each. A conventional product costing system is used at present, although and Activity Based Costing (ABC) system is being considered. Details of the three products, for typical period are:

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	Labour Hours per	Machine Hours per unit	Material per unit	Volumes unit
Product X	½	1 ½	₹20	750
Product Y	1 ½	1	12	1,250
Product Z	1	3	25	7,000

Direct labour costs ₹6 per hour and production overheads are absorbed on a machine hour basis. The rate for the period is ₹28 per machine hour.

You are required:

(a) To calculate the cost per unit for each product using conventional methods.

Further analysis shows that the total of production overheads can be divided as follows:

	%
Costs relating to set-ups	35
Costs relating machinery	20
Costs relating materials handling	15
Costs relating to inspection	30
Total production overhead	100%

The following activity volumes are associated with the product line for the period as a whole.

Total activities for the period

	Number of Set-ups	Number of movements of materials	Number of Inspections
Product X	75	12	150
Product Y	115	21	180
Product Z	480	87	670
	670	120	1,000

You are required:

(b) To calculate the cost per unit for each product using ABC principles; c) to comment on the reasons for any differences in the costs in your answers to (a) and (b).

Answer:

5. (a)

(i) Statement showing profit of division A:

Sale per day (units)	Sale Value	Cost	Profit/(loss)
	₹	₹	₹
1000	1200	1500	(300)
2000	2400	2400	-
3000	3600	3300	300
4000	4800	4200	600
5000	6000	5100	900
6000	7200	6000	1200

Profit of Division B:

No. of units	Sales	Transfer price	Other manufacturing cost	Total cost	Profit / (loss)
	₹	₹	₹	₹	₹
1000	5250	1200	3750	4950	300
2000	7960	2400	4500	6900	1060
3000	9900	3600	5250	8850	1050
4000	11120	4800	6000	10800	320
5000	12000	6000	6750	12750	(750)
6000	12060	7200	7500	14700	(2640)

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- (ii) Profitability of the company at the output level where division A's net profit is maximum:

	₹
Profit of division A at 6000 units	1,200
Profit of division B at 6000 units	(2,640)
Profit / (loss)	(1,440)
Division B's net profit is maximum:	
Profit of division A at 2000 units	-
Profit of division B at 2000 units	1,060
	1,060

- (iii) When the company is not organized on profit centre basis
Profit at different level of output

Units	Division A	Division B	Total
	₹	₹	₹
1000	(300)	300	-
2000	-	1060	1060
3000	300	1050	1350
4000	600	320	920
5000	900	(750)	150
6000	1200	(2640)	(1440)

Best output level is 3,000 units

- (b) (a) Computation of cost per unit using conventional Methods:

Total overheads	₹
X = 750 × 1.5 × 28 =	31,500
Y = 1250 × 1 × 28 =	35,000
Z = 7000 × 3 × 28 =	5,88,000
	6,54,500

Computation of cost

	X	Y	Z
	₹	₹	₹
Materials	20	12	25
Labour	3	9	6
Overheads	42	28	84
Factory Cost	65	49	115

- (b) Under ABC Costing

		Setup Cost	Machine Cost	Machine Handling Cost	Inspection Expenses	Total
Cost	₹	2,29,075	1,30,900	98,175	1,96,350	6,54,500
Cost Driver		No. of setups	Machine hours	No. of Moment of Materials	No. of Inspection	
Cost driver rates	₹	341.90 (229075/670)	5.6 (130900 /23375)	818.125 (98,175 /120)	196.35 (196350 /1000)	

Cost per unit under ABC costing

	X		Y		Z	
	₹	₹	₹	₹	₹	₹
Materials		20.00		12.00		25.00
Labour		3.00		9.00		6.00
Overheads						
Setup Cost		34.19		31.45		23.44

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Machine cost	8.40		5.60		23.44	
Machine Handling Cost	13.09		13.74		10.17	
Inspection Cost	39.27	94.95	28.27	79.06	18.79	69.20
Total Cost		117.95		100.06		100.20

6. (a) The Everalert Ltd., which has a satisfactory preventive maintenance system in its plant has installed a new Hot Air Generator based on electricity instead of fuel oil for drying its finished products. The Hot Air Generator required periodic shutdown maintenance. If the shutdown is scheduled yearly, the cost of maintenance will be as under:

Maintenance Cost	Probability
₹15,000	0.3
₹20,000	0.4
₹25,000	0.3

The costs are expected to be almost linear, i.e., if the shutdown is scheduled twice a year the maintenance cost will be double.

There is no previous experience regarding the time taken between breakdowns. Costs associated with breakdown will vary depending upon the periodicity of maintenance. The probability distribution of breakdown cost is estimated as under:

Breakdown Costs per annum	Shutdown once a year	Shutdown twice a year
₹75,000	0.2	0.5
₹80,000	0.5	0.3
₹1,00,000	0.3	0.2

Simulate the total costs – maintenance and breakdown costs – and recommend whether shutdown overhauling should be resorted to once a year or twice a year?

- (b) A company has four zones open and four salesmen available for assignment. The zones are not equally rich in their sales potentials. It is estimated that a typical salesman operating in each zone would bring in the following annual sales:

Zone: A:1,26,000 ; Zone B:1,05,000 ; Zone C:84,000; Zone D:63,000.

The four salesmen are also considered to differ in ability. It is estimated that working under the same condition their yearly sales would be proportionately as follows:

Salesman P:7; Salesman Q:5; Salesman R:5; Salesman S:4. If the criterion is maximum expected total sales, the intuitive answer is to assign the best salesman to the richest zone, the next best to the second richest zone and so on. Verify this by the method of assignment.

Answer:

6. (a)

Assigning random numbers to maintenance cost once a year basis:

Cost	Probability	Random Numbers (R.N.)
₹ 15,000	0.30	00-29
20,000	0.40	30-69
25,000	0.30	70-99

Assigning random numbers to breakdown costs when overhauling is once a year basis:

Cost	Probability	R.N.
₹ 75,000	0.20	00-19
80,000	0.50	20-69
1,00,000	0.30	70-99

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The total costs will be as under:

Year	R.N.	Maintenance Cost	R.N.	Breakdown Cost	Total
1	27	₹15,000	03	₹75,000	₹90,000
2	44	20,000	50	80,000	1,00,000
3	22	15,000	73	1,00,000	1,20,000
4	32	20,000	87	1,00,000	1,20,000
5	97	25,000	59	80,000	1,05,000
Average Annual Cost					1,06,000

Assigning random numbers to maintenance costs, on twice a year basis:

Cost	Probability	Random Numbers (R.N.)
₹ 30,000	0.30	00-29
40,000	0.40	30-69
50,000	0.30	70-99

Assigning random numbers to breakdown costs

Cost	Probability	Random Numbers (R.N.)
₹ 75,000	0.50	00-49
80,000	0.30	50-69
1,00,000	0.20	80-99

The total costs will be as under:

Year	R.N.	Maintenance Cost	R.N.	Breakdown Cost	Total
1	42	₹40,000	54	₹80,000	₹1,20,000
2	04	30,000	65	80,000	1,10,000
3	82	50,000	49	75,000	1,25,000
4	38	40,000	03	75,000	1,15,000
5	91	50,000	56	80,000	1,30,000
Average Annual Cost					1,06,000

[Note R.Ns. are taken from table]

Recommendation: From the above working it may be seen that shutdown maintenance/overhauling once a year will be more economical. The average annual cost will only be ₹1.06 lakhs as against 1.20 lakhs when shutdown is twice a year.

(b)

Sales Man	A	B	C	D
P	42	35	28	21
Q	30	25	20	15
R	30	25	20	15
S	24	20	16	12

Loss Matrix

0	7	14	21
12	17	22	27
12	17	22	27

Row Operation

0	7	14	21
0	5	10	15
0	5	10	15
1	4	8	12

Column Operation

0	3	6	9
0	1	2	3
0	1	2	3
0	0	0	0

0	2	5	8
0	0	1	2
0	0	1	2
1	0	0	0

0	2	4	7
0	0	0	1
0	0	0	1
2	1	0	0

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P	→	A	-	42
Q	→	B	-	25
R	→	C	-	20
S	→	D	-	12
				99

× 3000 = ₹2,97,000 Maximum sales

7. (a) The following table gives data on normal time & cost and crash time & cost for a project.

Activity	Normal		Crash	
	Time (days)	Cost (₹)	Time (days)	Cost (₹)
1 – 2	6	600	4	1,000
1 – 3	4	600	2	2,000
2 – 4	5	500	3	1,500
2 – 5	3	450	1	650
3 – 4	6	900	4	2,000
4 – 6	8	800	4	3,000
5 – 6	4	400	2	1,000
6 – 7	3	450	2	800

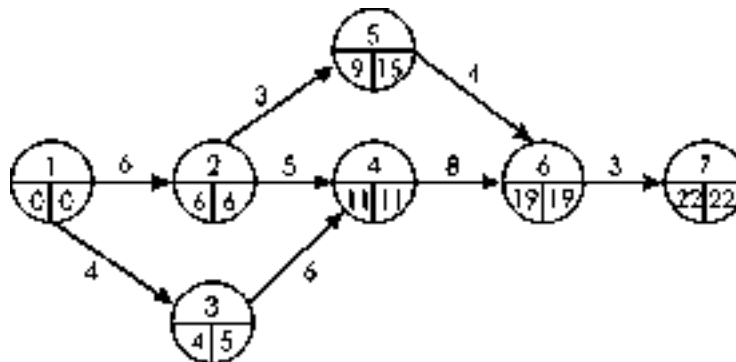
The direct cost per day is ₹100

- (i) Draw the network and identify the critical path
- (ii) What are the normal project duration and associated cost?

(b) Four products A, B, C and D have ₹5, ₹7, ₹3 and ₹9 profitability respectively. First type of material (limited supply of 800 kg) is required by A, B, C, and D at 4 kg, 3 kg, 8 kg, and 2 kg, respectively per unit. Second type of material has a limited supply of 300 kg, and is for A, B, C, and D at 1 kg, 2 kg, 0 kg, and 1 kg per unit. Supply of other types of material consumed is unlimited. Machine hours available are 500 hours and requirements are 8, 5, 0, and 4 hours for A, B, C, and D each per unit. Labour hours are limited to 900 hours and requirements are 3, 2, 1 and 5 hours for it profitability? Formulate this as Linear Programming Problem. You are not required to solve the LPP.

Answer:

7. (a) (i) The network for normal activity times indicates a project time of 22 weeks with the critical path 1-2-4-6-7.



(ii) Normal project duration is 22 weeks and the associated cost is as follows: Total cost = Direct normal cost + Indirect cost for 22 weeks. = 4,700 + 100 × 22 = ₹6,900.

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(b)

	Material I	Material II	Machine hours	Labour Hours
A	4	1	8	3
B	3	2	5	2
C	8	0	0	1
D	2	1	4	5
Max. availability	800	300	500	900

Let X_1 , X_2 , X_3 and X_4 are the quantity produced for products A, B, C and d respectively.

The objective function is –

$$\text{Max. } Z = 5X_1 + 7X_2 + 3X_3 + 9X_4$$

Subject to constraints

$$4X_1 + 3X_2 + 8X_3 + 2X_4 \leq 800 \text{ (Material I constraint)}$$

$$X_1 + 2X_2 + 0X_3 + X_4 \leq 300 \text{ (Material II constraint)}$$

$$8X_1 + 2X_2 + 0X_3 + 4X_4 \leq 500 \text{ (Machine hours constraint)}$$

$$3X_1 + 2X_2 + X_3 + 5X_4 \leq 900 \text{ (Labour hours constraint)}$$

And non-negativity constraints

$$X_1, X_2, X_3, X_4 \geq 0$$

8. (a) Cost Driver.
- (b) Cost Control vs. Cost Reduction.
- (c) Application of Simulation.
- (d) Activity Based Management.
- (e) Value Engineering.
- (f) Skimming Pricing Policy.

Answer:

8. (a) Cost driver: Any element that would cause a change in the cost of activity is cost driver. Actually cost drivers are basis of charging cost of activity to cost object. Cost drivers are used to trace cost to product by using a measure of resources consumed by each activity. For example, frequency of order, number of order etc. may be cost driver of customer order processing activity. Cost driver may be involved two parts:
 1. Resource cost driver
 2. Activity cost driver

A resource cost driver is a measure of the quantity of resources consumed by an activity. An activity cost driver is a measure of the frequency and intensity of demand, placed on activities by cost objects.

The cost drivers for various functions i.e., production, marketing, research, and developments are given below.

Production	Number of units Number of set-ups
Marketing	Number of sales personnel Number of sales orders

(b) Cost Control Vs. Cost Reduction:

Both cost reduction and cost control are efficient tools of management but their concepts and procedure are widely different. The differences are summarized below:

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Cost Control	Cost Reduction
(a) Cost control represents efforts made towards achieving target or goal.	(a) Cost reduction represents the achievement in reduction of cost
(b) The process of cost control is to set up a target, ascertain the actual performance and compare it with the target, investigate the variances, and	(b) cost reduction is not concern with maintenance of performance according to standard take remedial measures.
(c) cost control assumes the existence of standards or norms which are not challenged	(c) cost reduction assumes the existence of concealed potential savings in standards or norms which are therefore subjected to a constant challenge with a view to improvement by bringing out savings
(d) Cost control is a preventive function. costs are optimized before they are incurred	(d) Cost reduction is a corrective function. It operates even when an efficient cost control system exists. there is room for reduction in the achieved costs under controlled conditions
(e) cost control lacks dynamic approach	(e) Cost reduction is a continuous process of analysis by various methods of all the factors affecting costs, efforts and functions in an organization. the main stress is upon the why of a thing and the aim is to have continual economy in costs

(c) Application of Simulation

- (i) Scheduling aircraft,
- (ii) Job-ship scheduling and personnel scheduling,
- (iii) Manpower-hiring decisions,
- (iv) Traffic light-timing,
- (v) Transport-scheduling,
- (vi) Evaluating alternative investment opportunities, and
- (vii) Design of parking lots, harbor, and communication systems etc.

(d) Activity-based management (ABM) is a method of identifying and evaluating activities that a business performs using activity-based costing to carry out a value chain analysis or a re-engineering initiative to improve strategic and operational decisions in an organization.

ABC is not a method of costing, but a technique for managing the organisation better. It is a one-off exercise which measures the cost and performance of activities, resources and the objects which consume them in order to generate more accurate and meaningful information for decision-making. ABM draws on ABC to provide management reporting and decision making. ABM supports business excellence by providing information to facilitate long-term strategic decisions abo.

(e) Value Engineering

Value Engineering is an organized/systematic approach directed at analyzing the function of systems, equipment, facilities, services, and supplies for the purpose of achieving their essential functions at the lowest life-cycle cost consistent with required performance, reliability, quality, and safety. Society of Japanese Value Engineering defines VE as:

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"A systematic approach to analyzing functional requirements of products or services for the purposes of achieving the essential functions at the lowest total cost".

Value Engineering is an effective problem solving technique. Value engineering is essentially a process which uses function analysis, team- work and creativity to improve value. Value Engineering is not just "good engineering." It is not a suggestion program and it is not routine project or plan review. It is not typical cost reduction in that it doesn't "cheapen" the product or service, nor does it "cut corners."

Value Engineering simply answers the question "what else will accomplish the purpose of the product, service, or process we are studying?" VE technique is applicable to all type of sectors. Initially, VE technique was introduced in manufacturing industries. This technique is then expanded to all type of business or economic sector, which includes construction, service, government, agriculture, education and healthcare.

- (f) Price skimming is a pricing strategy which companies adopt when they launch a new product, in this strategy while launching a product company sets high price for a product initially and then reduce the price as time passes by so as to recover cost of a product quickly.

An example of price skimming would be mobiles which have some added features and due to those features they are sold initially at higher prices and then prices began to decline as time passes by, another example of price skimming would be 3D televisions which are right now being sold.

Advantages

1. Price skimming helps the company in recovering the research and development costs which are associated with the development of new product.
2. If the company caters to consumers who are quality conscious rather than price conscious than this type of strategy can work in a great way for a company.

Paper 15 – Strategic Cost Management and Decision Making

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Paper 15 - Strategic Cost Management and Decision Making

Time Allowed: 3 hours

Full Marks: 100

Section A

1. Answer the following and each question carries 2 marks. [10 × 2 = 20]

(i) A company has a capacity to make 4,00,000 units of a product. It has noted from market conditions that at a price of ₹ 50 per unit, it can sell 1,00,000 units but the demand would double for each ₹ 5 fall in the selling price. A minimum margin of 25% is required. The target cost for the company should be:

- (a) ₹ 50 (b) ₹ 40 (c) ₹ 30 (d) ₹ 20

(ii) Division A of a company manufactures a single product and the following data are provided:

Sales = 25,000 units	Fixed Cost = ₹4,00,000
Depreciation = ₹2,00,000	Residual Income = ₹30,000
Net Assets = ₹10,00,000	

Head Office assesses divisional performance by the method of Residual Income and uses cost of capital of 12%

- (a) ₹25 (b) ₹30 (c) ₹35 (d) None of these.

(iii) ABC Ltd., has correct PBIT of ₹1920 Cr. on total assets of ₹96 Cr. The company proposes to increase assets by ₹24 Cr., which is estimated to increase operating profit before Depreciation by ₹8.4 Cr., and a net increase in Depreciation by ₹4.8 Cr. This will be result in ROI:

- (a) To decrease by 1% (b) To increase by 1%
(c) To remain the same (d) None of these

(iv) A company makes components and sells internally to its subsidiary and also to external market. The external market price is ₹24 per component, which gives a contribution of 40% of sales. For external sales, variable costs include ₹1.50 per unit for distribution costs. This is, however not incurred in internal sales. There are no capacity constraints. To maximize company profit, the transfer price to subsidiary should be:

- (a) ₹ 9.60 (b) ₹ 12.90 (c) ₹ 14.40 (d) None of these

(v) A company operates throughput accounting system. The details of product X per unit are as under:

Selling Price	₹50
Material Cost	₹20
Conversion Cost	₹15
Time on bottleneck resources	10 minutes

The return per hour for product X is

- (a) ₹210 (b) ₹300 (c) ₹180 (d) ₹90

(vi) The information relating to the direct material cost of a company is as under:

	₹
Standard price per unit	3.60
Actual quantity purchased in units	1,600
Standard quantity allowed for actual production in units	1,450
Material price variance on purchase (favourable)	240

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What is the actual purchase price per unit?

- (a) ₹3.45 (b) ₹3.75 (c) ₹3.20 (d) ₹3.25

(vii) In calculating the life cycle costs of a product, which of the following item would be included?

- A) Planning and concept design costs
 B) Preliminary and detailed design costs
 C) Testing costs
 D) Production costs
 E) Distribution costs

- (a) All of the above (b) D and E (c) B, D and E (d) D

(viii) A company is to market a new product. It can produce up to 1,50,000 units of this product. The following are the estimated cost data:

Probability	Fixed Cost	Variable Cost
For production up to 75,000 units	₹8,00,000	60%
Exceeding 75,000 units	₹1,20,000	50%

Sale price is expected to be ₹25 per unit. How many units must the company sell to break even?

- (a) 1,00,000 units (b) 1,11,000 units (c) 1,27,000 units (d) 75,000 units

(ix) SUVAM Ltd., has the capacity of production of 80,000 units and presently sells 20,000 units at ₹100 each. The demand is sensitive to selling price and it has been observed that with every reduction of ₹10 in selling price, the demand is doubled. What should be the target cost at full capacity if profit margin on sale is taken as 25%?

- (a) ₹67.50 (b) ₹60.00 (c) ₹45.00 (d) None of the above

(x) A company makes and sells a single product. The selling price and marginal revenue equations are:

Selling Price = ₹50 - ₹0.001X

Marginal Revenue = ₹50 - ₹0.002X

Where X is the product the company makes. The variable cost amount to 20 per unit and the fixed costs are ₹1,00,000.

In order to maximize the profit, the selling price should be

- (a) ₹25
 (b) ₹30
 (c) ₹35
 (d) ₹40

Answer:

1. (i) (c) 30 hrs.

Cumulative output	Average time / unit (hrs.)	Total time (hrs.)	Incremental Time (hrs.)
1	300	300	
2	270 (0.9 × 300)	540	
4	243 (0.9 × 270)	972	432 (972 – 540)

- (ii) (b) ₹ 30.

Total contribution required:

$$\begin{aligned}
 12\% \text{ of } ₹ 10 \text{ lakhs} &= ₹ 1,20,000 + 30,000 + 2,00,000 + 4,00,000 \\
 &\qquad\qquad\qquad (RI) \qquad (Depr.) \qquad (FC) \\
 &= ₹ 7,50,000 \div 25,000 = ₹ 30.
 \end{aligned}$$

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- (iii) (a) to decrease by 1%

ROI without Investment	ROI with Investment
PBIT (₹ Cr.) 19.20	(+8.4 – 4.8) 22.80
Total Assets (₹ Cr.) 96.00	(+24.00) 120.00
ROI 20%	19% (i.e. 1% decrease)

- (iv) (b) ₹ 12.90

Transfer Price = Marginal Cost – Opportunity Cost
= ₹ 24 × 60% - ₹ 1.50 = ₹ 12.90.

- (v) (c) ₹ 180

(Selling Price – Material Cost)/Time of bottleneck resource
= [(₹ 50 – ₹ 20)/ 10 minutes] × 60 = ₹ 180 per hour.

- (vi) (a) ₹ 3.45

Actual quantity bought × Standard Price
= 1,600 × ₹ 3.60 = ₹ 5,760
Deduct favourable price variance 240
Actual quantity × Actual Price = 5,520
Or, 1,600 × Actual Price = ₹ 5,520.
So, Actual price ₹ 5,520 / 1,600 = ₹ 3.45.

- (vii) (a) All of the above

All the costs mentioned in the question are parts of the total life cycle costs.

- (viii) (b) 1,11,000 units

At a production of 75,000 units or less the fixed costs amount to ₹ 8 lakh contribution is ₹ 10 per unit (₹ 25 – 60% of ₹ 25). Production will however, be more than this level. Total fixed cost is then ₹ 12 lakh.
Contribution for first 75,000 units = ₹ 7,50,000
Hence, to meet ₹ 12 lakh fixed cost, further ₹ 4,50,000 contribution is required.
Contribution beyond 75,000 units is rs. 12.5 (₹ 25 – 50% of ₹ 25).
Additional units to be sold = ₹ 4,50,000 / ₹ 12.50 = 36,000 units = 1,11,000 units.

- (ix) (b) ₹ 60.

Demand	Price (₹)
20,000	100
40,000	90
80,000	80

Target Cost = ₹ 80 – (80 × 0.25) = ₹ 60.

- (x) (c) ₹ 35

Selling price = ₹ 50 – ₹ 0.001x
Marginal Revenue = ₹ 50 – ₹ 0.002x
Variable cost per unit = Marginal Cost per unit = ₹ 20
Optimal output for maximum profit: 20 = 50 – 0.002x,
Hence, x = 30/0.002 = 15,000 units
SP = 50 – 0.001x = 50 – 0.001 (15000) = 50 – 15 = ₹ 35.

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Section B

Answer any five questions from Question No. 2 to 8
Each question carries 16 marks. [5 x 16 = 80]

2. (a) XYZ Ltd., supports the concept of the Life Cycle Costing for new investment decisions, covering its engineering activities. XYZ Ltd., is to replace a number of its machine and the Chief engineer is to decide between the 'AB' machine, a major expensive machine, with a life of 10 years and the 'CD' machine with an estimated life of 5 years. If the 'CD' machine is chosen, it is likely that it would be replaced at the end of 5 years by another 'CD' machine.

The pattern of maintenance and running costs differs between two types of machine and the relevant data are as given below:

	AB	CD
Purchase Price	19,000	13,000
Trade-in-value	3,000	3,000
Annual repair cost	2,000	2,600
Overhaul cost (p.a.)	4,000	2,000
	(at year 8)	(at year 4)
Estimated financing cost averaged		
Over machine life (p.a.)	10%	10%

Required: Recommend, with supporting figures, which machine to be purchased, stating any assumptions made.

[Given PVIF (10,10)	=	0.39
PVIF (10,5)	=	0.62
PVIFA (10,10)	=	6.15
PVIFA (10,5)	=	3.60
PV factor @10% for 4 years	=	0.68
PV factor @10% for 8 years	=	0.47]

PVIF means present value interest factor.

PVIFA means present value interest factor for any Annuity.

- (b) An Engineering Company produces product P in its Production Shop 'A'. The overhead recovery rate is 100% of direct wages based on the following budgeted figures:

Direct wages	1,60,000
Variable overheads	64,000
Fixed overheads	96,000

The Production plan for the same budget period envisages an output of 18,000 units of P, whose sales and cost data are as under:

	₹/unit
Selling price	42
Direct materials	12
Direct wages	8
Total overheads	8

The company proposes to use the balance capacity of shop A after completing the above said production plan for the manufacture of component Q, whose cost data are as under:

	₹/unit
Direct materials	8
Direct wages	16
Total overheads	16

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The component Q is used by the company in the manufacture of some other product in another production department.

The company receives an export order from abroad for the purchase of 2000 units of product P at ₹30 each. This offer can be accepted by diverting the capacity from component Q. In that event, the company has to buy the component which is available from an outside supplier at a price of ₹40 each.

You are requested to evaluate the alternative courses of action and state with reasons whether the spare capacity should be utilized for the manufacture of:

- (i) The component Q or;
- (ii) 2000 units of product P for export and buying of the component Q from the outside supplier.

Answer:

2. (a) AB M/c – 10 years life

	Year	Cost (₹)	P/V factor	Discounted Cost (₹)
Purchase Price	0	19,000	1.00	19,000
Overhaul Costs	8	4,000	0.47	1,880
Trade-in-value	10	(3,000)	0.39	(1,170)
Annual Repair Cost	1.10	2,000	6.15	12,300
				32,010

Annualized equivalent = ₹32,110/6.15 = ₹5,221.

CD M/c – 5 years life

	Year	Cost (₹)	P/V factor	Discounted Cost (₹)
Purchase Price	0	13,000	1.00	13,000
Overhaul Costs	4	2,000	0.68	1,360
Trade-in-value	5	(3,000)	0.62	(1,860)
Annual Repair Cost	1.5	2,600	3.80	9,880
				22,380

Annualized equivalent = ₹22,380/3.80 = ₹5,890

Conclusion:

AB M/c should be purchased.

- (b) First let us split the overhead recovery rate into variable and fixed.

Variable overhead recovery rate = $64,000/1,60,000 \times 100 = 40\%$

Fixed overhead recovery rate = $90,000/1,60,000 \times 100 = 60\%$

Fixed overhead is not relevant for decision-making

Hence the variable cost of P and Q has been worked out as below:

	P	Q
Direct Materials	12.00	8.00
Direct Wages	8.00	16.00
Variable O/H @40% of Direct Wages	3.20	6.40
Variable Cost	23.20	30.40
Selling Price (Export)	30.00	
Contribution	6.80	
Purchase Price		40.00
Loss		9.60
		₹
If the Product P is produced		13,600
Contribution for 2000 units = 2000×6.80		
Then the component of Q is to be bought from the outside supplied.		
In such a case the loss will be 1000×9.60		9,600
Net Profit on export		4,000

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Spare Capacity should be utilized for export of 2000 units of P. 1000 units of Q may be bought from outside supplier. Then the net profit on export would be ₹4,000.

Direct wages	₹ / unit
P	8
Q	16

Hence for 1000 units of Q capacity, 2000 units of P can be manufactured.

3. (a) Bloom Ltd makes 3 products , A, B and C. The following information is available: (figures in ₹ Per unit)

Particulars	A	B	C
Selling Price (peak-season)	550	630	690
Selling Price (off-season)	550	604	690
Material Cost	230	260	290
Labour (peak-season)	110	120	150
Labour (off-season)	100	99	149
Variable Production Overhead	100	120	130
Variable Selling Overhead (only for peak-season)	10	20	15
Labour hours required for one unit of production (in hours)	8	11	7

Material Cost and Variable Production Overheads are the same for the peak-season and off-season. Variable Selling Overheads are not incurred in the off-season. Fixed Costs amount to ₹26,780 for each season, of which ₹2,000 is towards Salary for Special Technician, incurred only for product B, and ₹1,780 is the amount that will be incurred on after-sales warranty and free maintenance of only product C, to match competition.

Labour force can be inter-changeable used for all the products. During peak-season, there is labour shortage and the maximum labour hours available are 1,617 hours. During off-season, labour is freely available, but demand is limited to 100 units of A, 115 units of B and 135 units of C, with production facility being limited to 215 units for A, B and C put together.

You are required to:

- Advise the Company about the best product mix during the peak-season for maximum profit.
- What will be the maximum profit for the off-season?

- (b) What is Penetrating Pricing? What are the circumstances in which this policy can be adopted?

Answer:

3. (a) 1. Product Decision and Profits during Peak Season (Figure in ₹)

Product	A	B	C
(a) Selling Price per unit	550	630	690
(b) Variable Costs per unit:			
Direct Material	230	260	290
Direct Labour	110	120	150
Variable Overhead - Production	100	120	130
Variable Overhead - Selling	10	20	15
Sub-Total variable Cost	450	520	585
(c) Contribution per unit (a – b)	100	110	105
(d) Direct Labour Hours required per unit	8 hours	11 hours	7 hours
(e) Contribution per Labour hour (c ÷ d)	12.5	10	15

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(f) Ranking	II	III	I
(g) Possible Production with DLH of 1,617 hours (1617 ÷ d)	202 units	147 units	231 units
(h) Specific Fixed Overhead (given)	Nil	2,000	4,780
(i) Other General Fixed Overhead (Total 26,780 less h)	20,000	20,000	20,000
(j) Total Fixed OH if the product is produced individually (h + i)	20,000	22,000	24,780
(k) BEQ (j ÷ c)	200 units	200 units	236 units

Observation: Comparing (g) and (k) above, it is observed that only Product A should be produced, since B and C will not be able to recover the Fixed Costs. Hence, the Company should produce **202 units of Product A**, resulting in a Contribution of (₹202 x 100) = ₹20,200 – Fixed Cost ₹20,000 = **₹200**.

Note Even if Product C has the maximum ranking with respect to Key Factor, it is not profitable to produce. Hence, the next best profitable product, i.e. Product A should be preferred.

2. Computation of Contribution per unit during Off-Season (Figures in ₹)

Product	A	B	C
(a) Selling Price per unit	550	604	690
(b) Variable Cost per unit:			
Direct Material	230	260	290
Direct Labour	100	99	149
Variable Overhead – Production	100	120	130
Sub – Total Variable Cost	Product	A	B
(c) Contribution per unit (a – b)	120	125	130
(d) Ranking based on Contribution per unit	III	II	I
(e) Maximum Demand	100 units	115 units	135 units

Since Overall Total Possible production is only 215 units and there are specific fixed Costs for B and C, the following options are available for analysis –

Item	Contribution p.u.	Option 1		Option 2		Option 3	
		Units	Contribution	Units	Contribution	Units	Contribution
Product A	120	Nil	Nil	100	₹12,000	80	₹9,600
Product B	125	115	₹14,375	115	₹14,375	Nil	Nil
Product C	121	100	₹12,100	Nil	Nil	135	₹16,335
Total		215	₹26,475	215	₹26,375	215	₹25,935
Less: Fixed Cost			₹26,780		₹22,000		₹24,780
Profit / (Loss)			₹(305)		₹4,375		₹1,155

Best option is to produce 100 units of Product A and 115 units of Product B during off-season. Maximum Profit = ₹4,375.

- (b) 1. Penetration Pricing is a policy of using a **low price** as the principal instrument for penetrating mass markets early. This method is used for pricing a new product and to popularize it initially.
2. Profits may not be earned in the initial stages. However, Prices may be increased as and when the product is established and its demand picks up.
3. The low price policy is introduced for the purpose of long-term survival and profitability. Hence, careful analysis of the scope for market expansion and considerable amount of research and forecasting are necessary before determining the price under this strategy.
4. The circumstances in which Penetrating Pricing can be adopted are –

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(a) **Elastic demand:** The demand of the product is high when price is low. Hence, lower prices mean large volume and so more profits.

(b) **Mass Production:** When there are substantial savings in large-scale production, increase in demand is sustained by the adoption of low pricing policy.

Frighten off competition: The prices fixed at a low-level act as an entry barrier to the prospective competitors. The use of this policy by existing Firms will discourage the new firms to enter the market. The pricing policy is also known as "**Stay-out-pricing**".

4. (a) The summarized results of a company for the two years ended 31st December 2014 and 2015 are given below:-

	2015	2014
	₹ lacs	₹ Lacs
Sales	770	600
Direct Materials	324	300
Direct Wages	137	120
Variable Overheads	69	60
Fixed Overheads	150	80
Profit	90	40

As a result of re-organisation of production methods and extensive advertisement campaign use, the company was able to secure an increase in the selling prices by 10% during the year 2015 as compared to the previous year.

In the year 2014, the company consumed 1,20,000 kgs. of raw materials and used 24,00,000 hours of direct labour.

In the year 2015, the corresponding figures were 1,35,000 kgs. of raw materials and 26,00,000 hours of direct labour.

You are required to:

Use information given for the year 2014 as the base year information to analyse the result of the year 2015 and to show in a form suitable to the management the amount each factor has contributed by way of price, usage and volume to the change in profit in 2015.

- (b) State the limitations of Uniform Costing.

Answer:

4. (a) (ICAI Study Material Illustration 11 / P:200)
- 1) Sales price variance = $770 - \{770 \times (100/110)\} = ₹70$ (F)
 - 2) Sales volume variance = $\{770 \times (100/110)\} - 600 = ₹100$ (F)
% increase in volume = $(100/600) \times 100 = ₹16.66667\%$
 - 3) Sales Value variance = $770 - 600 = ₹170$ (F)
 - 4) Material cost variance = $300 - 324 = ₹24$ (F)
 - 5) Material volume variance = $300 \times (1/6) = ₹50$ (A)
Material price = $(30000000) / 120000 = ₹250/-$
Material expected to be used = $(120000 / 600) \times 700 = 140000$ Kgs
 - 6) Material usage variance = $5000 \times 250 = ₹12.5$ (F)
 - 7) Material price variance = $50 - 24 - 12.5 = ₹13.5$ (F)
 - 8) Labour cost variance = ₹17 (A)
 - 9) Labour volume variance = $120 / 6 = ₹20$ (A)
Labour rate = $(12000000) / (2400000) = ₹5/-$
Labour hours expected to be used = $(2400000 / 600) \times 700 = 2800000$
 - 10) Labour efficiency variance = $2 \times 5 = ₹10$ (F)

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- 11) Labour rate variance = $20 - 17 - 10 = ₹7$ (A)
 12) VOH cost variance = ₹9 (A)
 13) VOH volume variance = $60/6 = ₹10$ (A)
 14) VOH efficiency variance = $200000 \times 2.5 = ₹5$ (F)
 15) VOH expenditure variance = $10 - 9 - 5 = ₹4$ (A)
 16) FOH cost variance = ₹70 (A)

Profit reconciliation statement:

		₹ In lakhs
Profit		40
(+) sales variance:		
Price	70	
Volume	100	
Material variance:		
Usage	12.50	
Price	13.50	
Labour variance-efficiency	10	
VOH efficiency variance	5	211
		251
(-) Material volume variance	50	
Labour variance:		
Volume	20	
Rate	7	
VOH variances:		
Volume	10	
Expenditure	4	
FOH cost variance	70	161
Profit for 1988		90

(b) **Limitations of Uniform Costing:**

- (i) Uniform costing presumes the application of same principles and methods of Costing in each of the member firms. But individual units generally differ in respect of certain key factors and methods.
- (ii) For smaller units the cost of installation and operation of Uniform Costing System may be more than the benefits derived by them.
- (iii) Uniform costing may create conditions that are likely to develop monopolistic tendencies within the industry. Prices may be raised artificially and supplies curtailed.
- (iv) If complete agreement between the members is not forthcoming, the statistics presented cannot be relied upon. This weakens the Uniform Costing System and reduces its usefulness.

5. (a) A company can produce any of its 4 products, A, B, C and D. Only one product can be produced in a production period and this has to be determined at the beginning of the production run. The production Capacity is 1,000 hours. Whatever is produced has to be sold and there is no Inventory build-up to be considered beyond the production period. The following information is given:

Particulars	A	B	C	D
Selling Price (₹ Per unit)	40	50	60	70
Variable Cost (₹ Per unit)	30	20	20	30
No. of units that can be sold	1,000	600	900	600
No. of production hours required per unit of product	1 hour	1 hour and 15 minutes	1 hour and 15 minutes	2 hours

What are the Opportunity Costs of A, B, C and D?

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(b) A company produces for products, viz. P, Q, R and S. The data relating to production activity are as under

Product	Quantity of Production	Material Cost / unit ₹	Direct labour hours/ unit	Machine hours / unit	Direct Labour cost / unit ₹
P	1,000	10	1	0.50	6
Q	10,000	10	1	0.50	6
R	1,200	32	4	2.00	24
S	14,000	34	3	3.00	18

Production overheads are as under:

	₹
(i) Overheads applicable to machine oriented activity	1,49,700
(ii) Overheads relating to ordering materials	7,680
(iii) Set up costs	17,400
(iv) Administration overheads for spare parts	34,380
(v) Material handling costs	30,294

The following further information have been compiled:

Product	No. of set up	No. of materials orders	No. of times materials handled	No. of spare parts
P	3	3	6	6
Q	18	12	30	15
R	5	3	9	3
S	24	12	36	12

Required:

- (i) Select a suitable cost driver for each item of overhead expense and calculate the cost per unit of cost driver.
- (ii) Using the concept of activity based costing, compute the factory cost per unit of each product.

Answer:

5. (a)

Particulars	A	B	C	D
1. Contribution per unit = SP pu – VC pu	40 – 30 = ₹10	50 – 20 = ₹30	60 – 20 = ₹40	70 – 30 = ₹40
2. Time Required	1 hour	1.25 hours	1.25 hours	2 hours
3. Possible Production Point Qty = (1000 ÷ 2)	1,000 units	800 units	800 units	500 units
4. Possible Sale Quantity	1,000 units	600 units	900 units	600 units
5. Sales Quantity lost due to Production Constraint = 4 – 3, if 4 > 3.	Nil	NA	100 units	100 units
6. Opportunity Costs = (5 × 1)	Nil	Nil	₹4,000	₹4,000

(b) Computation of Cost Driver Rates

- 1) Overheads relating to Machinery oriented activity
Cost Driver → Machine Hour Rate
 $(1000 \times 0.5) + (1000 \times 0.5) + (1200 \times 2) + (14000 \times 3)$
 $1,49,700 / 49,900 = ₹3$ per hour
- 2) Overheads relating to ordering materials
Cost driver → No. of Materials orders
 $7680 / 30 = ₹256$ per orders
- 3) Set up costs
Cost driver → No. of set ups
 $17400 / 50 = ₹348$ per set up

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- 4) Administrative Overheads for spare parts
Cost driver → No. of spare parts
 $34380 / 36 = ₹955$ per spare part.
- 5) Material Handling costs
Cost driver → No. of times materials handled
 $30294 / 81 = ₹374$ per material handling

Computation of factory cost for each product

	P		Q		R		S	
Materials		10.00		10.00		32.00		34.00
Labour		6.00		6.00		24.00		18.00
Overheads								
Machine oriented activity	1.500		1.50		6.00		9.00	
Ordering of Materials	0.768		0.31		0.64		0.22	
Set up costs	1.044		0.63		1.45		0.60	
Administrative Spare Parts	5.730		1.43		2.39		0.82	
Material handling	2.244	11.29	1.12	4.99	2.81	13.29	0.96	11.60
Factory Cost (₹)		27.29		20.99		69.29		63.60

6. (a) A small retailer has studied the weekly receipts and payments over the past 200 weeks and has developed the following set of information:

Weekly Receipts	Probability	Weekly Payments	Probability
₹		₹	
3000	0.20	4000	0.30
5000	0.30	6000	0.40
7000	0.40	8000	0.20
12000	0.10	10000	0.10

Using the following set of random numbers, simulate the weekly pattern of receipts and payments for the 12 weeks of the next quarter, assuming further that the beginning bank balance is ₹8000. What is the estimated balance at the end of the 12 weekly period? What is the highest weekly balance during the quarter? What is the average weekly balance for the quarter?

Random Numbers

For Receipts	03	91	38	55	17	46	32	43	69	72	24	22
For Payments	61	96	30	32	03	88	48	28	88	18	71	99

According to the given information, the random number interval is assigned to both the receipts and the payments.

- (b) A Company has 4 factories F1, F2, F3 and F4 manufacturing the same product. Production and Raw material costs differ from factory to factory and are given in the table below in the first two rows. The transportation costs from the factories to the sale depots S1, S2 and S3 are also given. The last two columns in the table below give the sales price and total requirements at each depot and the production capacity of each factory given in the last row.

	F1	F2	F3	F4	Sales Price / unit (₹)	Requirement
Production Cost/Unit (₹)	15	18	14	13		
Raw Materials Cost/Unit (₹)	10	9	12	9		
Transportation Cost/Unit (₹)						
S1	3	9	5	4	34	80
S2	1	7	5	4	32	120
S3	5	8	3	6	31	150
Production Capacity	10	150	50	100		

Determine the optimal solution and the associated profit by using the Vogel's Approximation Method (VAM).

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Answer:

6. (a)

Range of random numbers							
Receipt (₹)	Probability	Cumulative probability	Range	Payments (₹)	Probability	Cumulative probability	Range
3000	0.20	0.20	0-19	4000	0.30	0.30	0-29
5000	0.30	0.50	20-49	6000	0.40	0.70	30-69
7000	0.40	0.90	50-89	8000	0.20	0.90	70-89
12000	0.10	1.00	90-99	10000	0.10	1.00	99-99

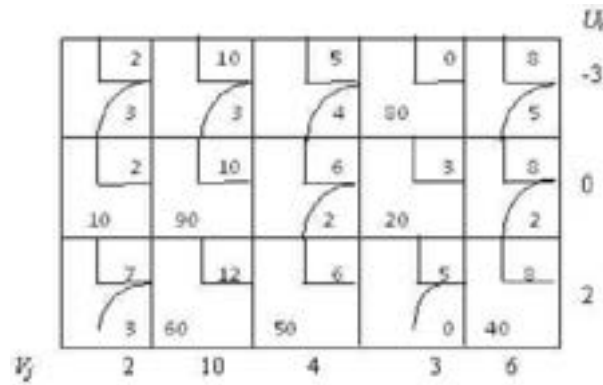
Simulation of Data for a period of 12 weeks					
Week	Random No. for receipt	Expected Receipt (₹)	Random No. for payment	Expected payment (₹)	Week end Balance
Opening Balance					8000
1	03	3000	61	6000	5000 (8000 + 3000 - 6000)
2	91	12000	96	10000	7000
3	38	5000	30	6000	6000
4	55	7000	32	6000	7000
5	17	3000	03	4000	6000
6	46	5000	88	8000	3000
7	32	5000	48	6000	2000
8	43	5000	28	4000	3000
9	69	7000	88	8000	2000
10	72	7000	18	4000	5000
11	24	5000	71	8000	2000
12	22	5000	99	10000	(3000)

Estimated balance at the end of 12th week = ₹(3,000)
 Highest balance = ₹ 7,000
 Average balance during the quarter = 45,000 / 12 = ₹3,750

(b) Loss Matrix

	2	11	5	0	3	8000	20000
				10			
	2	10	6	3	8	12000	10000
	10	90		20			
	7	12	6	5	3	15000	4000
		60	50		15		
	10	150	10	100	10		
	0	6	0	0	20		
	0	0	1	30	0		
	5	0	0	0	0		
	2	0	0	0	0		

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As Δ_{ij} is ≥ 0 , the solution is optimum

Qty Maximum Profit

S1	F4	→	80 × 8	=	640
S2	F1		10 × 6	=	60
F2			90 × (-2)	= (-)	180
F4			20 × 5	=	100
F3	F2		60 × -4	= (-)	240
	F3		50 × 2	=	100
	Dummy		60 × 0	=	0
			350		₹ 480

7. (a) A company had planned its operations as follows:

Activity	Duration (days)
1-2	7
2-4	8
1-3	8
3-4	6
1-4	6
2-5	16
4-7	19
3-6	24
5-7	9
6-8	7
7-8	8

(i) Draw the network and find the critical paths.

(ii) After 15 days of working, the following progress is noted:

(a) Activities 1-2, 1-3, and 1-4 completed as per original schedule.

(b) Activity 2-4 is in progress and will be completed in 4 more days.

(c) Activity 3-6 is in progress and will need 17 more days to complete.

(d) The staff at activity 3-6 are specialised. They are directed to complete 3-6 and undertake an activity 6-7, which will require 7 days. This re-arrangement arose due to a modification in a specification.

(e) Activity 6-8 will be completed in 4 days instead of the originally planned 7 days.

(f) There is no change in the other activities.

Update the network diagram after 15 days of start of work based on the assumption given above. Indicate the revised critical paths along with their duration.

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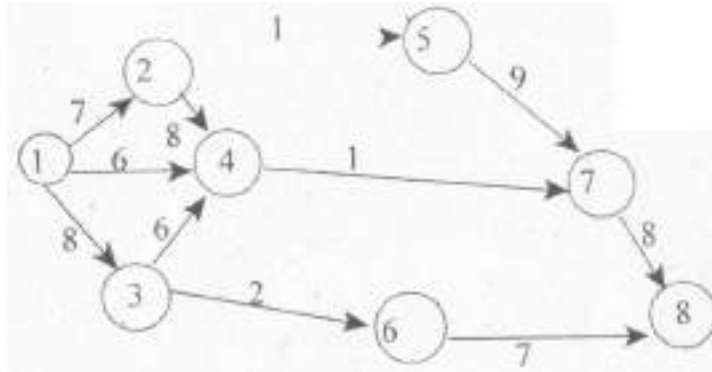
- (b) A company manufactures items X_1 and X_2 which are sold at a profit of ₹35 per unit of X_1 and ₹25 per unit of X_2 . X_1 requires 3 kgs of materials, 4 man-hours and 2 machine-hours per unit. X_2 requires 2kgs of materials, 3 man-hours and 2 machine-hours per unit. During each production run, there are 350 kgs, of materials available, 600 man-hours and 550 machine-hours for use.

Formulate under Simplex method of linear programming:

- (i) The objective function and the linear constraints, and
- (ii) The equations after introducing slack variables
- (iii) What are the various methods of solving a linear programming problem?

Answer:

7. (a) (i)



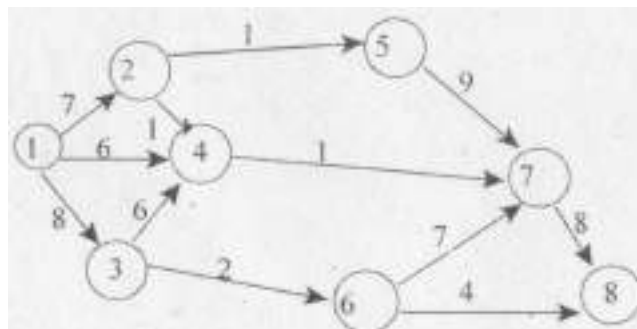
Paths	Duration
1-2-5-7-8	$7+16+9+8 = 40$
1-2-4-7-8	$7+8+19+8 = 42$
1-4-7-8	$6+19+8 = 33$
1-3-4-7-8	$8+6+19+8 = 41$
1-3-6-8	$8+24+7 = 39$

Critical Path 1-2-4-7-8 = 42 days

Revised duration of activities 2-4 and 3-6 after 15 days for updation.

Activity	Preceding Activity	Date of completion	Revised duration
2-4	1-2	$15+4 = 19$ days	$19-7 = 12$ days
3-6	1-3	$15+17 = 32$ days	$32-8 = 24$ days
6-7 (New-activity)	3-6		7 days
6-8	3-6		4 days

(ii)



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Paths	Duration
1-2-5-7-8	$7+16+9+8 = 40$
1-2-4-7-8	$7+12+19+8 = 46$
1-4-7-8	$6+19+8 = 33$
1-3-4-7-8	$8+6+19+8 = 41$
1-3-6-7-8	$8+24+7+8 = 47$
1-3-6-8	$8+24+4 = 36$

Critical Path = 1-3-6-7-8 = 47 days

(b) (i) The objective function to be maximized is - $Z = 35X_1 + 25X_2$

Subject to constraints

$$3X_1 + 2X_2 \leq 350$$

$$4X_1 + 3X_2 \leq 600$$

$$2X_1 + 2X_2 \leq 550$$

$$X_1, X_2 \geq 0$$

(ii) By introducing slack variable the equation will be-

$$3X_1 + 2X_2 + S_1 + 0S_2 + 0S_3 = 350$$

$$4X_1 + 3X_2 + 0S_1 + S_2 + 0S_3 = 600$$

$$2X_1 + 2X_2 + 0S_1 + 0S_2 + S_3 = 550 \text{ and}$$

$$Z = 35X_1 + 25X_2 + 0S_1 + 0S_2 + 0S_3 = 550$$

(iii) There are three methods of solving a linear programming problem which are as follows:

Simplex Method

Graphical Method

Transportation Method

8. (a) Socio Economic Costing.

(b) Six Sigma.

(c) Lean Accounting.

(d) Life Cycle Cost.

(e) Margin of Safety.

Answer:

8. (a) Socio Economics (also known as social economics) is the social science that studies how economic activity affects and is shaped by social processes. In general it analyzes how societies progress, stagnate, or regress because of their local or regional economy, or the global economy.

socioeconomics is sometimes used as an umbrella term with different usages. The term 'social economics' may refer broadly to the —use of economics in the study of society.

In many cases, socioeconomics focus on the social impact of some sort of economic change. such changes might include a closing factory, market manipulation, the signing of international trade treaties, new natural gas regulation, etc. such social effects can be wide-ranging in size, anywhere from local effects on a small community to changes to an entire society. Examples of causes of socioeconomic impacts include new technologies such as cars or mobile phones, changes in laws, changes in the physical environment (such as increasing crowding within cities), and ecological changes (such as prolonged drought or declining fish stocks). These may affect patterns of consumption, the distribution of incomes and wealth, the way in which people behave (both in terms of purchase decisions and the way in which they choose to spend their time), and the overall quality of life.

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Companies are increasingly interested in measuring socio-economic impact as part of maintaining their license to operate, improving the business enabling environment, strengthening their value chains, and fuelling product and service innovation.

- (b) Six Sigma has two key methodologies: DMAIC and DMADV, both inspired by W. Edwards Deming's Plan-Do-Check-Act Cycle: DMAIC is used to improve an existing business process, and DMADV is used to create new product or process designs for predictable, defect-free performance.

DMAIC

Basic methodology consists of the following five (5) steps:

- ◆ Define the process improvement goals that are consistent with customer demands and enterprise strategy.
- ◆ Measure the current process and collect relevant data for future comparison.
- ◆ Analyze to verify relationship and causality of factors. Determine what the relationship is, and attempt to ensure that all factors have been considered.
- ◆ Improve or optimize the process based upon the analysis using techniques like Design of Experiments.
- ◆ Control to ensure that any variances are corrected before they result in defects. set up pilot runs to establish process capability, transition to production and thereafter continuously measure the process and institute control mechanisms.

DMIADV

Basic methodology consists of the following five steps:

- ◆ Define the goals of the design activity that are consistent with customer demands and enterprise strategy.
- ◆ Measure and identify CTQs (critical to qualities), product capabilities, production process capability, and risk assessments.
- ◆ Analyze to develop and design alternatives, create high-level design and evaluate design capability to select the best design.
- ◆ Design details, optimize the design, and plan for design verification. This phase may require simulations.
- ◆ Verify the design, set up pilot runs, implement production process and handover to process owners.

Some people have used dmaicr (Realize). Others contend that focusing on the financial gains realized through Six Sigma is counter-productive and that said financial gains are simply byproducts of a good process improvement.

- (c) Lean Accounting: What we now call lean manufacturing was developed by Toyota and other Japanese companies. Toyota executives claim that the famed Toyota Production System was inspired by what they learned during visits to the Ford Motor Company in the 1920s and developed by Toyota leaders such as Taiichi Ohno and consultant Shigeo Shingo after World War II. As pioneer American and European companies embraced lean manufacturing methods in the late 1980s, they discovered that lean thinking must be applied to every aspect of the company including the financial and management accounting processes.

Lean Accounting is the general term used for the changes required to a company's accounting, control, measurement, and management processes to support lean manufacturing and lean thinking. Most companies embarking on lean manufacturing soon find that their accounting processes and management methods are at odds with the lean changes they are making. The reason for this is that traditional accounting and management methods were designed to support traditional manufacturing; they are based upon mass production thinking. Lean manufacturing breaks the rules of mass production, and so the traditional accounting and management methods are (at best) unsuitable and usually actively hostile to the lean changes the company is making.

(d) **Meaning of Life Cycle Costing**

- (i) **Life Cycle Costing;** aims at cost ascertainment of a product, project etc. over its projected life.
- (ii) It is a system that tracks and accumulates the actual costs and revenues attributable to cost object (i.e.; product) from its inception to its abandonment.
- (iii) Sometimes the terms; cradle-to-grave costing and womb-to-tomb costing convey the meaning of fully capturing all costs associated with the product from its initial to final stages.

(e) **Margin of Safety:**

It is the sales point beyond the breakeven point. Margin of safety can be obtained by subtracting break even sales from Total sales. It is useful to determine financial soundness of business enterprise. If margin of safety is high, then the financial position of the enterprise is sound.

Margin of Safety = Total Sales – Break Even Sales → (1)

Total Sales = Break Even Sales + Margin of Safety Sales → (2)

→ Margin of safety can also be computed as follows:

Margin of Safety = Profit / P/V ratio → (3)

A relative measure to the margin of safety is its ratio to total sales.

→ Margin of safety ratio is the ratio of Margin of safety sales to Total sales.

Margin of safety ratio = [Margin of safety / Total sales] x 100 → (4)

→ Margin of safety ratio and Break even sales ratios are complements of each other.

Paper 15 – Strategic Cost Management and Decision Making

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Paper 15 - Strategic Cost Management and Decision Making

Time Allowed: 3 hours

Full Marks: 100

Section A

1. Answer the following and each question carries 2 marks. [10×2= 20]
- (i) If the first time you perform a job takes 60 minutes, how long will the eighth job take if you are on an 80% learning curve?
(a) 48 minutes (b) 30.72 minutes (c) 31 minutes (d) None of the above
- (ii) NPL Ltd. Uses a JIT system and back flush accounting. It does not use a raw material stock control account. During May, 8000 units were produced and sold. The standard cost per unit is ₹100; this includes materials of ₹45. During May, ₹4,80,000 of conversion costs were incurred.
The debit balance on cost of goods sold account for May was
(a) ₹8,00,000 (b) ₹8,40,000 (c) ₹8,80,000 (d) ₹9,20,000
- (iii) The single price of the selling product manufactured by a company is fixed at ₹1500 per unit. In the coming year, 500 units of the product are likely to be sold. If the total value of investments of the company is ₹15 lakhs and it has a target ROI of 15%, the target cost would be:
(a) ₹9.30 (b) ₹9.50 (c) ₹1050 (d) None of these
- (iv) Which of the following would decrease unit contribution margin the most?
(a) 15% decrease in selling price
(b) 15% increase in variable costs
(c) 15% decrease in variable costs
(d) 15% decrease in fixed costs
- (v) A company determines its selling price by making up variable costs 60%. In addition, the company uses frequent selling price mark down to stimulate sales. If the mark down average 10%, what is the company's contribution margin ratio?
(a) 30.6% (b) 44% (c) 86.4% (d) None of these
- (vi) Back flush costing is most likely to be used when
(a) Management desires sequential tracking of costs
(b) A Just-in-Time inventory philosophy has been adopted
(c) The company carries significant amount of inventory
(d) Actual production costs are debited to work-in-progress.
- (vii) A company produces two joint products, P and V. In a year, further processing costs beyond split-off point spent were ₹ 8,000 and ₹ 12,000 for 800 units of P and 400 units of V respectively. P sells at ₹ 25 and V sells at ₹ 50 per unit. A sum of ₹ 9,000 of joint cost were allocated to product P based on the net realization method. What were the total joint cost in the year?
(a) ₹ 20,000 (b) ₹ 10,000 (c) ₹15,000 (d) None of these
- (viii) When allocation service department cost to production departments, the method that does not consider different cost behavior patterns is the
(a) Step method (b) Reciprocal method
(c) Single rate-method (d) Dual rate-method

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(ix) ABC Ltd. has developed a new product just complete the manufacture of first four units of the product. The first unit took 2 hours to manufacture and the first four units together took 5.12 hours to produce. The Learning Curve rate is

- (a) 83.50% (b) 80.00% (c) 75.50% (d) None of (a), (b) or (c)

(x) No. Units Sold Per Day	500
Sales Price	₹25
Direct Materials Cost per unit	₹10
Other Factory Costs per Day	₹6000
No. Hours of bottleneck used per day	8

The Return per Factory Hour for product is

- (a) ₹925 (b) ₹938 (c) ₹883 (d) ₹750

Answer: 1

(i) (b) Three doublings from 1 to 2 to 4 to 8 implies $.8^3$. Therefore, we have
 $60 \times (.8)^3 = 60 \times .512 = 30.72$ minutes

(ii) (b)

	₹
Cost of goods sold	8,00,000
(Less) Material cost	(3,60,000)
Conversion cost allocated	4,40,000
Conversion cost incurred	4,80,000
Excess charged to cost of goods sold account	40,000

Total debit on cost of goods sold account = Rs. 8,00,000 + Rs. 40,000 = Rs. 8,40,000

(iii) (c) ₹ 1,050

Particulars	₹
Sales Revenue = $500 \times ₹ 1,500$	7,50,000
Less: ROI 15% on ₹ 15 Lakhs =	2,25,000
Target Cost	5,25,000

Target Cost per unit = Target cost / 500 = $5,25,000 / 500 = ₹ 1,050$.

(iv) (a) A given percentage change in unit sale price must have greater effect on contribution margin than any other factor affected by the same percentage change.

(v) (a)

When V (Var. cost) = 100, SP = 160, M.Cost/SP = $60/100$

SP after 10% mark down of SP = 144, Cost = $60 - 16 = 44$

Contribution Margin Ratio = $44/144 = 0.3056 = 30.6\%$

(vi) (b) Back flush costing is most likely to be used when Just-in-Time inventory philosophy has been adopted.

(vii) (c)

Products	P	V	Total
Units	800	400	
S.P. (₹)	25	50	
Sales (₹)	20,000	20,000	
Further costs (₹)	8,000	12,000	
NRV (₹)	12,000	8,000	20,000

Joint cost appropriated ₹ 9,000

Total Joint Cost = $(9,000/12,000) \times 20,000 = ₹ 15,000$

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(viii) (c)

The single rate method combines fixed and variable costs without regard to cost behaviour patterns. A and B do not exactly fit in with the given question as they can be used on a single or dual rate; and Ans D allows variable costs to be allocated on different basis from fixed costs.

(ix) (b) 80%

Let the learning rate be x .

Since the first unit took 2 hours, average time for the first two units = $2x$ and

The average time for the first 4 units = $2x \times x = 2x^2$.

$$2x^2 = 5.12 \div 4 = 1.28.$$

$$\text{Or, } x = \sqrt{1.28 \div 2} = \sqrt{0.64}$$

$$= 0.80 \text{ i.e. } 80\%.$$

(x) (c)

	Working	Amount (₹)
Sales per Day	(500 x 25)	12,500
Direct Materials	(500 x 10)	-5,000
		7,500
Usage of bottleneck hours per day		8
Return per Factory Hour	(7,500/8)	938

Section B

Answer any five questions from Question No. 2 to 8

Each question carries 16 marks. [5 × 16 = 80]

2 (a) K & Co. manufactures and sells 15,000 units of a product. The Full Cost per unit is ₹200. The Company has fixed its price so as to earn a 20% Return on an Investment of ₹18,00,000.

Required:

1. Calculate the Selling Price per unit from the above. Also, calculate the Mark-up % on the Full Cost per unit.
2. If the Selling Price as calculated above represents a Mark-up % of 40% on Variable cost per unit, calculate the Variable cost per unit.
3. Calculate the Company's Income if it had increased the Selling Price to ₹230. At this price, the company would have sold 13,500 units. Should the Company have increased the Selling price to ₹460?
4. In response to competitive pressures, the Company must reduce the price to ₹210 next year, in order to achieve sales of 15,000 units. The Company also plans to reduce its investment to ₹16,50,000. If a 20% Return on Investment should be maintained, what is the Target Cost per unit for the next year?

[8]

2 (b) The ORC Club of a large public sector undertaking has a cinema theater for the exclusive use of themselves and their families. It is a bit difficult to get good motion pictures for show and so pictures are booked as and when available.

The theater has been showing the picture 'Blood Bath' for the past two weeks. This picture, which is strictly for adults only has been a great hit and the manager of the theater is convinced that the attendance will continue to be above normal for another two weeks, if the show of 'Blood Bath' is extended. However, another popular movie, eagerly looked forward to by both adults and children alike, 'Appu on the Airbus' is booked for next two weeks. Even if 'Blood Bath' is extended the theater has to pay the regular rental on 'Appu on the Airbus' as well.

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Normal attendance at theater is 2,000 patrons per week, approximately one fourth of whom are children under the age of 12. Attendance of 'Blood Bath' has been 50% greater than the normal total. The manager believes that this would taper off during the second two weeks, 25% below that of the first two weeks, during the third week and 33 1/3 % below that of the first two weeks, during the fourth week. Attendance for 'Appu on the Airbus' would be expected to be normal throughout its run regardless of the duration.

All runs at the theater are shown at a regular price of ₹2 for adults and ₹1.20 for children fewer than 12. The rental charge for 'Blood Bath' is ₹ 900 for one week or ₹1,500 for two weeks. For 'Appu on the Airbus' it is ₹ 750 for one week or ₹ 1,200 for two weeks. All other operating costs are fixed - ₹ 4,200 per week, except for the cost of potato wafers and cakes, which average 60% of their selling price, sales of potato wafers and cakes regularly average ₹ 1.20 per patron, regardless of age.

The Manager can arrange to show 'Blood Bath' for one week and 'Appu on the Airbus' for the following week or he can extend the show of 'Blood Bath' for two weeks or else he can show 'Appu on the Airbus' for two weeks as originally booked.

Show by computation, the most profitable course of action he has to pursue. [8]

Answer: 2(a)

- (i) Computation of Selling Price and mark - up % on the Full Cost per unit

Target Sale Price per unit = Full Cost + Target Profit = ₹200 + 24	₹224
So, Mark - up price is	12%

- (ii) Computation of Variable Cost per unit:

Above sale Price ₹224 = VC + 40% thereon, i.e. 140% on VC. So, Var. Cost = (224/140%)
= ₹160

- (iii) Calculate the company's Income if selling price are increased

Present Contribution at 15,000 units = (₹224 - ₹ 160) × 15,000 units = ₹ 9, 60, 000

Revised Contribution at 13,500 units = (₹230 - ₹160) × 13,500 units = ₹ 9. 45. 000
₹15. 000

Hence, Increase in Sale Price is not beneficial, due to reduction in Contribution by ₹ 15,000,

- (iv) Calculate the company's Target Profit if selling price are reduced and Target cost if investment is ₹ 16,50,000

Target Profit for next year = (16, 50, 000 x 20%)/ 13,500 = ₹24

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Answer: 2(b)

Statement showing evaluation of alternatives

		Blood bath	Blood bath & Appu on the airbus	Appu on the airbus
		₹	₹	₹
No. of spectators				
Adults:				
Third week	3,000 x 75%	2,250.00	2,250.00	1,500.00
fourth week	3,000 x 2/3	2,000.00	1,500.00	1,500.00
		4,250.00	3,750.00	3,000.00
Children:				
Third week				500.00
fourth week			500.00	500.00
			500.00	1,000.00
Total spectators:		4,250.00	4,250.00	4,000.00
Revenue:				
By sale of tickets		8,500.00	8,100.00	7,200.00
			(3,000 x 2 + 1000 x 1.2)	
Add : contribution from snacks		2,040.00	2,040.00	1,920.00
		10,540.00	10,140.00	9,120.00
Less : Incremental cost		1,500.00	900.00	
		9,040.00	9,240.00	9,120.00

It is found that the net revenue is more at the option of running blood bath and Appu on the Air bus a week each, it must be chosen.

3. (a) SPOT Ltd. manufactures and sells as single product X whose price is ₹40 per unit and the variable cost is ₹16 per unit.
- (i) If the fixed costs for this year are ₹4,80,000 and the annual sales are at 60% margin of safety, calculate the rate of net return on sales, assuming an income tax level of 40%.
- (ii) For the next year, it is proposed to add another product line Y whose selling price would be ₹50 per unit and the variable cost ₹10 per unit. The total fixed costs are estimated at ₹6,66,600. The sales mix of X:Y would be 7:3. At what level of sales next year, would SPOT Ltd. break even? Give separately for both X and Y the break even sales in rupees and quantities. [10]
3. (b) Company A can manufacture 1,000 units bicycles in a month for a fixed cost of ₹3,00,000. The variable cost is ₹500 per unit. Its current demand is 600 units which it sales at ₹1,000 per unit. It is approached by Company Z for an order of 200 units of ₹700 per unit. Should the Company A accept the order? Give your views as a CMA. [6]

Answer: 3(a)

(i) Statement showing computation of profit on X:

SP = 40
VC = 16
C = 24

$$P/V \text{ Ratio} = \frac{C}{S} \times 100 = \frac{24}{40} \times 100 = 60\%$$

$$BES = \frac{FC}{P/V \text{ Ratio}} = \frac{4,80,000}{60\%} = ₹8,00,000$$

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Let x be the total sales

$$0.6x = x - 8,00,000$$

$$\Rightarrow x = 20,00,000$$

$$\Rightarrow \text{No. of units} = \frac{x}{40} = 50,000 \text{ units}$$

	₹	
(I) Sales (50,000 x 40)	=	20,00,000
(II) Variable Cost	=	8,00,000
(III) Contribution	=	12,00,000
(IV) Fixed Cost	=	4,80,000
(V) Profit	=	7,20,000
(VI) Tax (7,20,000 x 40%)	=	2,88,000
(VII) Net Profit	=	4,32,000

(ii) Let the break - even units of products X & Y be 7a & 3a respectively.

In order to break even the contribution must be equal to FC

$$\rightarrow (7a \times 24) + (3a \times 40) = 6,66,000$$

$$\rightarrow a = 2314.58$$

$$\text{BES of X} = 7a = 16,202.08 \times \text{SP} = 648080$$

$$Y = 3a = 6943.75 \times \text{SP} = 347200.$$

(b) The CMA will go ahead with the order because in his opinion the special order will yield ₹200 per unit. He knows that the fixed cost ₹3,00,000 is irrelevant because it is going to be incurred regardless of whether the order is accepted or not. Effectively, the additional cost which Company A would have to incur is the variable cost of ₹500 per unit. Hence, the order will yield ₹200 per unit (i.e. ₹700 - ₹500 of variable cost).

4. (a) **AYX Ltd. manufactures three products. The material cost, selling price and bottleneck resource details per unit are as follows:**

Particulars	Product X	Product Y	Product Z
Selling price (₹)	66	75	90
Material and other variable cost (₹)	24	30	40
Bottleneck resource time (minutes)	15	15	20

Budgeted factory costs for the period are ₹2,21,600. The bottleneck resources time available is 75,120 minutes per period.

Required:

(i) Company adopted throughput accounting and products are ranked according to 'product return per minute'. Select the highest rank product.

(ii) Calculate throughput accounting ratio and comment on it.

[8]

4 (b) **XYZ Ltd. follows JIT system. It had following transactions in May, 2017:**

(i) Raw materials were purchased for ₹2,00,000.

(ii) Direct labour cost incurred ₹36,000

(iii) Actual overhead costs ₹3,00,000

(iv) Conversion costs applied ₹3,16,000

All materials, that were purchased, were placed into production and the production was also completed and sold during the month. The difference between actual and applied costs is computed.

You are required to pass Backflush journal entries.

[8]

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Answer: 4(a)

(i) Calculation of Rank according to product return per minute (₹)

Particulars	X	Y	Z
Selling price	66	75	90
Less: Variable cost	24	30	40
Throughput contribution (a)	42	45	50
Minutes per unit (b)	15	15	20
Contribution per minute (a) ÷ (b)	2.8	3	2.5
Ranking	II	I	III

(ii) Calculation of Throughput Accounting ratio

Particulars	X	Y	Z
Factory cost per minute (₹ 2,21,600/75,120 minutes) (₹)	2.95	2.95	2.95
TA ratio (Contribution per minute/Cost per minute)	0.95	1.02	0.85
Ranking	II	I	III

Analysis - Product Y yields more contribution compared to average factory contribution per minute, whereas X and Z yield less. J.

Answer: 4(b)

**In the books of Dandia Ltd.
Journal Entries (Backflush)**

Particulars	Debit (₹)	Credit (₹)
Raw Material in Process A/c.....Dr.	2,00,000	
To, Accounts Payable		2,00,000
(being purchase of raw materials)		
Conversion Cost Control A/c.....Dr.	3,36,000	
To, Direct wages A/c		36,000
To, Accounts Payable		3,00,000
(being overhead cost incurred)		
Finished Goods A/c.....Dr.	5,16,000	
To, Raw Material in Process A/c		2,00,000
To, WIP A/c		3,16,000
(Being completion of goods)		
Cost of Goods Sold A/c.....Dr.	5,16,000	
To, Finished Goods		5,16,000
(being cost of finished goods sold transferred)		
Cost of Goods Sold A/c.....Dr.	20,000	
To, Overhead Control A/c		20,000
(being variance is recognized)		

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5. (a) A Company with two manufacturing division is organized on profit centre basis. Division 'A' is the only source for the supply of a component that is used in Division B in the manufacture of a product KPO. One such part is used each unit of the product KPO. As the demand for the product is not steady. Division B can obtain order for increased quantities only by spending more on sales promotion and by reducing the selling prices. The manager of Division B has accordingly prepared the following forecast of sales quantities and selling prices.

Sales units per day	Average Selling price per unit of KPO (₹)
1,000	5.25
2,000	3.98
3,000	3.30
4,000	2.78
5,000	2.40
6,000	2.01

The manufacturing cost of KPO in Division B is ₹3,750 first 1,000 units and ₹750 per 1,000 units in excess of 1,000 units.

Division A incurs a total cost of ₹1,500 per day for an output to 1,000 components and the total costs will increase by ₹900 per day for every additional 1,000 components manufactured. The Manager of Division A states that the operating results of Division will be optimised if the transfer price of the component is set at ₹1.20 per unit and he has accordingly set the aforesaid transfer price for his supplies of the component to Division A.

You are required:

- (i) Prepare a schedule showing the profitability at each level of output for Division A and Division B
 - (ii) Find the profitability of the company as a whole at the output level which (A) Division A's net profit is maximum. (B) Division B's net profit is maximum.
 - (iii) If the company is not organised on profit centre basis, what level of output will be chosen to yield the maximum profit. [8]
5. (b) XYZ Ltd. makes three main products, using broadly the same production methods and equipment for each. A conventional product costing system is used at present, although and Activity Based Costing (ABC) system is being considered. Details of the three products, for typical period are:

	Labour Hours per unit	Machine Hours per unit	Material per unit	Volumes unit
Product X	½	1 ½	₹20	750
Product Y	1 ½	1	₹12	1,250
Product Z	1	3	₹25	7,000

Direct labour costs ₹6 per hour and production overheads are absorbed on a machine hour basis. The rate for the period is ₹28 per machine hour.

You are required:

- (i) to calculate the cost per unit for each product using conventional methods. Further analysis shows that the total of production overheads can be divided as follows

	%
Costs relating to set-ups	35
Costs relating machinery	20
Costs relating materials handling	15
Costs relating to inspection	<u>30</u>
Total production overhead	<u>100%</u>

The following activity volumes are associated with the product line for the period as a whole. Total activities for the period

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	Number of Set- ups	Number of movements of materials	Number of Inspections
Product X	75	1	150
Product Y	115	2	180
Product Z	480	8	670
	670	12	1,000

You are required:

- (ii) To calculate the cost per unit for each product using ABC principles; c) to comment on the reasons for any differences in the costs in your answers to (a) and (b). [8]

Answer: 5 (a)

- (i) Statement showing profit of division A:

Sale per day(units)	Sale value	Cost	Profit/(loss)
	₹	₹	₹
1000	1200	1500	(300)
2000	2400	2400	-
3000	3600	3300	300
4000	4800	4200	600
5000	6000	5100	900
6000	7200	6000	1200

Profit of division B:

No of units	Sales	Transfer price	Other manufacturing cost	Total cost	Profit/(loss)
	₹	₹	₹	₹	₹
1000	5250	1200	3750	4950	300
2000	7960	2400	4500	6900	1060
3000	9900	3600	5250	8850	1050
4000	11120	4800	6000	10800	320
5000	12000	6000	6750	12750	(750)
6000	12060	7200	7500	14700	(2640)

- (ii) Profitability of the company at the output level where division A's net profit is maximum:

	₹
Profit of division A at 6000units	1200
Profit of division B at 6000units	(2640)
Profit / (loss)	(1440)
Division B's net profit is maximum:	
Profit of division A at 2000 units	-
Profit of division B at 2000units	1060
	1060

- (iii) When the company is not organized on profit centre basis

Profit at different levels of output

Units	Division A	Division B	Total
	₹	₹	₹
1000	(300)	300	—
2000	—	1060	1060
3000	300	1050	1350
4000	600	320	920
5000	900	(750)	150
6000	1200	(2640)	(1440)

Best output level is 3000 units

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Answer: 5(b)

(i) Computation of cost per unit using Conventional Methods:

Total overheads	₹
X = 750 x 1.5 x 28=	31,500
Y = 1250 x 1 x 28=	35,000
Z = 7000 x 3 x 28=	<u>5,88,000</u>
	<u>6,54,500</u>

Computation of Cost

	X	Y	Z
	₹	₹	₹
Materials	20	12	25
Labour	3	9	6
Overheads	42	28	84
Factory Cost	65	49	115

(ii) Under ABC Costing

	Setup Cost	Machine Cost	Machine Handling Cost	Inspection Expenses	Total
Costs(₹)	2,29,075	1,30,900	98,175	1,96,350	6,54,500
Cost Driver	No. of setups	Machine hours	No. of Moment of Materials	No. of Inspections	
Cost driver rates(₹)	341.90 (229075/670)	5.6 (130900/23375)	818.125 (98,175/120)	196.35 (196350/1000)	

Cost per unit under ABC costing

	X		Y		Z	
	₹	₹	₹	₹	₹	₹
Materials		20.00		12.00		25.00
Labour		3.00		9.00		6.00
Overheads						
Setup Cost	34.19		31.45		23.44	
Machine cost	8.40		5.60		16.80	
Machine Handling Cost	13.09		13.74		10.17	
Inspection Cost	39.27	94.95	28.27	79.06	18.79	69.20
Total Cost		117.95		100.06		100.20

6. (a) The ABC Pvt. Ltd., which has a satisfactory preventive maintenances system in its plant has installed a new Hot Air Generator based on electricity instead of fuel oil for drying its finished products. The Hot Air Generator required periodic shutdown maintenance. If the shutdown is scheduled yearly, the cost of maintenance will be as under:

Maintenance Cost	Probability
₹15,000	0.3
₹20,000	0.4
₹25,000	0.3

The costs are expected to be almost linear, i.e., if the shutdown is scheduled twice a year the maintenance cost will be double.

There is no previous experience regarding the time taken between breakdowns. Costs associated with breakdown will vary depending upon the periodicity of maintenance. The probability distribution of breakdown cost is estimated as under:

Breakdown Costs per annum	Shutdown once a year	Shutdown twice a year
₹75,000	0.2	0.5
₹80,000	0.5	0.3
₹1,00,000	0.3	0.2

Simulate the total costs – maintenance and breakdown costs – and recommend whether shutdown overhauling should be resorted to once a year or twice a year? [8]

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6. (b) A captain of a cricket team has to allot five middle batting positions to five batsmen. The average runs scored by each batsman at these positions are as follows:

Batsmen	Batting Position					
		III	IV	V	VI	VII
A		40	40	35	25	50
B		42	30	16	25	27
C		50	48	40	60	50
D		20	19	20	18	25
E		58	60	59	55	53

Make the assignment so that the expected total average runs scored by these batsmen are maximum.

[8]

Answer: 6(a)

Assigning random numbers to maintenance cost once a year basis:

Cost (₹)	Probability	Random Numbers (R.N.)
15,000	0.30	00-29
20,000	0.40	30-69
25,000	0.30	70-99

Assigning random numbers to breakdown costs when overhauling is once a year basis:

Cost (₹)	Probability	Random Numbers (R.N.)
75,000	0.20	00-19
80,000	0.50	20-69
1,00,000	0.30	70-99

The total costs will be as under:

Year	R.N	Maintenance Cost	R.N.	Breakdown Cost	Total
1	27	15,000	03	75,000	90,000
2	44	20,000	50	80,000	1,00,000
3	22	15,000	73	1,00,000	1,20,000
4	32	20,000	87	1,00,000	1,20,000
5	97	25,000	59	80,000	1,05,000
Average Annual Cost					1,06,000

Assigning random numbers to maintenance costs, on twice a year basis:

Cost	Probability	Random Numbers (RN)
30,000	0.30	00-29
40,000	0.40	30-69
50,000	0.30	70-99

Assigning random numbers to breakdown costs

Cost	Probability	Random Numbers (RN)
75,000	0.50	00-49
80,000	0.30	50-69
1,00,000	0.20	80-99

The total costs will be as under:

Year	R.N	Maintenance Cost	R.N.	Breakdown Cost	Total
1	42	40,000	54	80,000	1,20,000
2	04	30,000	65	80,000	1,10,000
3	82	50,000	49	75,000	1,25,000
4	38	40,000	03	75,000	1,15,000
5	91	50,000	56	80,000	1,30,000
Average Annual Cost					1,06,000

[Note R.Ns. are taken from table]

Recommendation: From the above working it may be seen that shutdown maintenance/overhauling once a year will be more economical. The average annual cost will only be ₹1.06 lakhs as against 1.20 lakhs when shutdown is twice a year.

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Answer: 6(b)

	III	IV	V	VI	VII	Loss Matrix				
A	40	40	35	25	50	20	20	25	35	10
B	42	30	16	25	27	18	30	44	35	33
C	50	48	40	60	50	10	12	20	0	10
D	20	19	20	18	25	40	41	40	42	35
E	58	60	59	55	53	2	0	1	5	7

Row Operation

M_3	10	14	25	0
10	10	14	25	0
0	12	25	17	15
10	12	19	0	10
5	6	4	7	0
2	0	0	5	7

Column Operation

10	10	15	25	0
0	12	26	17	15
10	12	20	0	10
5	6	5	7	0
2	0	1	5	7

Improved Matrix

10	6	10	25	0
0	8	21	17	15
10	8	15	0	10
5	2	0	7	0
6	0	0	9	11

Maximum Average Runs

A	→	VII	-	50
B	→	III	-	42
C	→	VI	-	60
D	→	V	-	20

7.(a) A Company manufactures 3 products which are processed through 3 different production stages. The time required to manufacture one unit of each of the three products and the daily capacity of the stages are given in the following table:

State	Time/unit in minutes			Stage capacity (minutes)
	Product	Product 2	Product 3	
1	1	2	1	430
2	3	-	2	460
3	1	4	-	420
Profit/unit	₹3	₹2	₹5	

- (i) Set the data in a simplex table.
 (ii) Find the table for optimum solution

[8]

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7. (b) The following table gives data on normal time & cost and crash time & cost for a project.

Activity	Normal		Crash	
	Time (days)	Cost (₹)	Time (days)	Cost (₹)
1 - 2	6	600	4	1,000
1 - 3	4	600	2	2,000
2 - 4	5	500	3	1,500
2 - 5	3	450	1	650
3 - 4	6	900	4	2,000
4 - 6	8	800	4	3,000
5 - 6	4	400	2	1,000
6 - 7	3	450	2	800

The direct cost per day is ₹100

- (i) Draw the network and identify the critical path [8]
 (ii) What are the normal project duration and associated cost?

Answer: 7(a)

Let x_1 be the no. of units of product 1

Let x_2 be the no. of units of product 2

Let x_3 be the no. of units of product 3

Objective function: $\text{Max } Z = 3x_1 + 2x_2 + 5x_3$

Subject to constraints:

$$x_1 + 2x_2 + x_3 \leq 430$$

$$3x_1 + 2x_3 \leq 460$$

$$x_1 + 4x_2 \leq 420$$

$$\text{And } x_1, x_2, x_3 \geq 0$$

$$x_1 + 2x_2 + x_3 + S_1 = 430$$

$$3x_1 + 2x_3 + S_2 = 460$$

$$x_1 + 4x_2 + S_3 = 420$$

$$\text{Max } Z = 3x_1 + 2x_2 + 5x_3 + 0.S_1 + 0.S_2 + 0.S_3$$

$$\therefore x_1 = 0$$

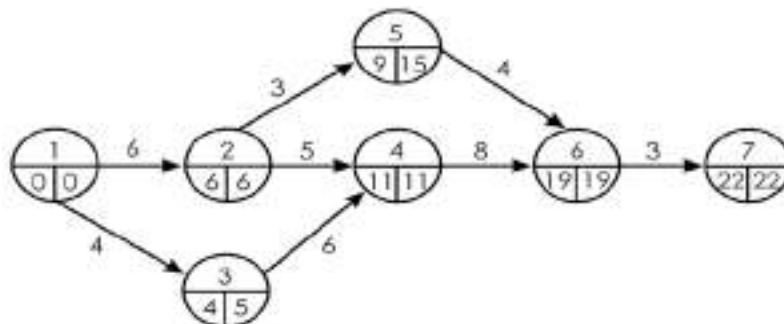
$$x_2 = 100$$

$$x_3 = 230$$

$$Z = 1350$$

Answer: 7(b)

- (i) The network for normal activity times indicates a project time of 22 weeks with the critical path 1-2-4-6-7.



- (ii) Normal project duration is 22 weeks and the associated cost is as follows:

Total cost = Direct normal cost + Indirect cost for 22 weeks.

$$= 4,700 + 100 \times 22 = ₹ 6,900.$$

8. Write Short note (any four)

[4×4 =16]

- (a) Advantages of Activity Based Costing
- (b) Lean Accounting
- (c) Vogel's Approximation Method (VAM)
- (d) Steps to be followed to increase the throughput
- (e) Benefits of Inter-firm Comparison

Answer:

8 (a) Advantages of Activity Based Costing

- (i) It provides more accurate product costing information by reducing arbitrary cost allocations.
- (ii) It improves the quality of information available for decision making by answering the questions such as what activities and events are driving cost and where efforts should be made to control cost?
- (iii) It is easiest way to allocate overhead in the product.
- (iv) It helps to identify the activities that can be eliminated.
- (v) It links up cause and effect relationship.
- (vi) A BC helps to identify the value added activities (that increase the customer's satisfaction) and non- value added activities (that creates the problems in customer's satisfaction)
- (vii) ABC translates cost in to a language that people can understand and that can be linked up to business activities.

(b) Lean Accounting

Lean Accounting is the general term used for the changes required to a company's accounting, control, measurement, and management processes to support lean manufacturing and lean thinking. Most companies embarking on lean manufacturing soon find that their accounting processes and management methods are at odds with the lean changes they are making. Lean manufacturing breaks the rules of mass production, and so the traditional accounting and management methods are (at best) unsuitable and usually actively hostile to the lean changes the company is making.

Lean Accounting is itself lean, low-waste, and visual, and frees up finance and accounting people's time so they can become actively involved in lean change instead of being merely "bean counters." Companies using Lean Accounting have better information for decision-making, have simple and timely reports that are clearly understood by everyone in the company, they understand the true financial impact of lean changes, they focus the business around the value created for the customers, and Lean Accounting actively drives the lean transformation. This helps the company to grow, to add more value for the customers, and to increase cash flow and value for the stock-holders and owners.

(c) Vogel's Approximation Method (VAM)

This method is preferred over the other two methods because the initial basic feasible solution obtained is either optimum or very close to the optimum solution. Therefore, the amount of time required to arrive at the optimum solution is greatly reduced. Various steps of this method are summarized as under:

Step 1:

Compute a penalty for each row and column in the transportation table. The penalty for a given row and column is merely the difference between the smallest cost and the next smallest cost in that particular row or column.

Step 2:

Identify the row or column with the largest penalty. In this identified row or column, choose the cell which has the smallest cost and allocate the maximum possible quantity to the lowest cost cell in that row or column so as to exhaust either the supply at a particular source or satisfy demand at a warehouse.

If a tie occurs in the penalties, select that row/column which has minimum cost. If there is a tie in the minimum cost also, select that row/column which will have maximum possible assignments. It will considerably reduce computational work.

Step 3:

Reduce the row supply or the column demand by the amount assigned to the cell.

Step 4:

If the row supply is now zero, eliminate the row, if the column demand is now zero, eliminate the column, if both the row supply and the column demand are zero, eliminate both the row and column.

Step 5:

Recompute the row and column difference for the reduced transportation table, omitting rows or columns crossed out in the preceding step.

Step 6:

Repeat the above procedure until the entire supply at factories are exhausted to satisfy demand at different warehouses.

(d) Steps to be followed to increase the throughput

The theory of constraints is applied within an organisation by following what are called 'the five focusing steps.' These are a tool that Goldratt developed to help organisations deal with constraints, otherwise known as bottlenecks, within the system as a whole (rather than any discrete unit within the organisation.) The steps are as follows:

- (a) Identify the bottle neck in the system i.e., identification of the limiting factor of the production (or) process such as installing capacity or hours etc.
- (b) Decide how to exploit the systems bottleneck that means bottleneck resource should be actively and effectively used as much as possible to produce as many goods as possible.
- (c) Subordinate everything else to the decision made in step (b). The production capacity of the bottleneck resource should determined production schedule.
- (d) Augment the capacity of the bottleneck resource with the minimum capital input.
- (e) Identify the new bottlenecks in the process and repeat the same above steps to address the bottlenecks.

(e) Benefits of Inter-firm Comparison

- (a) Inter-firm Comparison makes the management of the organisation aware of strengths and weakness in relation to other organisations in same industry.
- (b) As only the significant items are reported to the Management time and efforts are not unnecessary wasted.
- (c) The management is able to keep up to data information of the trends and ratios and it becomes easier for them to take the necessary steps for improvement.
- (d) It develops cost consciousness among the members of the industry.
- (e) Information about the organisation is made available freely without the fear of disclosure of confidential data to outside market or public.
- (f) Specialized knowledge and experience of professionally run and successful organisations are made available to smaller units who can take the advantages it may be possible for them to have such an infrastructure.
- (g) The industry as a whole benefits from the process due to increased productivity, standardization of products, elimination of unfair comparison and the trade practices.
- (h) Reliable and collective data enhance the organising power in deal in with various authorities and Government bodies.
- (i) Inter firm comparison assists in a big way in identifying industry sickness and gives a timely warning so that effective remedial steps can be taken to save the organisation.

Paper 15 – Strategic Cost Management and Decision Making

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Paper 15 - Strategic Cost Management and Decision Making

Time Allowed: 3 hours

Full Marks: 100

Section A

1. Answer the following and each question carries 2 marks. [10×2= 20]

- (i) B Ltd. Has earned net profit of ₹ 1 lakh, and its overall P/V ratio and margin of safety are 25% and 50% respectively. What is the total fixed cost of the company?
(a) ₹2,50,000 (b) ₹2,00,000 (c) ₹ 3,00,000 (d) ₹ 1,00,000
- (ii) A company determines its selling price by marking up variable costs 60%. In addition, the company uses frequent selling price mark down to stimulate sales. If the mark down average 10%, what is the company's contribution margin ratio?
(a) 30.6% (b) 44% (c) 86.4% (d) None of these
- (iii) If the direct labour cost is reduced by 20% with every doubling of output, what will be the cost of labour for the sixteenth unit produced as an approximate percentage of the cost of the first unit produced?
(a) 51.2% (b) 40.96% (c) 62% (d) None of these
- (iv) A company has the capacity of production of 80,000 units and presently sells 20,000 units at ₹ 100 each. The demand is sensitive to selling price and it has been observed that with every reduction of ₹10 in selling price the demand is doubled. What should be the target cost at full capacity if profit margin on sale is taken as 25%?
(a) ₹75 (b) ₹ 90 (c) ₹ 60 (d) ₹ 25
- (v) A company has 2,000 units of an obsolete item which are carried in inventory at the original purchase price of ₹ 30,000. If these items are reworked for ₹10,000, they can be sold for ₹18,000. Alternatively, they can be sold as scrap for ₹ 3,000 in the market. In a decision model used to analyze the reworking proposal, the opportunity cost should be taken as:
(a) ₹ 8,000 (b) ₹ 12,000 (c) ₹ 3,000 (d) ₹10,000
- (vi) A company manufactures two products using common material handling facility. The total budgeted material handling cost is ₹60,000. The other details are:

	Product X	Product Y
Number of units produced	30	30
Material moves per product line	5	15
Direct labour hour per unit	200	200

Under activity based costing system the material handling cost to be allocated to product X (per unit) would be:

- (a) ₹1,000 (b) ₹ 500 (c) ₹ 1,500 (d) ₹2,500

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(vii) The total cost of manufacturing a component is as under at a capacity of 50,000 units of production:

	₹
Prime cost	10.00
Variable overheads	2.40
Fixed Overheads	4.00
	16.40

The selling price is ₹ 21 per unit. The variable selling and administrative expenses is 60 paise per component extra. During the next quarter only 10,000 units can be produced and sold. Management plans to shut down the plant estimating that the fixed manufacturing cost can be reduced to ₹ 74,000 per quarter. When the plant is operating, the fixed overheads are incurred at a uniform rate throughout the year. Additional costs of plant shutdown for the quarter are estimated at ₹ 14,000. The shut down pint for the quarter in units of product will be:

- (a) ₹ 25,000 (b) ₹14,000 (c) ₹11,000 (d) ₹ 20,000

(viii) If the time taken to produce the first unit of a product is 4000 hrs, what will be the total time taken to produce the 5th to 8th unit of the product, when a 90% learning curve applies?

- (a) 10,500 hours (b) 12,968 hours (c) 9,560 hours (d) 10,368 hours

(ix) A company operates throughput accounting system. The details of product X per unit are as under.

Selling Price	₹50
Material Cost	₹20
Conversion cost	₹15
Time on bottleneck resources	10 minutes

The return per hour for product X is:

- (a) ₹ 210 (b) ₹300 (c) ₹ 180 (d) ₹90

(x) The information relating to the direct material cost of a company is as under:

	₹
Standard price per unit	3.60
Actual quantity purchased in units	1,600
Standard quantity allowed for actual production in units	1.450
Material price variance on purchase (favourable)	240

What is the actual purchase price per unit?

- (a) ₹ 3.45 (b) ₹ 3.75 (c) ₹ 3.20 (d) ₹ 3.25

Answer: 1

(i) (d)

MS=Profit/PV Ratio = ₹4 Lakh: MS=50%; BE Sales = (1-0.50) = 0.50

Hence BES = ₹4 lakh

Fixed Cost 25% of ₹4,00,000 = ₹1,00,000

(ii) (a)

When V (Var. cost) = 100, SP = 160, M.Cost/SP = 60/100

SP after 10% mark down of SP = 144, Cost = 60-16=44

Contribution Margin Ratio = 44/144=0.3056=30.6%

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(iii) (b)

1st	100%
2nd	80% x 100%
4th	80% of 2nd
8th	80% of 4th
16th	80% of 8th = 0.80 x 0.80 x 0.80 x 0.80 = 40.96%

Say, 41% of the time required for the 1st unit.

(iv) (c)

Demand	Price (₹)
20,000	100
40,000	90
80,000	80

Target Cost = ₹80 - (25% of 80) = ₹80 - 20 = ₹60

(v) (c) Original price is not relevant

Rework income	₹18,000	
Deduct cost of rework	10,000	
Net inflow	₹8,000	It is relevant

The other alternative relevant cash flow is from sale as scrap = ₹3,000. Hence, the opportunity cost is ₹3,000.

(vi) (b)

Total moves in material handling = 5+15=20

Percentage move for Product A = 5/20=25%

Material handling cost to be allocated to Product A = ₹60,000/25%=Rs.15,000

i.e., ₹15,000/30= ₹500 per unit.

(vii) (b)

Contribution per unit of component	₹	₹
Variable Prime cost	10.00	
Variable overhead	2.40	
Selling/Administrative expenses	0.60	13.00
Contribution		Rs. 8.00

Avoidable fixed cost per quarter

= total fixed cost-(unavoidable fixed cost + additional shut down cost)

= (50,000 x ₹4) - (₹74,000 + ₹14,000) = ₹1,12,000.

The required shut down point for the quarter = ₹1,12,000 / ₹8 = 14,000 units.

(viii) (d)

Units	Average Time (hours)	Total Time (hours)
1	4000	4000
2	3600	7200
4	3240	12960
8	2916	23328

Total time for 5th to 8 units = 23328 - 12960 = 10368 hrs.

(ix)(c) (Selling Price - Material Cost)/ Time of bottleneck resource

= [(₹50 - ₹20)/10 minutes] x 60 = ₹180 per hour.

(x)(a)

Actual quantity bought x standard price

= 1,600 x ₹3.60 = Rs. 5,760

Deduct favorable price variance 240

Actual quantity x actual price = 5,520

Or, 1,600 x actual price = ₹5,520 So,

Actual price ₹5,520/1,600 = ₹3.45

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Section B

Answer any five questions from Question No. 2 to 8
Each question carries 16 marks. [5 × 16 = 80]

2. (a) A company is considering the purchase of a machine for ₹3,50,000. It feels quite confident that it can sell the goods produced by the machine as to yield an annual cash surplus of ₹1,00,000. There is however me uncertainty as to the machine working life. A recently publish Trade Association Survey shows that members of the Association have between them owned 250 of these machines and have found the lives of the machines vary as under:

No. of year of machine life	3	4	5	6	7	Total
No. of machines having given life	20	50	100	70	10	250

Assuming discount rate of 10% the net present value for each different machine life is follows:

Machine life	3	4	5	6	7
NPV (₹)	(1,01,000)	(33,000)	29,000	86,000	1,37,000

You required to advice whether the company should purchase a machine or not. [6]

- 2 (b) A manufacturing company currently operating at 80% capacity has received an export order from Middle East, which will utilise 40% of the capacity of the factory. The order has to be either taken in full and executed at 10% below the current domestic prices or rejected totally.

The current sales and cost data are given below.

Sales	₹16.00 lakhs.
Direct Material	₹ 5.80 lakhs.
Direct Labour	₹ 2.40 lakhs.
Variable Overheads	₹ 0.60 lakhs.
Fixed Overheads	₹ 5.20 lakhs.

The following alternatives are available to the management:

- Continue with domestic sales and reject the export order.
- Accept the export order and allow the domestic market to starve to the extent of excess of demand.
- Increase capacity so as to accept the export order and maintain the domestic demand by
 - Purchasing additional plant and increasing 10% capacity and there by increasing fixed overheads by ₹65,000 and
 - Working overtime at one and half time the normal rate to meet balance of the required capacity.

You are required to evaluate each of the above alternatives and suggest the best one.

[10]

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Answer: 2(a)

Computation of NPV of an asset considering the probability of life of machine.

Year	Probability (a) ₹	NPV (b) ₹	Expected value (a × b)
3	20/250	(1,01,000)	(8,080)
4	50/250	(33,000)	(6,600)
5	100/250	29,000	11,600
6	70/250	86,000	24,080
7	10/250	1,37,000	5,480
			26,480

So, Assets should be purchased.

Answer: 2(b)

Statement showing computation of profit at different alternatives:

(In Lakhs)

	Particulars	I	II	III
		Present Sales 80%	40% - Foreign 60% - Domestic	40% - Foreign 80% - Domestic
I.	Sales(₹)	16	19.2 (7.2+12)	23.2 (7.2+16)
II.	Variable Cost (₹)			
	Direct Material (₹)	5.8	7.25	8.70
	Direct Labour (₹)	2.4	3.00	3.60
	Variable Overheads (₹)	0.6	0.75	0.90
	Overtime Premium (₹)	----	----	0.15
		8.80	11.00	13.35
III.	Contribution (₹)	7.20	8.20	9.85
IV.	Fixed Cost(₹)	5.20	5.20	5.85 (5.20+0.65)
V.	Profit(₹)	2.00	3.00	4.00

From the above computation, it was found that the profit is more at the III alternative i.e. accepting the foreign order fully and maintaining the present domestic sales, it is the best alternative to be suggested.

3 (a) A Company manufacturing a highly successful line of cosmetics intends to diversify the product line to achieve fuller utilization of its plant capacity. As a result of considerable research made the company has been able to develop a new product called 'EMO'.

EMO is packed in tubes of 50 grams capacity and is sold to the wholesalers in cartons of 24 tubes at ₹240 per carton. Since the company uses its spare capacity for the manufacturer of EMO, no additional fixed expenses will be incurred. However, the cost account has allocated a share of ₹4,50,000 per month as fixed expenses to be absorbed by EMO as a fair share of the company's present fixed costs to the new production for costing purposes.

The company estimated the production and sale of EMO at 3,00,000 tubes per month and on this basis the following cost estimates have been developed.

	₹ per carton
Direct Materials	108
Direct Wages	72
All overheads	54
Total costs	234

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After a detailed market survey the company is confident that the production and sales of EMO can be increased to 3,50,000 empty tubes and the cost of empty tubes, purchased from outside will result in a saving of 20% in material and 10% in direct wages and variable overhead costs of EMO. The price at which the outside firm is willing to supply the empty tubes is ₹1.35 per empty tube. If the company desires to manufacture empty tubes in excess of 3,00,000 tubes, new machine involving an additional fixed overheads ₹30,000 per month will have to be installed. Required-

- (i) State by showing your working whether company should make or buy the empty tubes at each of the three volumes of production of EMO namely 3,00,000; 3,50,000 and 4,50,000 tubes.
- (ii) At what volume of sales will it be economical for the company to install the additional equipment for the manufacture of empty tubes?
- (iii) Evaluate the profitability on the sale of EMO at each, of the aforesaid three levels of output based on your decision and showing the cost of empty tubes as a separate element of cost. [10]

3 (b) The profit for the year of PIT Ltd. work out to 12.5% of the capital employed and the relevant figures are as under:

	₹
Sales	5,00,000
Direct Material	2,50,000
Direct labour	1,00,000
Variable overheads	40,000
Capital employed	4,00,000

The new sales manager who has joined the company recently estimates for the next year a profit of about 23% on the capital employed provided the volume of sales is increased by 10% and simultaneously there is an increase in Selling Price of 4% and an overall cost reduction in all the elements of cost by 2%.

Find out by computing in detail the cost and profit for next year, whether the proposal of sales manager can be adopted. [6]

Answer: 3 (a)

Total Cost per tube including EMO:

Direct Material	(108/24)	= ₹ 4.50
Direct Wages	(72/24)	= ₹ 3.00
Variable Overheads	[54/24 - 450000/300000]	= ₹ 0.75

Particulars	Total Cost (₹)	Tube Cost (₹)	Product Cost (₹)
Material	4.5	0.9	3.60
Wages	3.0	0.3	2.70
Variable Overhead	0.75	0.075	0.675
	8.25	1.275	6.975

Statement showing computation of manufacturing cost of 300000 tubes

Cost of making (300000 x 1.275)	= ₹ 3,82,500
Cost of buying (300000 x 1.35)	= ₹ 4,05,000

It is better to make the tubes at 300000 level of output.

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Computation of Cost for additional tubes:

Particulars	50000	150000
Cost of Making (₹)	93750 [(50000 x 1.275) + 30000]	221750 [(150000 x 1.275) + 30000]
Cost of Buying (₹)	67500 (50000 x 1.35)	202500 (150000 x 1.35)

From the above, it is better to buy at these levels.

- (ii) The level at which it is beneficial to make the tubes over and above 300000 units.
 [Indifference Point] x (Fixed Cost/Diff. in Variable Cost per unit) = 30,000 x (1.35-1.275)
 = 4,00,000 units.

The Company will be justified to install the additional Equipment for the manufacture of Empty tubes at a sales volume of 700000 units.

Statement showing computation of Profit at three levels of output:

	Particulars	300000	350000	450000
I.	Sales [240/24] (₹)	3000000	3500000	4500000
II.	Cost (₹)	2092500 (300000x6.975)	2441250 (350000x6.975)	3138750 (450000x6.975)
III.	Tube Cost (₹)	382500 (300000x1.275)	472500 (350000x1.35)	607500 (450000x1.35)
IV.	Fixed cost (₹)	450000	450000	450000
V.	Total Cost (₹)	2925000	3363750	4196250
VI.	Profit (I – V) (₹)	75000	136250	303750

Answer: 3 (b)

(a) Computation of Fixed Cost:

		₹
Sales		5,00,000
(-) Profit	4,00,000 x 12.5%	<u>50,000</u>
Total Cost		4,50,000
(-) VC: DM		2,50,000
DL		1,00,000
VOH	<u>40,000</u>	<u>3,90,000</u>
Fixed Cost		<u>60,000</u>

Statement showing computation of profit obtained on adopting the sales manager's proposal:

		₹
(I)	Sales 5,00,000 x (110/100) x (104/100) =	5,72,000
(II)	Variable Cost 3,90,000 × $\frac{110}{100} \times \frac{98}{100}$ =	4,20,420
(III)	Contribution	1,51,580
(IV)	Fixed Cost 60,000 x 98%	58,800
(V)	Profit	92,780

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$$\% \text{ of profit on capital employed} = \frac{92,780}{4,00,000} \times 100 = 23.195 > 23\%$$

∴ Proposal is adoptable.

4 (a) ANRO use traditional standard costing system. The inspection and setup costs are actually ₹ 1,760 against a budget of ₹2,000.

ABC system is being implemented and accordingly, the number of batches is identified as the cost driver for inspection and setup costs. The budgeted production is 10,000 units in batches of 1,000 units, whereas actually, 8,800 units were produced in 11 batches.

(i) Find the volume and total fixed overhead variance under the traditional standard costing system.

(ii) Find total fixed overhead cost variance under the ABC system. [10]

4 (b) One kilogram of product 'Kit' requires two chemicals A and B. The following were the details of product 'Kit' for the month of June, 2017:

(a) Standard mix Chemical 'A' 50% and Chemical 'B' 50%

(b) Standard price per kilogram of Chemical 'A' ₹12 and Chemical 'B' ₹15

(c) Actual input of Chemical 'B' 70 kilograms.

(d) Actual price per kilogram of Chemical 'A' ₹15

(e) Standard normal loss 10% of total input.

(f) Materials Cost variance total ₹650 adverse.

(g) Materials Yield variance total ₹135 adverse.

You are required to calculate:

1. Materials mix variance total

2. Materials usage Variance total

3. Materials price variance total

4. Actual loss of actual input

5. Actual input of chemical 'A'

6. Actual price per kilogram of Chemical 'B' [6]

Answer: 4 (a)

(i) Calculation of volume and total fixed overhead under Traditional Standard Costing System

$$\text{Budgeted overhead cost per unit} = \frac{\text{₹ } 2,000}{10,000 \text{ units}} = \text{₹ } 0.20$$

$$\text{Actual overhead cost per unit} = \frac{\text{₹ } 1,760}{8,800 \text{ units}} = \text{₹ } 0.20$$

$$\begin{aligned} \text{Total fixed overhead variance} &= \text{Absorbed budgeted overhead} - \text{Actual overhead} \\ &= (\text{₹ } 0.20 \times 8,800 \text{ units}) - \text{₹ } 1,760 = \text{Nil} \end{aligned}$$

$$\begin{aligned} \text{Fixed overhead expenditure variance} &= \text{Budgeted overhead} - \text{Actual overhead} \\ &= 2,000 - 1,760 = \text{₹ } 240 \text{ (F)} \end{aligned}$$

$$\text{Standard absorption rate} = \frac{\text{₹ } 2,000}{10,000 \text{ units}} = \text{₹ } 0.20 \text{ per unit}$$

$$\begin{aligned} \text{Fixed overhead volume variance} &= \text{Standard absorption rate} \times (\text{Budgeted units} - \text{Actual units}) \\ &= \text{₹ } 0.20 (10,000 \text{ units} - 8,800 \text{ units}) = \text{₹ } 240 \text{ (A)} \end{aligned}$$

Verification:

$$\begin{aligned} \text{Total fixed overhead variance} &= \text{Expenditure variance} + \text{Volume variance} \\ &= 240 \text{ (F)} + 240 \text{ ((A)} = \text{Nil} \end{aligned}$$

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(ii) Calculation of fixed overhead cost variance under ABC System

Particulars	Budget	Actual	ABC standard
Total cost (₹)	2,000	1,760	1,800
Production (units)	10,000	8,800	8,800
No. of batches	10	11	9
Batch size (units/batch)	1,000	800	1,000
Cost per batch	200	160	200

Under ABC 8,800 units should have been produced in standard batch size of 1,000 units/batch.

No. of batches = $8,800/1,000 = 9$ approx.

Standard cost under ABC = Budgeted cost per batch × ABC standard number of batches

$$= ₹ 200 \times 9 = 1,800$$

Under ABC, variability is with respect to batches and not units

Absorbed overheads = 9 batches × Standard rate per batch

$$= 9 \times ₹ 200 = ₹ 1,800$$

Actual overheads = ₹ 1,760

Total overheads cost variance = ₹ 40 (F)

Answer: 4(b)

Let, actual output of chemical A be 'a' kgs

Actual price per Kg of chemical B be ₹ b

Standard input be 100Kgs

Actual output be 90Kgs

	Standard			Actual		
	Q	P	V	Q	P	V
A	50	12	600	a	15	15a
B	50	15	750	70	b	70b
	100		1350	70 + a		15a + 70b
(-) normal loss	10	--	--	a - 20	--	--
	90		1350	90		15a + 70b

	(1)	(2)	(3)	(4)
	SQSP	RSQSP	AQSP	AQAP
A		$12 \times (70+a/100) \times 50$	$12 \times a$	
B		$15 \times (70+a/100)/50$	15×70	
	1350	$945 + 13.5a$	$1050 + 12a$	$15a + 70b$

Given material cost variance = (1) - (4) = - 650

$$= 15a + 70b = ₹ 2000$$

Material yield variance = (1) - (2) = - 135

$$\Rightarrow a = 40$$

$$\Rightarrow b = 20$$

1) SQSP = ₹ 1350

2) RSQSP = $945 + (13.5 \times 40) = ₹ 1485$

3) AQSP = $1050 + (12 \times 40) = ₹ 1530$

4) AQAP = $(15 \times 40) + (70 \times 20) = ₹ 2000$

(a) Material mix variance = ₹ 45(A)

(b) Material usage variance = ₹ 180(A)

(c) Material price variance = ₹ 470(A)

(d) Actual loss of actual input = ₹ 20

(e) Actual input of chemical A = 40Kgs

(f) Actual price per Kgs of chemical B = ₹ 20

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5 (a) What is Bench trending and how does it differ from Bench Marking? [6]

5 (b) Infamach Ltd. wants to fix proper selling prices for their products 'A' and 'B' which they are newly introducing in the market. Both these products will be manufactured in Department D, which is considered as a Profit Centre.

The estimated data are as under: -

	A	B
Annual Production (unit)	1,00,000	2,00,000
Direct Materials per unit (₹)	15.00	14.00
Direct Labour per unit (₹)	9.00	6.00
(Direct Labour Hour Rate = ₹ 3)		

The proportion of overheads other than interest, chargeable to the two products are as under:

Factory overheads (50% fixed) 100% of Direct Wages. Administration overheads (100% fixed) 10% of factory costs. Selling and Distribution overheads (50% variable) ₹ 3 and ₹ 4 respectively per unit of products A and B.

The fixed capital investment in the Department is ₹50 lakhs. The working capital requirement is equivalent to 6 months stock of cost of sales of both the product. For this project a term loan amounting to ₹40 lakhs has been obtained from Financial Institutions on a interest rate of 14% per annum. 50% of the working capital needs are met by bank borrowing carrying interest at 18% per annum. The Department is expected to give a return of 20% on capital employed.

You are required to:

- Fix the selling price of products A and B such that the contribution per direct labour hour is the same for both the products.
- Prepare a statement showing in details the overall profit that would be made by the Department. [10]

Answer: 5(a)

Continuous monitoring of specific process performance with a selected group of benchmarking is a systematic and continuous measurement process of comparing through measuring an organization business processes against business leaders (role models) anywhere in the world, to gain information that will help organization take action to improve its performance. The continuous process of enlisting the best practices in the world for the processes, goals and objectives leading to world class levels of achievement.

Benchmarking is the process of comparing the cost, time or quality of what one organization does against what another organization does. The result is often a business case for making changes in order to make improvements.

Benchmarking is a powerful management tool because it overcomes "paradigm blindness". Paradigm Blindness can be summed up as the mode of thinking, "the way we do it is the best because this is the way we've always done it". Bench Marking opens organizations to new methods, ideas and tools to improve their effectiveness. It helps crack through resistance to change by demonstrating other methods of solving problems than the one currently employed and demonstrating that they work, because they are being used by others.

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Answer: 5(b)

Statement of Cost

	A	B
	₹	₹
Material	15	14
Direct Labour	9	6
Price Cost	24	20
Factory Overhead (100% Direct Labour)	9	6
Factory Cost	33	26
Administration Overhead (10% of Factory Cost)	3.30	2.6
Cost of production	36.30	28.6
Selling and Distribution	3	4
Cost of Sales (or) Unit Cost	39.30	32.60

Variable Cost:

	A	B
	₹	₹
Prime Cost	24	20
Factory Overhead (Variable) (9 x 50%) (6 x 50%)	4.5	3
Selling (Variable)	1.5	2
Total	30	25

Computation of Total capital Employed:

Fixed Capital		₹
Working Capital:		50,00,000
A = 1,00,000 x 39.3	39,30,000	
B = 2,00,000 x 32.6	65,20,000	
	1,04,50,000 x 6/12	52,25,000
Total Capital employed		1,02,25,000
Required Return @ 20% on Total Capital employed		20,45,000
Total Cost		1,04,50,000
Add: EBIT		20,45,000
Sales Value		1,24,95,000
Less: Variable Cost	1,00,000 x 30 + 2,00,000 x 25	80,00,000
Contribution		44,95,000
Contribution per hour	44,95,000/7,00,000	6.4214
Contribution for unit of 'A'	3 x 6.4214	19.2463
Contribution per hour	44,95,000/7,00,000	
Contribution for unit of 'B'	2 x 6.4214	12.8429

Computation of Selling Price:

	A	B
	₹	₹
Variable cost	30	25
Add: Required Contribution	19.4643	12.8429
Selling Price	49.4643	37.8429

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(b)

		₹
I	Sales	1,24,95,000
II	Cost	1,04,50,000
III	EBIT (Profit)	20,45,000
IV	Interest on term loan (40,00,000 x 14%)	(5,60,000)
V	Interest on bank borrowing 52,25,000 x $\frac{1}{2}$ x $\frac{18}{100}$	(4,70,250)
VI	Profit	10,14,750

6 (a) An automobile production line turns out about 100 cars a day, but deviations occur owing to many causes. The production is more accurately described by the probability distribution given below

Production/Day	Prob.	Production/Day	Prob.
95	0.03	101	0.15
96	0.05	102	0.10
97	0.07	103	0.07
98	0.10	104	0.05
99	0.15	105	0.03
100	0.20		
		Total	1.00

Finished cars are transported across the bay, at the end of each day, by ferry. If the ferry has space for only 101 cars, what will be the average number of cars waiting to be shipped, and what will be the average number of empty space on the boat? [8]

6 (b) A company has four zones open and four salesmen available for assignment. The zones are not equally rich in their sales potentials. It is estimated that a typical salesman operating in each zone would bring in the following annual sales:

Zone: A: 1,26,000; Zone B: 1,05,000; Zone C: 84,000; Zone D: 63,000.

The four salesmen are also considered to differ in ability. It is estimated that working under the same condition their yearly sales would be proportionately as follows:

Salesman P: 7; Salesman Q: 5; Salesman R: 5; Salesman S: 4. If the criterion is maximum expected total sales, the intuitive answer is to assign the best salesman to the richest zone, the next best to the second richest zone and so on. Verify this by the method of assignment. [8]

Answer: 6(a)

Simulation of data of an Automobile Production line			
Production/day	Probability	Cumulative Probability	Random No. Range
95	0.03	0.03	0-2
96	0.05	0.08	3-7
97	0.07	0.15	8-14
98	0.10	0.25	15-24
99	0.15	0.40	25-39
100	0.20	0.60	40-59
101	0.15	0.75	60-74
102	0.10	0.85	75-84
103	0.07	0.92	85-91
104	0.05	0.97	92-96
105	0.03	1.00	97-99
	1.00		

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Stimulated data				
Day	Random No.	Production	No. of cars waiting to be shipped	No. of empty space on the boat
1	20	98	-	3
2	63	101	-	-
3	46	100	-	1
4	16	98	-	3
5	45	100	-	1
6	41	100	-	1
7	44	100	-	1
8	66	101	-	-
9	87	103	2	-
10	26	99	-	2
11	78	102	1	-
12	40	100	-	1
13	29	99	-	2
14	92	104	3	-
15	21	98	-	3
Total			6	18

Average no. of cars waiting to be shipped = $6/15 = 0.40$

Average no. of empty space on the boat = $18/15 = 1.2$

Answer: 6(b)

Sales Man	A	B	C	D	Loss Matrix
P	42	35	28	21	0 7 14 21
Q	30	25	20	15	12 17 22 27
R	30	25	20	15	12 17 22 27
S	24	20	16	12	

Row Operation

0	7	14	21
0	5	10	15
0	5	10	15
1	4	8	12

0	2	5	8
0	0	1	2
0	0	1	2
1	0	0	0

Column Operation

0	3	6	9
0	1	2	3
0	1	2	3
0	0	0	0

Column Operation

0	2	4	7
0	0	0	1
0	0	0	1
2	1	0	0

P	→	A	-	42
Q	→	B	-	25
R	→	C	-	20
S	→	D	-	<u>12</u>

99 x 3000 = ₹ 2,97,000 Maximum sales

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7 (a) A civil engineering firm has to bid for the construction of a dam. The activities and time estimates are given below:

Activity	Duration		
	Optimistic	Most likely	Pessimistic
1-2	14	17	25
2-3	14	18	21
2-4	13	15	18
2 – 8	16	19	28
3 – 4 (dummy)			
3 – 5	15	18	27
4 – 6	13	17	21
5 – 7 (dummy)			
5 – 9	14	18	20
6 – 7 (dummy)			
6 – 8 (dummy)			
7 – 9	16	20	41
8 – 9	14	16	22

The policy of the firm with respect to submitting bids is to bid the minimum amount that will provide a 95% of probability of at best breaking even. The fixed costs for the project are 8 lakhs and the variable costs are ₹ 9,000 everyday spent working on the project. The duration is in days and the costs are in terms of rupees. What amount should the firm bid under this policy? (You may perform the calculations on duration etc. upto two decimal places). [10]

7(b) A Company produces the products P, Q and R from three raw materials A, B and C. One unit of product P requires 2 units of A and 3 units of B. A unit of product Q requires 2 units of B and 5 units of C and one unit of product R requires 3 units of A, 2 unit of B and 4 units of C. The Company has 8 units of material A, 10 units of B and 15 units of C available to it. Profits/unit of products P, Q and R are ₹3, ₹5 and ₹4 respectively.

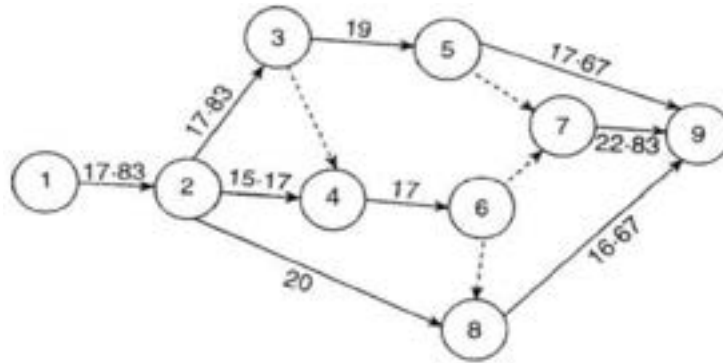
- (a) Formulate the problem mathematically,
 (b) Write the Dual problem.

Answer: 7(a)

The expected duration and variance of each activity is computed in the following table:

Activity	Optimistic (t ₀)	Time most likely (t _m)	Pessimistic (t _p)	Expected duration $t_e = \frac{1}{6}(t_0 + 4t_m + t_p)$	Variance $\left[\frac{1}{6}(t_p - t_0)\right]^2$
1—2	14	17	25	17.83	3.36
2—3	14	18	21	17.83	1.36
2—4	13	15	18	15.17	
2—8	16	19	28	20.00	
3—4	—	—	—	—	
3—5	15	18	27	19.00	4
4—6	13	17	21	17.00	
5—7	—	—	—	—	
5—9	14	18	20	17.67	
6—7	—	—	—	—	
6—8	—	—	—	—	
7—9	16	20	41	22.83	17.36
8—9	14	16	22	16.67	

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The various paths and their lengths are as follows:

	Path	Duration
I.	1-2-3-5-7-9	77.49*
II.	1-2-3-5-9	72.33
III.	1-2-3-4-6-7-9	75.49
IV.	1-2-3-4-6-8-9	69.33
V.	1-2-8-9	54.50
VI.	1-2-4-6-8-9	66.67
VII.	1-2-4-6-7-9	72.83

Thus, the critical path is 1—2—3—5—7—9 with project duration of 77.49 days. Project variance is obtained by summing variances of critical activities, $\sigma^2 = 3.36 + 1.36 + 4 + 17.36 = 26.08$.

\therefore Standard duration of project length, $\sigma = \sqrt{26.08} = 5.11$

To calculate the project duration which will have 95% chances of its completion, we find the value of Z corresponding to 95% area from normal distribution area table which is 1.645. Thus

$$P(X \leq T_s) = P\left(Z \leq \frac{T_s - 77.49}{5.11}\right) = 0.95$$

$$= \frac{T_s - 77.49}{5.11} = 1.645 \quad \text{or} \quad T_s = 1.645 \times 5.11 + 77.49 = 86 \text{ days.}$$

Since the fixed cost of the project is ₹ 8 lakhs and the variable cost is ₹ 9000 per day, amount to bid = ₹ 8 lakhs + ₹ 9000 x 86 = ₹ 15,74,000.

Answer: 7(b)

Raw Materials	P	Q	R	Available units
A	2	-	3	8
B	3	2	2	10
C	-	5	4	15

Profits 3/- 5/- 4/-

Let x_1 be the no. of units of P

Let x_2 be the no. of units of Q

Let x_3 be the no. of units of R

Objective function: Max. $Z = 3x_1 + 5x_2 + 4x_3$

Subject to constraints:

$$2x_1 + 3x_2 \leq 8$$

$$3x_1 + 2x_2 + 2x_3 \leq 10$$

$$5x_2 + 4x_3 \leq 15$$

And $x_1, x_2, x_3 \geq 0$.

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Primal

$$\text{Max. } Z = 3x_1 + 5x_2 + 4x_3$$

Subject to

$$2x_1 + 3x_2 \leq 8$$

$$3x_1 + 2x_2 + 2x_3 \leq 10$$

$$5x_2 + 4x_3 \leq 15$$

And $x_1, x_2, x_3 \geq 0$

Dual

$$\text{Min. } Z = 8y_1 + 10y_2 + 15y_3$$

Subject to

$$2y_1 + 3y_2 \geq 3$$

$$3y_1 + 2y_2 + 5y_3 \geq 5$$

$$2y_2 + 4y_3 \geq 4$$

And $y_1, y_2, y_3 \geq 0$

$$2x_1 + 3x_2 + S_1 = 8$$

$$3x_1 + 2x_2 + 2x_3 + S_2 = 10$$

$$5x_2 + 4x_3 + S_3 = 15$$

$$\text{Max } Z = 3x_1 + 5x_2 + 4x_3 + 0.S_1 + 0.S_2 + 0.S_3$$

$$\therefore x_1 = 23/20 \quad x_2 = 19/10 \quad x_3 = 11/8$$

$$Z = 18.45$$

8. Write short notes on any four out of the following five questions.

[4 × 4 = 16]

- (a) Six Sigma
- (b) Kaizen Costing
- (c) The Variants of Backflush Accounting
- (d) Business Process Re-engineering.
- (e) Uses of Learning curve

Answer: 8

(a) Six Sigma

Six Sigma has two key methodologies: DMAIC and DMADV, both inspired by W. Edwards Deming's Plan-Do-Check- Act Cycle: DMAIC is used to improve an existing business process, and DMADV is used to create new product or process designs for predictable, defect-free performance.

DMAIC

Basic methodology consists of the following five (5) steps:

- Define the process improvement goals that are consistent with customer demands and enterprise strategy.
- Measure the current process and collect relevant data for future comparison.
- Analyze to verify relationship and causality of factors. Determine what the relationship is, and attempt to ensure that all factors have been considered.
- Improve or optimize the process based upon the analysis using techniques like Design of Experiments.
- Control to ensure that any variances are corrected before they result in defects. Set up pilot runs to establish process capability, transition to production and thereafter continuously measure the process and institute control mechanisms.

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DMIADV

Basic methodology consists of the following five steps:

- Define the goals of the design activity that are consistent with customer demands and enterprise strategy.
- Measure and identify CTQs (critical to qualities), product capabilities, production process capability, and risk assessments.
- Analyze to develop and design alternatives, create high-level design and evaluate design capability to select the best design.
- Design details, optimize the design, and plan for design verification. This phase may require simulations.
- Verify the design, set up pilot runs, implement production process and handover to process owners.

Some people have used DMAICR (Realize). Others contend that focusing on the financial gains realized through Six Sigma is counter-productive and that said financial gains are simply byproducts of a good process improvement.

(b) Kaizen Costing

The initial VE review may not be complete and perfect in all cost aspects. There may be further chances of waste reduction, cost and time reduction and product improvement. Such continuous cost reduction technique is called as Kaizen Costing.

Kaizen Costing refers to the ongoing continuous improvement program that focuses on the reduction of waste in the production process, thereby further lowering costs below the initial targets specified during the design phase. It is a Japanese term for a number of cost reduction steps that can be used subsequent to issuing a new product design to the factory floor.

Toyota's Experience of Kaizen Costing: Toyota aggressively pursued Kaizen Costing to reduce costs in the manufacturing phase. Methods for achieving these kaizen goals include cutting material costs per unit and improvement in standard operating procedures. These are pursued based on employee's suggestions. About two million suggestion were received from Toyota employees in t\one recent year alone roughly thirty-five per employee. Ninety-seven percent of them were adopted. This is really a prime example of concept of employee empowerment in which workers are encouraged to take their own initiatives to improve operations, reduce costs, and improve product quality and customer service.

(c) The Variants of Backflush Accounting

There are a number of variants of the Backflush system, each differing as to the 'trigger points' at which costs are recognized within the cost accounts and thus associated with products. All variants, however, have the following common features:

- the focus is on output – costs are first associated with output (measured as either sales or completed production) and then allocated between stocks and costs of goods sold by working back.
- Conversion costs (labour and overheads) are never attached to products until they are complete (or even sold) – thus the traditional WIP account doesn't exist.

Two variants of the Backflush system are summarized below. Note that in each as conversion costs (labour and overheads) are incurred they will be recorded in a conversion cost (CC) account.

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Variant 1

This has two trigger points (TP) :

TP 1 - purchase of raw materials / components. A 'raw and in process (RIP)' account will be debited with the actual cost of materials purchased, and creditors credited.

TP 2 - completion of good units. The finished goods (FG) account will be debited with the standard cost of unit produced and the RIP and CC account will be credited with the standard cost.

Under this variant, then, there will be two stock accounts :

- raw materials (which may, in fact, be incorporated into WIP)
- finished goods

Variant 2

This has only one trigger point – the completion of good units. The FG account is debited with the standard cost of units produced, with corresponding credits to the CC account and the creditors account.

Thus the cost records exclude :

- raw materials purchased but not yet used for complete production
- the creditors for these materials (and any price variance)

and there is only stock account, carrying the standard cost of finished goods stock.

Other variants include those using the sale of complete goods units as a trigger point for the attachment of conversion cost to unit -- thus there is no finished goods account, just a raw materials stock account, carrying the materials cost of raw materials, WIP and finished goods.

(d) Business Process Re-engineering.

Business Process Re-engineering (BPR) refers to the fundamental rethinking and redesign of business processes to achieve improvement in critical measures of performance such as cost, quality, service, speed and customer satisfaction. In contrast the concept of Kaizen, which involves small, incremental steps towards gradual improvement, re-engineering involves a giant leap. It is the complete redesign of a process with an emphasis on finding creative new way to accomplish an objective. It has been described as taking a blank piece of paper and starting from scratch to redesign a business process. Rather than searching continually for minute improvement, reengineering involves a radical shift in thinking about how an objective should be met. Re-engineering prescribes radical, quick and significant change. Admittedly, it can entail high risks, but it can also bring big rewards. These benefits are most dramatic when new models are discovered for conducting business.

(e) Uses of Learning curve

Learning curve is now being widely issued in business. Some of the uses are as follows:

1. Where applicable the learning curve suggest great opportunities for cost reduction to be achieved by improving learning.
2. The learning curve concept suggests a basis for correct staffing in continuously expanding production. The curve shows that the work force need not be increased at the same rate as the prospective output. This also helps in proper production planning through proper scheduling of work; providing manpower at the right moment permitting more accurate forecast of delivery dates.

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3. Learning curve concept provides a means of evaluating the effectiveness of training programs.
4. Learning curve is frequently used in conjunction with establishing bid price for contracts. Usually, the bid price is based on the cumulative average unit cost for all the units to be produced for a given contract. If production is not interrupted. Additional units beyond this quantity should be costed at the increment costs incurred, and not at the previous cumulative average. If the contract agreement so provides, a contract may be cancelled and production stopped before the expected efficiency is reached.
5. The use of learning curve, where applicable, is important in the working capital required. If the requirement is based on average cumulative unit cost, the revenues from the first few units may not cover the actual expenditures.
6. As employees become more efficient, the rate of production increases and so more materials are needed, the work-in-progress inventory turns over faster, and finished goods inventory grows at an accelerated rate.
7. Learning curve techniques are useful in exercising control, Variable norms can be established for each situation, and a comparison between these norms and actual expenses can be made. Specific or average incremental unit cost should be used for this purpose.
8. The learning curve may be used for make-or- buy decisions especially if the outside manufacturer has reached the maximum on the learning curve. Help to calculate the sensitive rates in wage bargaining.

Paper 15 – Strategic Cost Management and Decision Making

Paper – 15 – Strategic Cost Management and Decision Making

Full Marks : 100

Time allowed: 3 hours

Section - A

1. Answer the following and each question carries 2 marks. [10×2=20]

- (i) A company determines its selling price by making up variable costs 60%. In addition, the company uses frequent selling price mark down to stimulate sales. If the mark down average 10%, what is the company's contribution margin ratio?
- (A) 30.6%
(B) 44%
(C) 86.4%
(D) None of these

- (ii) A company produces two joint products, P and V. In a year, further processing costs beyond split-off point spent were ₹ 8,000 and ₹ 12,000 for 800 units of P and 400 units of V respectively. P sells at ₹ 25 and V sells at ₹ 50 per unit. A sum of ₹ 9,000 of joint cost were allocated to product P based on the net realization method. What were the total joint cost in the year?
- (A) ₹ 20,000
(B) ₹ 10,000
(C) ₹ 15,000
(D) None of these

- (iii) A company is to market a new product. It can produce up to 1,50,000 units of this product. The following are the estimated cost data:

	Fixed Cost	Variable Cost
For production up to 75,000 units	₹ 8,00,000	60%
Exceeding 75,000 units	₹ 12,00,000	50%

Sale price is expected to be ₹ 25 per unit.

How many units must the company sell to break even?

- (A) 1,00,000 units
(B) 1,11,000 units
(C) 1,27,000 units
(D) 75,000 units
- (iv) Back flush costing is most likely to be used when
- (A) Management desires sequential tracking of costs
(B) A Just-in-Time inventory philosophy has been adopted
(C) The Company carries significant amount of inventory
(D) Actual production costs are debited to work-in-progress
- (v) If the first time you perform a job takes 60 minutes, how long will the eighth job take if you are on an 80% learning curve?

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- (A) 48 minutes
- (B) 30.72 minutes
- (C) 31 minutes
- (D) None of the above

(vi) Which of the following would decrease unit contribution margin the most?

- (A) 15% decrease in selling price
- (B) 15% increase in variable cost
- (C) 15% decrease in variable cost
- (D) 15% decrease in fixed cost

(vii) A company has the capacity of production of 80,000 units and presently sells 20,000 units at ₹ 100 each. The demand is sensitive to selling price and it has been observed that with every reduction of ₹ 10 in selling price the demand is doubled. What should be the target cost at full capacity if profit margin on sale is taken as 25%?

- (A) ₹ 75
- (B) ₹ 90
- (C) ₹ 60
- (D) ₹ 25

(viii) If the time taken to produce the first unit of a product is 4000 hrs, what will be the total time taken to produce the 5th to 8th unit of the product, when a 90% learning curve applies?

- (A) 10,500 hours
- (B) 12,968 hours
- (C) 9,560 hours
- (D) 10,368 hours

(ix) ABC Ltd. has developed a new product just complete the manufacture of first four units of the product. The first unit took 2 hours to manufacture and the first four units together took 5.12 hours to produce. The Learning Curve rate is

- (A) 83.50%
- (B) 80.00%
- (C) 75.50%
- (D) None of the above

(x) A company manufactures two products using common material handling facility. The total budgeted material handling cost is ₹ 60,000. The other details are:

	Product X	Product Y
Number of units produced	30	30
Material moves per product line	5	15
Direct labour hour per unit	200	200

Under activity based costing system the material handling cost to be allocated to product X (per unit) would be:

- (A) ₹ 1,000
- (B) ₹ 500
- (C) ₹ 1,500
- (D) ₹ 2,500

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Answer:

1. (i) (a) When V (Var. cost) = 100, SP = 160, M. Cost/SP = 60/100
 SP after 10% mark down of SP = 144, Cost = 60-16 = 44
 Contribution Margin Ratio = 44/144 = 0.3056 = 30.6%

- (ii) (c)

Products	P	V	Total
Units	800	400	
S.P. (₹)	25	50	
Sales (₹)	20,000	20,000	
Further Costs (₹)	8,000	12,000	
NRV (₹)	12,000	8,000	20,000

Joint cost appropriated ₹ 9,000

Total Joint Cost = (9,000/12,000) x 20,000 = ₹15,000

- (iii) (b) 1,11,000 units.

At a production of 75,000 units or less the fixed costs amount to ₹8 lakh Contribution is ₹10 per unit (₹25 - 60% of ₹ 25). Production will however, be more than this level. Total fixed cost is then ₹ 12 lakh.

Contribution for first 75,000 units = ₹7,50,000

Hence, to meet ₹12 lakh fixed cost, further ₹4,50,000 contribution is required.

Contribution beyond 75,000 units is ₹ 12.5 (₹ 25 - 50% of ₹25).

Additional units to be sold = ₹4,50,000 / ₹12.50 = 36,000 units = 1,11,000 units.

- (iv) (b) back flush costing is most likely to be used when Just-in-time inventory philosophy has been adopted.

- (v) (b) Three doublings from 1 to 2 to 4 to 8 implies .8³. Therefore, we have 60 × (.8)³ = 60 × .512 = 30.72 minutes.

- (vi) (a) A given percentage change in unit sale price must have greater effect on contribution margin than any other factor affected by the same percentage change.

- (vii) (c)

Demand	Price (₹)
20,000	100
40,000	90
80,000	80

Target Cost = ₹ 80 - (25% of 80) = ₹ 80 - 20 = ₹ 60.

- (viii) (d)

Units	Average Time (hours)	Total time (Hours)
1	4000	4000
2	3600	7200
4	3240	12960
8	2916	23328

Total time for 5th to 8 units = 23328 - 12960 = 10368 hrs.

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(ix) (b) 80%

Let the learning rate be x.

Since the first unit took 2 hours, average time for the first two units = 2x and

The average time for the first 4 units = $2x \times x = 2x^2$.

$$2x^2 = 5.12 \div 4 = 1.28.$$

$$\begin{aligned} \text{Or, } x &= \sqrt{1.28 \div 2} = \sqrt{0.64} \\ &= 0.80 \text{ i.e. } 80\%. \end{aligned}$$

(x) (b) ₹500 Cost per material more = $60,000 \div (5 + 15) = ₹3,000$

$$X = \text{Total Cost} = 3,000 \times 5 = 15,000$$

$$\text{Cost per unit} = ₹15,000 \div 30 \text{ units} = 500 \text{ per unit.}$$

Section – B

Answer any five questions from question nos. 2 to 8. Each question carries 16 marks.

2. (a) K&Co. manufactures and sells 15,000 units of a product. The full cost per unit is ₹ 200. The Company has fixed its price so as to earn a 20% return on an Investment of ₹ 18,00,000.

Required:

(i) Calculate the selling price per unit from the above. Also, calculate the Mark-up % on the Full Cost per unit.

(ii) If the selling price as calculated above represents a mark-up % of 40% on variable cost per unit, calculate the variable cost per unit.

(iii) Calculate the company's income if it had increased the selling price to ₹ 230. At this price, the company would have sold 13,500 units. Should the company have increased the selling price to ₹ 230?

(iv) In response to competitive pressures, the company must reduce the price to ₹ 210 next year, in order to achieve sales of 15,000 units. The company also plans to reduce its investment to ₹ 16,50,000. If a 20% return on investment should be maintained, what is the Target cost per unit for the next year? [8]

(b)(i) Explain the relationship of synergy with strategic realignment in the context of merger.

(ii) What are the problems of strategy evaluation. [4+4]

Answer:

2. (a) (i) Computation of selling price and mark-up % on the Full Cost per unit
 Target Sale price per unit = Full Cost + Target Profit = ₹ 200 + 24 = ₹ 224.
 So, Mark-up price is = 12%

(ii) Computation of Variable Cost per unit:
 Above sale price ₹ 224 = VC + 40% thereon, i.e., 140% on VC. So, Variable Cost = $(224/140\%) = ₹ 160$.

(iii) Calculate the company's income if selling price are increased

Present Contribution at 15,000 units = $(₹ 224 - ₹ 160) \times 15000 \text{ units}$	₹ 9,60,000
Revised contribution at 13,500 units = $(₹ 230 - ₹ 160) \times 13,500 \text{ units}$	₹ 9,45,000
	₹ 15,000

Hence, increase in sale price is not beneficial, due to reduction in Contribution by ₹ 15,000.

- (iv) Calculate the company's target profit if selling price are reduced and target cost if investment is ₹ 16,50,000

$$\text{Target Profit for next year} = (16,50,000 \times 20\%) / 13,500 = ₹ 24.$$

- (b) (i) Synergy is the term used to describe a situation where different entities cooperate the sum of its parts. The most fundamental of all reasons for mergers is the 'synergy' argument, which serves as the basis of strategic realignment.

Separate companies 'pre-merger values'

Accordingly under synergy, the combined value of a firm is much greater than the value of individual firms. The phenomenon of synergy arises due to economics of scale of operation. Besides, the combined mega features such as enhanced managerial capabilities, creativity, innovativeness, R&D and market coverage capacity expand beyond simple arithmetic. Due to the complementary nature of resources and skills, a widened horizon of opportunities is also responsible for synergy on a merger situation.

- (ii) Task of strategy evaluation suffers from the problems arising out of misinterpretation of environmental forces and corporate resources. The evaluator may not always be correct when he questions the validity of the on-going strategy. This is because of the fact that determination of opportunities and threats is often of a function the perception and the attitude of the person making such exercise as it is of the factor itself. For instance, a dynamic and enterprising planner may perceive abundant opportunities emerging due to economic and technological developments and formulate expansion strategy. This approach may not be appreciated by an evaluator with a conservative attitude and closed cognitive style that holds the view that the enterprise should continue to maintain its present product-market posture owing to disquieting political developments.

Inaccurate assessment of financial, marketing, managerial and other resources of the enterprise and existence of synergistic benefits poses another obstacle to the appraisal of strategy. Thus, for instance, a corporate planner chooses a diversification strategy because in his view the firm has adequate financial and managerial resources to support this plan. But the evaluator questions the utility of such a strategy because he doubts the skill and competence of the senior executives of the firm. Another obstacle that is inherent in strategy appraisal is identification, evaluation and choice of strategic alternatives. In the real world, it has been noted that some organisations without making independent appraisal of opportunities choose a course of action because others in the same line of business have done so. This type of approach renders the product-market strategy weak.

Another source of difficulty involved in appraisal of strategy is misinterpretation of current results. Generally, the central chief executive, without digger deep into the problem, regards the current strategy as unsound if the performance has not been satisfactory and directs the corporate planner to re-examine it. In the same vein, he labels the strategy as sound because of the excellent operating results. But such type of hurried judgment may, at times, be erroneous. Poor results may have been due to improper execution of strategy or outstanding profits were due to certain other

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factors such as war and product rationing. The management swayed by good results may not take serious note of implications of impending environmental changes and accordingly remain indifferent to any modification in the current plan for the future.

3. (a) What is BPR? How can BPR be applied to an organisation?

[2+6]

(b) A manufacturing company currently operating at 80% capacity has received an export order from Middle East, which will utilise 40% of the capacity of the factory. The order has to be either taken in full and executed at 10% below the current domestic prices or rejected totally.

The current sales or cost data are given below:

Items	₹ lakhs
Sales	16.00
Direct Material	5.80
Direct Labour	2.40
Variable Overheads	0.60
Fixed Overheads	5.20

The following alternatives are available to the management:

(i) Continue with domestic sales and reject the export order.

(ii) Accept the export order and allow the domestic market to starve to the extent of excess of demand.

(iii) Increase capacity so as to accept the export order and maintain the domestic demand by –

Purchasing additional plant and increasing 10% capacity and thereby increasing fixed overheads by ₹ 65,000, and Working overtime at one and half time the normal rate to meet balance of the required capacity.

You are required to evaluate each of the above alternatives and suggest the best one.

[6+2]

Answer:

3. (a) BPR is a business process management strategy, originally pioneered in the early 1990s. Focusing on the analysis and design of workflows and process within an organisation. BPR is also known as business process redesign, business transformation, or the business process change management. BPR aimed to help organisations fundamentally rethink how they do their work in order to dramatically improve customer service, cut operational costs, and become world-class competitors. Competition is continuously increasing with respect to price, quality and selection, service and promptness of delivery. Removal of barriers, international cooperation, technological innovations cause competition to intensify. All these changes impose the need for organizational transformation, whether the entire processes, organisation climate and organization structure is changed.

BPR application ways:

(i) Empowering people: i.e., ability to do their work: the right information, the right tools, the right training, the right environment, and the authority they do.

(ii) Providing information in many different ways.

(iii) Providing right tools - with the right tools, the numerical parts of the plans arrive in a consistent, electronic format permitting consolidation by a computer. This leaves the analyst free to do the more productive work of analysing the quality of the plan.

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- (iv) Providing efficient training.
- (v) Eliminating unproductive uses of time.
- (vi) By improving data processing eliminate unnecessary papers.
- (vii) Eliminating unnecessary variations in the procedures and systems.
- (viii) Minimising the burden of record keeping. It means more efficient and effective with the six components of data processing like computing, transmitting, storing, retrieving, manipulating, and displaying data.

(b) Statement showing computation of profit at different alternatives:

Particulars	Alternative I (Present Sales 80%)	Alternative II 40% - Foreign 60% - Domestic	Alternative III 40% - Foreign 80% - Domestic
Sales	16.00	19.20 (7.20 + 12.00)	23.20 (7.20 + 16.00)
Variable Cost:			
Direct material	5.80	7.25	8.70
Direct labour	2.40	3.00	3.60
Variable overheads	0.60	0.75	0.90
Overtime premium	---	---	0.15
Total	8.80	11.00	13.35
Contribution	7.20	8.20	9.85
Fixed Cost	5.20	5.20	5.85 (5.20+0.65)
Profit	2.00	3.00	4.00

From the above computation, it was found that the profit is more at the Alternative III i.e. accepting the foreign order fully and maintaining the present domestic sales, it is the best alternative to be suggested.

4. (a) **AYX Ltd., manufactures three products. The material cost, selling price and bottleneck resource details per unit are as follows:**

Particulars	Product X	Product X	Product X
Selling Price (₹)	66	24	15
Material and Other variable cost (₹)	75	30	15
Bottleneck resource time (minutes)	90	40	20

Budgeted factory costs for the period are ₹ 2,21,600. The bottleneck resources time available is 75,120 minutes per period.

Required:

- (i) Company adopted throughput accounting and products are ranked according to 'product return per minute'. Select the highest rank product.
- (ii) Calculate throughput accounting ratio and comment on it.

(b) XYZ Ltd. follows JIT system. It had following transactions in May, 2017:

- (i) Raw materials were purchased for ₹ 2,00,000,
- (ii) Direct labour cost incurred ₹ 36,000,
- (iii) Actual overhead costs ₹ 3,00,000,
- (iv) Conversion costs applied ₹ 3,16,000

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All materials, that were purchased, were placed into production and the production was also completed and sold during the month. The difference between actual and applied costs is computed.

You are required to pass Backflush journal entries.

[8+8]

Answer:

4. (a) (i) Calculation of rank according to product return per minute

Particulars	X	Y	Z
Selling price	66	75	90
Less: Variable cost	24	30	40
Throughput contribution (a)	42	45	50
Minutes per unit (b)	15	15	20
Contribution per minute (a) ÷ (b)	2.8	3	2.5
Ranking	II	I	III

(ii) Calculation of Throughput Accounting Ratio

Particulars	X	Y	Z
Factory cost per minute (₹ 2,21,600/75,120 minutes) (₹)	2.95	2.95	2.95
TA Ratio (Contribution per minute / Cost per minute)	0.95	1.02	0.85
Ranking	II	I	III

Analysis – Product Y yields more contribution compared to average factory contribution per minute, whereas X and Z yield less.

(b)

In the Books of XYZ Ltd.
Journal Entries (Backflush)

Particulars	Debit (₹)	Credit (₹)
Raw Material in Process A/c To Accounts Payable (Being purchase of raw materials)	Dr. 2,00,000	2,00,000
Conversion Cost Control A/c To Direct Wages A/c To Accounts Payable A/c (Being overhead cost incurred)	Dr. 3,36,000	36,000 3,00,000
Finished Goods A/c To Raw Material in Process A/c To WIP A/c (Being completion of goods)	Dr. 5,16,000	2,00,000 3,16,000
Cost of Goods Sold A/c To Finished Goods (Being Cost of finished goods sold transferred)	Dr. 5,16,000	5,16,000
Cost of Goods Sold A/c To Overhead Control A/c (Being variance is recognized)	Dr. 20,000	20,000

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5. (a) What is the purpose of preparation of 'Lean accounting'? [3]

(b) What control process should be considered in 'Target Costing' project? [3]

(c) A manufacturing company has the following production budget for November 2016:

Product A = 20,000 units and Product B = 40,000 units

A standard hour represents 10 units of A and 8 units of B.

Standard wage rate per hour is ₹ 0.50

During the month 7500 hours were paid for @ ₹ 0.60 per hour, which included 350 unproductive hours due to unbudgeted holidays as also loss of production of 250 units of Product-A due to machine breakdown.

Actual production for the month was 24,000 units of A and 38,000 units of B.

Calculate the following:

(i) Direct labour rate variance

(ii) Direct laaour idle time variance

(iii) Direct labour efficiency variance.

(iv) Direct labour total variance.

[2½ × 4 = 10]

Answer:

5. (a) There are positive and negative reasons for using Lean Accounting. The positive reasons include the issues addressed in the "Vision for Lean Accounting". Lean Accounting provides:

- (i) Provide accurate, timely and understandable information to motivate the lean transformation throughout the organization, to eliminate waste from accounting processes while maintaining thorough financial control,
- (ii) Fully comply with Generally Accepted Accounting Principles (GAAP),
- (iii) Support the lean culture by motivating investment in people. Lean Accounting is nothing more than tracking inflow to outflow as measure of profitability,' which is governed by GAAP.

(b) Following three important control points should take care properly in all target costing projects:

- (i) Identification of principal control point over the course of target costing programme.
- (ii) Point of go/no go decision: If target costing is not reached, management retains power to abandon the design project. There comes a point, when actual performance is very close to expected performance in matter of cost recurrence.
- (iii) Milestone can be in terms of timer (say one month) and/or points (say in design process) at which specific activities are completed.

(c)

Product	Production (Units)	Per standard hours (Units)	Standard hours
A	24000	10	2400
B	38000	8	47500
			7150

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- (i) Direct labour rate variance: $(SR-AR) \times AT = ₹ (0.50-0.60) \times 7500 = ₹ 750$ (A)
- (ii) Direct labour idle time variance: $Abnormal\ idle\ time \times SR = 375 \times 0.50 = ₹ 187.50$ (A)
- (iii) Direct labour efficiency variance:
 $(ST-AT\ excluding\ abnormal\ Idle\ Time) \times SR = (7150 - 7125) \times ₹ 0.50 = ₹ 12.50$ (F)
- (iv) Direct labour total variance:
 Standard cost-7150 hours @ ₹ 0.50 = ₹ 3,575
 Actual cost-7500 hours @ ₹ 0.60 = ₹ 4,500
 Direct labour total variance ₹ 925 (A)

Note:

Abnormal idle time - Unbudgeted holidays	= 350 hours
Machine breakdown-(1/10) x 250	= 25 hours
	<u>375 hours</u>

6. (a) The ABC Pvt. Ltd., which has a satisfactory preventive maintenances system in its plant has installed a new Hot Air Generator based on electricity instead of fuel oil for drying its finished products. The Hot Air Generator required periodic shutdown maintenance. If the shutdown is scheduled yearly, the cost of maintenance will be as under:

Maintenance Cost	Probability
₹ 15,000	0.3
₹ 20,000	0.4
₹ 25,000	0.3

The costs are expected to be almost linear, i.e., if the shutdown is scheduled twice a year the maintenance cost will be double.

There is no previous experience regarding the time taken between breakdowns. Costs associated with breakdown will vary depending upon the periodicity of maintenance. The probability distribution of breakdown cost is estimated as under:

Breakdown Costs per annum	Shutdown once a year	Shutdown twice a year
₹ 75,000	0.2	0.5
₹ 80,000	0.5	0.3
₹ 1,00,000	0.3	0.2

Simulate the total costs – maintenance and breakdown costs – and recommend whether shutdown overhauling should be resorted to once a year or twice a year? [8]

- (b) A captain of a cricket team has to allot five middle batting positions to five batsmen. The average runs scored by each batsman at these positions are as follows:

Batting Position		III	IV	V	VI	VII
Batsmen	A	40	40	35	25	50
	B	42	30	16	25	27
	C	50	48	40	60	50
	D	20	19	20	18	25
	E	58	60	59	55	53

Make the assignment so that the expected total average runs scored by these batsmen are maximum. [8]

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Answer:

6. (a) Assigning numbers to maintenance cost once a year basis:

Cost (₹)	Probability	Random Numbers (R.N.)
15,000	0.30	00-29
20,000	0.40	30-69
25,000	0.30	70-99

Assigning random numbers to breakdown costs when overhauling is once a year basis:

Cost (₹)	Probability	Random Numbers (R.N.)
75,000	0.20	00-19
80,000	0.50	20-69
1,00,000	0.30	70-99

The total costs will be as under:

Year	R.N.	Maintenance Cost	R.N.	Breakdown Cost	Total
1	27	15,000	03	75,000	90,000
2	44	20,000	50	80,000	1,00,000
3	22	15,000	73	1,00,000	1,20,000
4	32	20,000	87	1,00,000	1,20,000
5	97	25,000	59	80,000	1,05,000
					1,06,000

Assigning random numbers to maintenance costs, on twice a year basis:

Cost (₹)	Probability	Random Numbers (R.N.)
30,000	0.30	00-29
40,000	0.40	30-69
50,000	0.30	70-99

Assigning random numbers to breakdown costs:

Cost (₹)	Probability	Random Numbers (R.N.)
75,000	0.00	00-49
80,000	0.30	50-69
1,00,000	0.20	80-99

The total costs will be as under:

Year	R.N.	Maintenance Cost	R.N.	Breakdown Cost	Total
1	42	40,000	54	80,000	1,20,000
2	04	30,000	65	80,000	1,10,000
3	82	50,000	49	75,000	1,25,000
4	38	40,000	03	75,000	1,15,000
5	91	50,000	56	80,000	1,30,000
					1,06,000

[Note R.N.s. are taken from table]

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Recommendation: From the above working it may be seen that shutdown maintenance/overhauling once a year will be more economical. The average annual cost will only be ₹ 1.06 lakhs as against 1.20 lakhs when shutdown is twice a year.

(b)

	III	IV	V	VI	VII	Loss Matrix				
						20	20	25	35	10
A	40	40	35	25	50	18	30	44	35	33
B	42	30	16	25	27	10	12	20	0	10
C	50	48	40	60	50	40	41	40	42	35
D	20	19	20	18	25	2	0	1	5	7
E	58	60	59	55	53					

Row Operation

M_3

10	10	14	25	0
0	12	25	17	15
10	12	19	0	10
5	6	4	7	0
2	0	0	5	7

Column Operation

10	10	15	25	0
0	12	26	17	15
10	12	20	0	10
5	6	5	7	0
2	0	1	5	7

Improved Matrix

10	6	10	25	0
0	8	21	17	15
10	8	15	0	10
5	2	0	7	0
6	0	0	9	11

Maximum Average Runs

A	→	VII	-	50
B	→	III	-	42
C	→	VI	-	60
D	→	V	-	20

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7. (a) SMC has three Departments – Assembly, Painting and Packing with the capability of making three types of Almirah. An Almirah of Type I requires one hour of Assembly, 40 minutes of Painting and 20 minutes of Packing time respectively. Similarly, Type II requires 80 minutes, 20 minutes and one hour respectively. The Type III requires 40 minutes each of Assembly, Painting and Packing time. The total time available at Assembly, Painting and Packing Departments are 600 hours, 400 hours and 800 hours respectively. The unit profits for types I, II and III are Rs40, 80 and 60 respectively. Formulate the problem as a LPP. [10]

- (b) The following table gives data on normal time & cost and crash time & cost for a project.

Activity	Normal		Crash	
	Time (Days)	Cost (₹)	Time (Days)	Cost (₹)
1-2	6	600	4	1,000
1-3	4	600	2	2,000
2-4	5	500	3	1,500
2-5	3	450	1	650
3-4	6	900	4	2,000
4-6	8	800	4	3,000
5-6	4	400	2	1,000
6-7	3	450	2	800

The direct cost per day is ₹ 100.

- (i) Draw the network and identify the critical path;
 (ii) What are the normal project duration and associated cost? [6]

Answer:

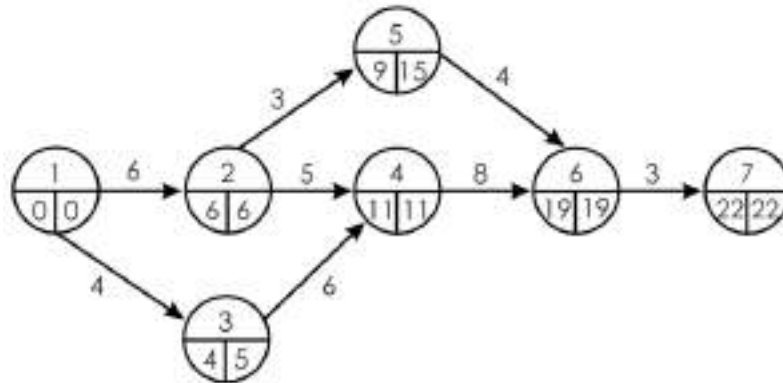
7. (a) Let X_1 , X_2 and X_3 be the number of units of Type I, Type II and Type III Almirah respectively. The data given in the question can be converted into a matrix form as under –

Particulars	Type I	Type II	Type III	Time Available
Assembly Hours per unit	1	4/3	2/3	600
Painting Hours per unit	2/3	1/3	2/3	400
Packing Hours per unit	1/3	1	2/3	800
Profit per unit	₹40	₹80	₹60	

The LPP is given as under -	
Maximise Revenue Z	$= 40 X_1 + 80 X_2 + 60 X_3$
subject to:	
$X_1 + 4/3 X_2 + 2/3 X_3$	≤ 600 (Assembly Time Condition)
$2/3 X_1 + 1/3 X_2 + 2/3 X_3$	≤ 400 (Painting Time Condition)
$1/3 X_1 + X_2 + 2/3 X_3$	≤ 800 (Packing Time Condition)
X_1, X_2, X_3	≥ 0 (Non-Negativity Assumption)

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- (b) (i) The network for normal activity times indicates a project time of 22 weeks with the critical path 1-2-4-6-7.



- (ii) Normal project duration is 22 weeks and the associated cost is as follows:

$$\begin{aligned} \text{Total cost} &= \text{Direct normal cost} + \text{Indirect cost for 22 weeks.} \\ &= 4,700 + 100 \times 22 = ₹ 6,900. \end{aligned}$$

8. Answer any 4 questions out of 5

[4*4=16]

- (a) Distinguish between Cost Reduction & Cost Control
- (b) Lean Accounting
- (c) Six Sigma
- (d) Steps to be followed to increase the throughput
- (e) Vogel's Approximation Method (VAM).

Answer:

8. (a) Difference between Cost reduction and cost control:

Particulars	Cost Reduction	Cost Control
1. Permanence	Permanent, Real and reflects genuine saving in cost	Represents efforts made towards achievement of pre-determined target or goal,
2. Nature of function	It is a corrective function. It can operate along with an efficient cost control system. This concept Believes that there is always a scope for further reduction in costs.	It is a preventive function, where costs are optimized before these are incurred,
3. Nature of process	It presumes the existence of concerned potential savings in norms or standards and therefore it is a corrective process.	It does not focus on costs independent of revenue nor considers product attributes as given. It is a wholistic control process.
4. Performance evaluation	It is not concerned with maintenance of performance according to standards	The process involves setting up a target, investigating variances and taking remedial measures to correct them
5. Nature of Standards	Continuous process of critical examination includes analysis and challenge of standards. It assumes	It accepts the standards, once they have been fixed. In other words, standards shall remain, as

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	the existence of potential savings in the standards and aims at improving them by bringing out more savings,	it is.
6. Dynamism	Fully a dynamic approach	It is a routine exercise and lacks dynamic approach.
7. Coverage	Universally applicable to all areas of business. Does not depend upon standards, though target amounts may be set.	Limited applicability to those items of cost for which standards can be set.
8. Basic approach	It is not concerned with maintenance of performance according to standards. It challenges the very standards set.	It involves setting up a target, ascertaining the actual performance and doing the variance analysis, followed by remedial actions.

(b) **Lean Accounting:**

Lean Accounting is the general term used for the changes required to a company's accounting, control, measurement, and management processes to support lean manufacturing and lean thinking. Most companies embarking on lean manufacturing soon find that their accounting processes and management methods are at odds with the lean changes they are making. Lean manufacturing breaks the rules of mass production, and so the traditional accounting and management methods are (at best) unsuitable and usually actively hostile to the lean changes the company is making.

Lean Accounting is itself lean, low-waste, and visual, and frees up finance and accounting people's time so they can become actively involved in lean change instead of being merely "bean counters." Companies using Lean Accounting have better information for decision-making, have simple and timely reports that are clearly understood by everyone in the company, they understand the true financial impact of lean changes, they focus the business around the value created for the customers, and Lean Accounting actively drives the lean transformation. This helps the company to grow, to add more value for the customers, and to increase cash flow and value for the stockholders and owners.

(c) **Six Sigma:**

Six Sigma has two key methodologies: DMAIC and DMADV, both inspired by W. Edwards Deming's Plan-Do-Check- Act Cycle: DMAIC is used to improve an existing business process, and DMADV is used to create new product or process designs for predictable, defect-free performance.

DMAIC

Basic methodology consists of the following five (5) steps:

- Define the process improvement goals that are consistent with customer demands and enterprise strategy.
- Measure the current process and collect relevant data for future comparison.
- Analyze to verify relationship and causality of factors. Determine what the relationship

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- is, and attempt to ensure that all factors have been considered.
- Improve or optimize the process based upon the analysis using techniques like Design of Experiments.
 - Control to ensure that any variances are corrected before they result in defects. Set up pilot runs to establish process capability, transition to production and thereafter continuously measure the process and institute control mechanisms.

DMIADV

Basic methodology consists of the following five steps:

- Define the goals of the design activity that are consistent with customer demands and enterprise strategy.
- Measure and identify CTQs (critical to qualities), product capabilities, production process capability, and risk assessments.
- Analyze to develop and design alternatives, create high-level design and evaluate design capability to select the best design.
- Design details, optimize the design, and plan for design verification. This phase may require simulations.
- Verify the design, set up pilot runs, implement production process and handover to process owners.

Some people have used DMAICR (Realize). Others contend that focusing on the financial gains realized through Six Sigma is counter-productive and that said financial gains are simply byproducts of a good process improvement.

- (d) Steps to be followed to increase the throughput The theory of constraints is applied within an organisation by following what are called 'the five focusing steps.' These are a tool that Goldratt developed to help organisations deal with constraints, otherwise known as bottlenecks, within the system as a whole (rather than any discrete unit within the organisation.) The steps are as follows:
- (a) Identify the bottle neck in the system i.e., identification of the limiting factor of the production (or) process such as installing capacity or hours etc.
 - (b) Decide how to exploit the systems bottleneck that means bottleneck resource should be actively and effectively used as much as possible to produce as many goods as possible.
 - (c) Subordinate everything else to the decision made in step (b). The production capacity of the bottleneck resource should determined production schedule.
 - (d) Augment the capacity of the bottleneck resource with the minimum capital input.
 - (e) Identify the new bottlenecks in the process and repeat the same above steps to address the bottlenecks.
- (e) Benefits of Inter-firm Comparison
- (a) Inter-firm Comparison makes the management of the organisation aware of strengths and weakness in relation to other organisations in same industry.
 - (b) As only the significant items are reported to the Management time and efforts are not unnecessary wasted.
 - (c) The management is able to keep up to data information of the trends and ratios and it becomes easier for them to take the necessary steps for improvement.
 - (d) It develops cost consciousness among the members of the industry.

- (e) Information about the organisation is made available freely without the fear of disclosure of confidential data to outside market or public.
- (f) Specialized knowledge and experience of professionally run and successful organisations are made available to smaller units who can take the advantages it may be possible for them to have such an infrastructure.
- (g) The industry as a whole benefits from the process due to increased productivity, standardization of products, elimination of unfair comparison and the trade practices.
- (h) Reliable and collective data enhance the organising power in deal in with various authorities and Government bodies.
- (i) Inter firm comparison assists in a big way in identifying industry sickness and gives a timely warning so that effective remedial steps can be taken to save the organisation.

Paper 15 – Strategic Cost Management and Decision Making

Paper – 15 – Strategic Cost Management and Decision Making

Full Marks : 100

Time allowed: 3 hours

Section - A

1. Answer the following and each question carries 2 marks. [10×2=20]

- (i) If the direct labour cost is reduced by 20% with every doubling of output, what will be the cost of labour for the sixteenth unit produced as an approximate percentage of the cost of the first unit produced?
- (A) 51.2%
(B) 40.96%
(C) 62%
(D) None of these
- (ii) A company has 2,000 units of an obsolete item which are carried in inventory at the original purchase price of ₹ 30,000. If these items are reworked for ₹ 10,000, they can be sold for ₹ 18,000. Alternatively, they can be sold as scrap for ₹ 3,000 in the market. In a decision model used to analyze the reworking proposal, the opportunity cost should be taken as:
- (A) ₹ 8,000
(B) ₹ 12,000
(C) ₹ 3,000
(D) ₹ 10,000
- (iii) By making and selling 9,000 units of a product, a company makes a profit of ₹ 10,000, whereas in the case of 7,000 units, it would lose ₹ 10,000 instead. The number of units to break-even is
- (a) 7,500 units
(b) 8,000 units
(c) 7,750 units
(d) 8,200 units
- (iv) 1200 units of microchips are required to be sold to earn a profit of ₹1,06,000 in a monopoly market. The fixed cost for the period is ₹74,000. The contribution in the monopoly market is as high as 3/4th of its variable cost. Determine the target selling price per unit.
- (a) 450
(b) 325
(c) 400
(d) 350
- (v) A company has the capacity of production of 80000 units and presently it sells 20000 units at ₹ 100 each. The demand is sensitive to selling price and it has been observed that every reduction of ₹ 10 in selling price the demand is doubled. What should be the target cost at full capacity if profit margin on sales is taken at 25%?

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- (a) ₹ 58 lakhs
- (b) ₹ 52 lakhs
- (c) ₹ 48 lakhs
- (d) ₹ 50 lakhs

(vi) A company makes a single product which it sells at ₹10 per unit. Fixed costs are ₹ 48,000 per month and the product has a contribution to sales ratio of 40%. In a period when actual sales were ₹1,40,000, the company's margin of safety in units was:

- (a) 2000
- (b) 3000
- (c) 3500
- (d) 4000

(vii) Which of the following would take place if a company is able to reduce its variable cost?

Contribution Margin	Break-Even Point
(a) Increase	Increase
(b) Decrease	Decrease
(c) Increase	Decrease
(d) Decrease	Increase

(viii) The information relating to the direct material cost of a company is as under:

Particulars	₹
Standard price per unit	3.60
Actual quantity purchased in units	1,600
Standard quantity allowed for actual production in units	1,450
Material price variance on purchase (favourable)	240

What is the actual purchase price per unit?

- (A) ₹ 3.45
- (B) ₹ 3.75
- (C) ₹ 3.20
- (D) ₹ 3.25

(ix) A company operates throughput accounting system. The details of product X per unit are as under:

Particulars	
Selling Price	₹50
Material Cost	₹20
Conversion	₹15
Time on bottleneck resources	10 minutes

The return per hour for product X is:

- (A) ₹ 210
- (B) ₹ 300
- (C) ₹ 180
- (D) ₹ 90

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- (x) A company manufactures two products using common material handling facility. The total budgeted material handling cost is ₹ 60,000. The other details are:

	Product X	Product Y
Number of units produced	30	30
Material moves per product line	5	15
Direct labour hour per unit	200	200

Under activity based costing system the material handling cost to be allocated to product X (per unit) would be:

- (A) ₹ 1,000
 (B) ₹ 500
 (C) ₹ 1,500
 (D) ₹ 2,500

Answer:

1. (i) (b)

1 st	100%
2 nd	80% × 100%
4 th	80% of 2 nd
8 th	80% of 4 th
16 th	80% of 8 th = $0.80 \times 0.80 \times 0.80 \times 0.80 = 40.96\%$

Say, 41% of the time required for the 1st unit.

- (ii) (c) Original price is not relevant

Rework income	₹ 18,000
Deduct cost of rework	10,000
Net inflow	₹ 8,000

It is relevant

The other alternative relevant cash flow is from sale as scrap = ₹ 3,000. Hence, the opportunity cost is ₹ 3,000.

- (iii) (b) 40.96%

Contribution for 2000 units = 20,000 (difference in profits for two output levels)

Hence, contribution per unit = 10.

Substituting in equation $1,00,000 = F + 10,000$. Or $F = 80,000$.

BEP = $80000 / 10 = 8000$.

- (iv) (d) Contribution = $1,06,000 + 74,000 = 1,80,000$

Contribution/Unit = $180000/1200 = 150$

Variable cost/unit = $150 \div \frac{3}{4} = ₹ 200$

Selling price = 350

- (v) (c) Maximum Capacity

80,000 Units

Present Sale

20,000 Units @ ₹ 100/-per Unit

Selling Price/Unit

Demand

100

20,000

90

40,000

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Overheads:	₹
Set-up	60,000
Machines	15,20,000
Receiving	8,70,000
Packing	5,00,000
Engineering	7,46,000

The Company operates a JIT inventory policy and receives each component once per production run.

Required:

(i) Compute the product cost based on direct labour hour recovery rate of overheads.

(ii) Compute the product cost using Activity Based Costing. [4+8=12]

(b) What is Target Cost? How would you determine it? [2+2=4]

Answer:

2. (a) (i) Computation of overhead rate based on direct labour hour hours:

P	60,000	2.5	150000
Q	40,000	4	160000
R	16,000	2	32000
Total			342000

Total Overheads = 60,000 + 15,20,000 + 8,70,000 + 5,00,000 + 7,46,000 = 36,96,000

Overhead rate per direct labour hour = 36,96,000/3,42,000 = 10.807 = 10.81

Product Cost based on direct labour recovery rate:

	P	Q	R
Raw Material	50	40	22
Direct Labour	16	24	12
Overheads @ ₹ 10.81 per hour			
a. × 10.81	27.03		
4 × 10.81		43.24	
2 × 10.81			21.62
Total Cost	93.03	107.24	55.62

Or,

Based on the whole production figures,

	P	Q	R
Production units	60,000	40,000	16,000
Raw Material	30,00,000	16,00,000	3,52,000
Direct Labour	9,60,000	9,60,000	1,92,000
Overheads @ 10.81 per hour			
2.5 × 10.81 × 60000	16,21,800		
4 × 10.81 × 40,000		17,29,600	
2 × 10.81 × 16,000			3,45,920
Total Cost	52,21,800	42,89,600	8,89,920

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(ii) Cost Driver Rates:

Nature of Overhead	Overhead cost (₹)	Total Quantity of activity Driver	Activity Driver	Cost Driver Rate ₹/ unit of Cost driver
Set-up	60,000	60	Production Runs	1000
Machines	15,20,000	294000	Machine Hours	5.17
Receiving	8,70,000	1080	No. of Receipts	805.56
Packing	5,00,000	64	No. of Deliveries	7812.5
Engineering	7,46,000	100	No. of Production Orders	7460
Total				

Overhead allocation to products based on Activity Based Costing: (Total Value for Production units Basis)

Based on the whole production figures,

	P	Q	R
Production units	60,000	40,000	16,000
Raw Material	30,00,000	16,00,000	3,52,000
Direct Labour	9,60,000	9,60,000	1,92,000
Overheads Set-up @ ₹ 1000 per hour production run			
1000x6	6000		
1000x14		14,000	
1000x40			40,000
Machines @ ₹ 5.17 per machine hour			
2.5x60,000x5.17	7,75,500		
2x40,000x5.17		4,13,600	
4x16,000x5.17			3,30,880
Receiving @ 805.56 per receipt			
60x805.56	48,333.60		
140x805.56		1,12,778.40	
880x805.56			7,08,892.80
Packing @ 7812.5 per delivery			
18x7812.5	1,40,625		
6x7812.5		46,875	
40x7812.5			3,12,500
Engineering @ 7460 per production order			
30 x 7460	2,23,800		
20 x 7460		1,49,200	
50x7460			3,73,000
Total Overhead Cost	11,94,258.60	7,36,453.40	17,65,272.80
Total Cost	51,54,258.60	32,96,453.40	23,09,272.80

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On a per unit cost basis,

	P	Q	R
Production Units	60,000	40,000	16,000
Raw material	50	40	22
Direct Labour	16	24	12
Overheads			
Set-up @ ₹ 1000 per production run 1000x6/60000 1000x14/40,000 1000x40	0.10	0.35	2.50
Machines @ ₹ 5.17 per machine hour 2.5x60,000x5.17/60000 2x40,000x5.17/40,000 4x16,000x5.17/16000	12.93	10.34	20.68
Receiving @ 805.56 per receipt 60x805.56/60000 140x805.56/40,000 880x805.56/16,000	0.81	2.82	44.31
Packing @ 7812.5 per delivery. 18x7812.5/60000 6x7812.5/40,000 40x7812.5/16000	2.34	1.17	19.53
Engineering @ 7460 per production order 30 x 7460 / 60000 20 x 7460 / 40,000 50x7460/16000	3.73	3.73	23.31
Total Overhead Cost	19.91	18.41	110.33
Total Cost	85.91	82.41	144.33

Note: Figures could vary slightly due to different decimal approximations considered by students for cost driver rates or in other calculations.

The question contains the raw material cost totaling to 24,76,000. But on multiplying the per unit raw material cost, we get 49,52,000. This is given wrongly in the question.

- (b) Target Cost is the cost at which a proposed product with specified functionality and quality must be produced to generate a desired level of profitability at its anticipated selling price.

Or

Target cost is Target selling price less the required profit margin

The target selling price is the price that is dictated by competition in case there are comparable products, or the perceived value that a customer will pay for the product in case there is no competition.

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The desired profit level is fixed by the seller. The difference between the selling price and the profit margin represents the target cost to be achieved by design or cost reduction or by economies of scale or by other means.

How to determine target cost:

The market requirement is identified regarding design, utility, need for the product.

Target selling price is determined based on customer expectation and sales forecast.

Target production volume is set based on price volume relationship

Target profit margin is established based on the company's long term profit objectives, projected volumes, course of action, etc.

The target cost or allowable cost is determined as the target selling price minus the target profit margin.

- 3. (a) Excel Electronics manufacturing electronic equipments is currently procuring component A from a local supplier at a cost of ₹60 each. The company is presently considering the proposal for installing a machine for the manufacture of the component. It has two alternative proposals as under:**

(A) Installation of semi-automatic machine involving an annual fixed expenditure of ₹36 lakhs and a variable cost of ₹24 per component manufactured.

(B) Installing an automatic machine involving an annual fixed expenditure of ₹ 60 lakhs and a variable cost of ₹ 20 per component manufactured.

You are required to:

- (i) Find the annual requirement of components to justify a switch-over from procurement of components to manufacture of the same by installing (I) semiautomatic machine and (II) automatic machine.**
- (ii) Advise the company on the machine to be installed if the annual requirement of the components is 5,00,000 units.**
- (iii) Advise the company at what annual volume it should select automatic machine instead of semi-automatic machine. [3+3+2=8]**

- (b) Write eight steps of Business process re-engineering suggested by Vakola et al. (1998). [8]**

Answer:

3. (a) (i)

	Semi-Automatic machine (₹)	Automatic Machine (₹)
Purchase price of the component		
Variable Cost	60	60
Saving	24	20
	36	40
Fixed Cost	36,00,000	60,00,000
Components required to be produced to justify the installation of the machine	$36,00,000/36 = 1,00,000$	$60,00,000/40 = 1,50,000$

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(ii) If the annual requirement is 5,00,000 units:

Variable Cost	1,20,00,000	1,00,00,000
Fixed Cost	36,00,000	60,00,000
Total cost	1,56,00,000	1,60,00,000

Recommendation: Install semi-automatic machine.

(iii)

Fixed costs for Automatic machine	₹ 60,00,000
(-) Fixed costs for semi – Automatic machine	₹ 36,00,000
Difference	₹ 24,00,000

Volume required to justify Automatic machine = $24,00,000 / 4 = 6,00,000$ components.

(b) Business process re-engineering (BPR)

Business process re-engineering (BPR) is a business management strategy, originally pioneered in the early 1990s, focusing on the analysis and design of workflows and processes within an organization. BPR seeks to help companies radically restructure their organizations by focusing on the ground-up design of their business processes. Business process re-engineering is also known as business process redesign, business transformation, or business process change management. The globalization of the economy and the liberalization of the trade markets have formulated new conditions in the market place which are characterized by instability and intensive competition in the business environment. Competition is continuously increasing with respect to price, quality and selection, service and promptness of delivery. Removal of barriers, international cooperation, technological innovations cause competition to intensify. All these changes impose the need for organizational transformation, where the entire processes, organization climate and organization structure are changed.

The eight proposed stages, as SUGGESTED BY Vakola et al. (1998) are as follows:

- Develop Vision and Objectives
- Understand existing processes
- Identify Process for Re-design
- Identify Change Levers
- Implement the new process
- Make new process operational
- Evaluate the new process
- Monitor ongoing continuous improvement.

4. (a) ANRO use traditional standard costing system. The inspection and setup costs are actually ₹ 1,760 against a budget of ₹ 2,000.

ABC system is being implemented and accordingly, the number of batches is identified as the cost driver for inspection and setup costs. The budgeted production is 10,000 units in batches of 1,000 units, whereas actually, 8,800 units were produced in 11 batches.

(i) Find the volume and total fixed overhead variance under the traditional standard costing system.

(ii) Find total fixed overhead cost variance under the ABC system.

[10]

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(b) One kilogram of product 'kit' requires two chemicals A and B. The following were the details of product 'Kit' for the month of June, 2017:

- (a) Standard mix Chemical 'A' 50% and Chemical 'B' 50%
- (b) Standard price per kilogram of Chemical 'A' ₹ 12 and Chemical 'B' ₹ 15
- (c) Actual input of Chemical 'B' 70 kilograms
- (d) Actual price per kilogram of Chemical 'A' ₹ 15
- (e) Standard normal loss 10% of total input.
- (f) Materials cost variance total ₹ 650 adverse
- (g) Materials Yield variance total ₹ 135 adverse.

You are required to calculate:

1. Materials mix variance total
2. Materials usage variance total
3. Materials price variance total
4. Actual loss of actual input
5. Actual input of chemical 'A'
6. Actual price per kilogram of Chemical 'B'

[6]

Answer:

4. (a) (i) Calculation of volume and total fixed overhead under Traditional Standard Costing System:

Budgeted overhead cost per unit = ₹ 2,000/10,000 units = ₹ 0.20

Actual overhead cost per unit = ₹ 1,760/8,800 units = ₹ 0.20

Total fixed overhead variance = Absorbed budgeted overhead - Actual overhead
= (₹ 0.20 × 8,800 units) - ₹ 1,760 = Nil

Fixed overhead expenditure variance = Budgeted overhead - Actual overhead
= 2,000 - 1,760 = ₹240 (F)

Standard absorption rate = ₹ 2,000/10,000 units = ₹ 0.20 per unit

Fixed overhead volume variance = Standard absorption rate × (Budgeted units - Actual units) = ₹ 0.20 (10,000 units - 8,800 units) = ₹ 240 (A)

Verification:

Total fixed overhead variance = Expenditure variance + Volume variance = 240 (F) + 240 ((A) = Nil

(ii) Calculation of fixed overhead cost variance under ABC System

Particulars	Budget	Actual	ABC Standard
Total Cost (₹)	2,000	1,760	1,800
Production (units)	10,000	8,800	8,800
No. of batches	10	11	9
Batch size (units/batch)	1,000	800	1,000
Cost per batch	200	160	200

Under ABC 8,800 units should have been produced in standard batch size of 1,000 units/batch.

No. of batches = 8,800/1,000 = 9 approx.

Standard cost under ABC = Budgeted cost per batch × ABC standard number of batches = ₹ 200 × 9 = 1,800

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Under ABC, variability is with respect to batches and not units Absorbed overheads
 = 9 batches × Standard rate per batch
 = 9 × ₹ 200
 = ₹ 1,800

Actual overheads = ₹ 1,760

Total overheads cost variance = ₹ 40 (F)

- (b) Let, actual output of chemical A be 'a' kgs
 Actual price per Kg of chemical B be ₹ b
 Standard input be 100Kgs
 Actual output be 90Kgs

	Standard			Actual		
	Q	P	V	Q	P	V
A	50	12	600	A	15	15a
B	<u>50</u>	15	<u>750</u>	<u>70</u>	B	<u>70b</u>
	100		1350	70+a		15a+70b
(-) Normal Loss	<u>10</u>	--	--	<u>a-20</u>	--	--
	90		1350	90		15a+70b

	(1)	(2)	(3)	(4)
	SQSP	RSQSP	AQSP	AQAP
A		$12 \times (70 + a/100) \times 50$	$12 \times a$	
B		$15 \times (70 + a/100) \times 50$	15×70	
	1350	$945 + 13.5a$	$1050 + 12a$	$15a + 70b$

$$\begin{aligned} \text{Given material cost variance} &= (1) - (4) = -650 \\ &= 15a + 70b \\ &= ₹ 2000 \end{aligned}$$

$$\begin{aligned} \text{Material yield variance} &= (1) - (2) = -135 \\ \Rightarrow a &= 40 \Rightarrow b = 20 \end{aligned}$$

- 1) SQSP = ₹ 1350
- 2) RSQSP = $945 + (13.5 \times 40) = ₹ 1485$
- 3) AQSP = $1050 + (12 \times 40) = ₹ 1530$
- 4) AQAP = $(15 \times 40) + (70 \times 20) = ₹ 2000$
 - (a) Material mix variance = ₹ 45(A)
 - (b) Material usage variance = ₹ 180(A)
 - (c) Material price variance = ₹ 470(A)
 - (d) Actual loss of actual input = ₹ 20
 - (e) Actual input of chemical A = 40Kgs
 - (f) Actual price per Kgs of chemical B = ₹ 20

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5. (a) What is Bench trending and how does it differ from Bench Marking?

[8]

(b) You are given, in respect of a manufacturing company, the following activity centres and their costs for a period:

	₹
1. Material handling	8,000
2. Machining	5,000
3. Assembly	4,800
4. inspection	1,400

The other particulars are:

	₹
Number of materials parts	80,000
Machine hours	150
Numbers of assembly parts	8,000
Number of finished units	1,000

(i) Calculate overhead allocation rates using ABC.

(ii) What will be the cost of a product which uses the following?

8 units of materials

One-fourth of the machine hour

8 assembly parts (₹100)

Power etc. (₹10)

Given direct material cost for one unit ₹200.

[4+4=8]

Answer:

5. (a) Continuous monitoring of specific process performance with a selected group of benchmarking is a systematic and continuous measurement process of comparing through measuring an organization business processes against business leaders (role models) anywhere in the world, to gain information that will help organization take action to improve its performance. The continuous process of enlisting the best practices in the world for the processes, goals and objectives leading to world class levels of achievement.

Benchmarking is the process of comparing the cost, time or quality of what one organization does against what another organization does. The result is often a business case for making changes in order to make improvements.

Benchmarking is a powerful management tool because it overcomes "paradigm blindness". Paradigm Blindness can be summed up as the mode of thinking, "the way we do it is the best because this is the way we've always done it". Bench Marking opens organizations to new methods, ideas and tools to improve their effectiveness. It helps crack through resistance to change by demonstrating other methods of solving problems than the one currently employed and demonstrating that they work, because they are being used by others.

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(b) (i) Allocation rates:

	Per unit of application base (₹)
Material handling (₹ 8,000 ÷ 80,000)	0.10
Machining (₹ 5,000 ÷ 150)	33.33
Assembly (₹ 4,800 ÷ 8,000)	0.60
Inspection (₹ 1,400 ÷ 1,000)	1.40

(ii) Cost Statement:

		Per unit (₹)
Direct Material		200
Power etc.		10
Variable Costs		210
Other Costs:		
Material handling (8 parts × 0.10)	0.80	
Machining (1/4 × ₹ 33.33)	8.33	
Assembly (8 parts × 0.60)	4.80	
Inspection (1 unit × 1.40)	1.40	15.33
Total		₹ 225.33

6. (a) An automobile production line turns out about 100 cars a day, but deviations occur owing to many causes. The production is more accurately described by the probability distribution given below:

Production /Day	Probability	Production /Day	Probability
95	0.03	101	0.15
96	0.05	102	0.10
97	0.07	103	0.07
98	0.10	104	0.05
99	0.15	105	0.03
100	0.20		
		Total	1.00

Finished cars are transported across the bay, at the end of each day, by ferry. If the ferry has space for only 101 cars, what will be the average number of cars waiting to be shipped, and what will be the average number of empty space on the boat? [8]

(b) A company has four zones open and four salesmen available for assignment. The zones are not equal rich in their sales potentials. It is estimated that a typical salesman operating in each zone would bring in the following annual sales:

Zone: A: 1,26,000; Zone: B: 1,05,000; Zone: C: 84,000; Zone: D: 63,000.

The four sales men are also considered to differ in ability. It is estimated that working under the same condition their yearly sales would be proportionately as follows:

Salesman P: 7; Salesman Q: 5; Salesman R: 5; Salesman S: 4.

If the criterion is maximum expected total sales, the intuitive answer is to assign the best salesman to the richest zone, the next best to the second richest zone and so on. Verify this by the method of assignment. [8]

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Answer:

6. (a)

Simulation of data of an Automobile Production line			
Production/day	Probability	Cumulative Probability	Random No. Range
95	0.03	0.03	0-2
96	0.05	0.08	3-7
97	0.07	0.15	8-14
98	0.10	0.25	15-24
99	0.15	0.40	25-39
100	0.20	0.60	40-59
101	0.15	0.75	60-74
102	0.10	0.85	75-84
103	0.07	0.92	85-91
104	0.05	0.97	92-96
105	0.03	1.00	97-99
	1.00		

Stimulated Data				
Day	Random No.	Production	No. of cars waiting to be shipped	No. of empty space on the boat
1	20	98	--	3
2	63	101	--	--
3	46	100	--	1
4	16	98	--	3
5	45	100	--	1
6	41	100	--	1
7	44	100	--	1
8	66	101	--	--
9	87	103	2	--
10	26	99	--	2
11	78	102	1	--
12	40	100	--	1
13	29	99	--	2
14	92	104	3	--
15	21	98	--	3
Total			6	18

Average no. of cars waiting to be shipped = $6/15 = 0.40$

Average no. of empty space on the boat = $18/15 = 1.2$

(b)

Sales Man	A	B	C	D		Loss Matrix
P	42	35	28	21	0	7 14 21
Q	30	25	20	15	12	17 22 27
R	30	25	20	15	12	17 22 27
S	24	20	16	12		

Row Operation

0	7	14	21
0	5	10	15
0	5	10	15
1	4	8	12

Column Operation

0	3	6	9
0	1	2	3
0	1	2	3
0	0	0	0

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Row Operation	Column Operation
$\begin{array}{cccc} \boxed{0} & 2 & 5 & 8 \\ D & \boxed{0} & 1 & 2 \\ \hline 0 & 0 & 1 & 2 \\ \vdots & 0 & \boxed{0} & 0 \end{array}$	$\begin{array}{cccc} \boxed{0} & 2 & 4 & 7 \\ \hline 0 & \boxed{0} & 0 & 1 \\ \hline 0 & 0 & \boxed{0} & 1 \\ \hline 2 & 1 & 0 & \boxed{0} \end{array}$

P	→	A	-	42
Q	→	B	-	25
R	→	C	-	20
S	→	D	-	<u>12</u>

$$\underline{99} \times 3000 = ₹ 2,97,000 \text{ Maximum Sales}$$

7. (a) XYZ Auto-manufacturing company has to prepare a design of its latest model of motorcycle. The various activities to be performed to prepare a design are as follows:

Activity	Description of activity	Preceding activity
A	Prepare drawing	---
B	Carry out cost analysis	A
C	Carry out financial analysis	A
D	Manufacture tools	C
E	Prepare bill of material	B, C
F	Receive material	D, E
G	Order sub-accessories	E
H	Receive sub-accessories	G
I	Manufacture components	F
J	Final assembly	I, H
K	Testing and shipment	J

Prepare an appropriate network diagram.

[8]

- (b) A Company produces the products P, Q and R from three raw materials A, B and C. One unit of product P requires 2 units of A and 3 units of B. A unit of product Q requires 2 units of B and 5 units of C and one unit of product R requires 3 units of A, 2 unit of B and 4 units of C. The company has 8 units of material A, 10 units of B and 15 units of C available to it. Profits/unit of products P, Q and R are ₹ 3, ₹ 5 and ₹ 4 respectively.

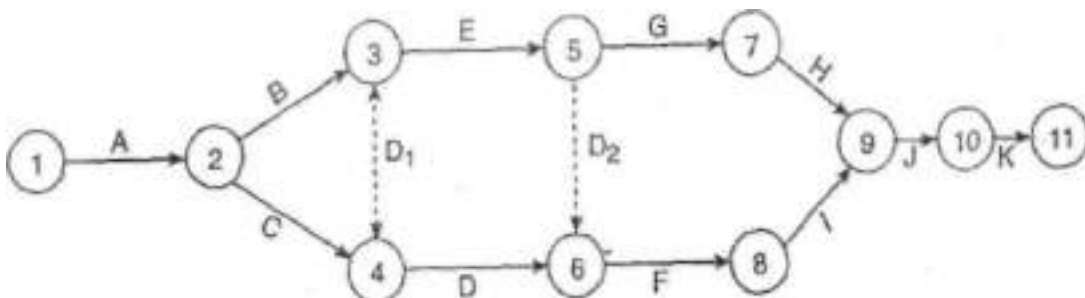
(a) Formulate the problem mathematically,

(b) Write the Dual problem.

[8]

Answer:

7. (a) The network diagram will be as follows:



(b)

Raw Materials	P	Q	R	Available units
A	2	-	3	8
B	3	2	2	10
C	-	5	4	15

Profits 3/- 5/- 4/-

Let x_1 be the no. of units of P

Let x_2 be the no. of units of Q

Let x_3 be the no. of units of R

Objective function: Max. $Z = 3x_1 + 5x_2 + 4x_3$

Subject to constraints:

$$2x_1 + 3x_2 \leq 8$$

$$3x_1 + 2x_2 + 2x_3 \leq 10$$

$$5x_2 + 4x_3 \leq 15$$

And $x_1, x_2, x_3 \geq 0$.

Primal

$$\text{Max. } Z = 3x_1 + 5x_2 + 4x_3$$

Subject to

$$2x_1 + 3x_2 \leq 8$$

$$3x_1 + 2x_2 + 2x_3 \leq 10$$

$$5x_2 + 4x_3 \leq 15$$

And $x_1, x_2, x_3 \geq 0$

Dual

$$\text{Min. } Z = 8y_1 + 10y_2 + 15y_3$$

Subject to

$$2y_1 + 3y_2 \geq 3$$

$$3y_1 + 2y_2 + 5y_3 \geq 5$$

$$2y_2 + 4y_3 \geq 4$$

And $y_1, y_2, y_3 \geq 0$

$$2x_1 + 3x_2 + S_1 = 8$$

$$3x_1 + 2x_2 + 2x_3 + S_2 = 10$$

$$5x_2 + 4x_3 + S_3 = 15$$

$$\text{Max } Z = 3x_1 + 5x_2 + 4x_3 + 0.S_1 + 0.S_2 + 0.S_3$$

$$\therefore x_1 = 23/20 \quad x_2 = 19/10 \quad x_3 = 11/8$$

$$Z = 18.45$$

8. Answer any 4 questions out of 5

[4*4=16]

(a) Simulation Technique

(b) Kaizen Costing

(c) The Variants of Backflush Accounting

(d) Principles of Total Quality Management (TQM)

(e) Uses of Learning Curve

Answer:

8. (a) Simulation:

Simulation is a modelling and analysis tool that is widely used for the purpose of designing, planning and control of manufacturing systems. Simulation in general is to pretend that one deals with a real thing while really working with an imitation. In Operations Research, the imitation is a computer model of the simulated reality. The task of executing simulations provides insight and a deep understanding of physical processes that are being modelled.

Simulation is generally referred to as computer simulation, which simulates the operation of a manufacturing system. A computer simulation or a computer model is a computer program, which attempts to simulate an abstract model of a particular system.

A simple example of a simulation involves the tossing of a ball into the air. The ball can be said to "simulate" a missile, for instance. That is, by experimenting with throwing balls starting at different initial heights and initial velocity vectors, it can be said that we are simulating the trajectory of a missile.

Monte Carlo method of simulation is the most popular method of simulation. In Linear Programming, Simulation is called as the 'technique of last resort'. It means, when all other methods fails, we resort to Simulation as the last resort.

(b) Kaizen Costing:

The initial VE review may not be complete and perfect in all cost aspects. There may be further chances of waste reduction, cost and time reduction and product improvement. Such continuous cost reduction technique is called as Kaizen Costing.

Kaizen Costing refers to the ongoing continuous improvement program that focuses on the reduction of waste in the production process, thereby further lowering costs below the initial targets specified during the design phase. It is a Japanese term for a number of cost reduction steps that can be used subsequent to issuing a new product design to the factory floor.

Toyota's Experience of Kaizen Costing: Toyota aggressively pursued Kaizen Costing to reduce costs in the manufacturing phase. Methods for achieving these kaizen goals include cutting material costs per unit and improvement in standard operating procedures. These are pursued based on employee's suggestions. About two million suggestion were received from Toyota employees in t\one recent year alone roughly thirty-five per employee. Ninety-seven percent of them were adopted. This is really a prime example of concept of employee empowerment in which workers are encouraged to take their own initiatives to improve operations, reduce costs, and improve product quality and customer service.

(c) The Variants of Backflush Accounting

There are a number of variants of the Backflush system, each differing as to the 'trigger points' at which costs are recognized within the cost accounts and thus associated with products. All variants, however, have the following common features:

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- the focus is on output – costs are first associated with output (measured as either sales or completed production) and then allocated between stocks and costs of goods sold by working back.
- Conversion costs (labour and overheads) are never attached to products until they are complete (or even sold) – thus the traditional WIP account doesn't exist.

Two variants of the Backflush system are summarized below. Note that in each as conversion costs (labour and overheads) are incurred they will be recorded in a conversion cost (CC) account.

Variant 1

This has two trigger points (TP):

TP 1 - purchase of raw materials / components. A 'raw and in process (RIP)' account will be debited with the actual cost of materials purchased, and creditors credited.

TP 2 - completion of good units. The finished goods (FG) account will be debited with the standard cost of unit produced and the RIP and CC account will be credited with the standard cost.

Under this variant, then, there will be two stock accounts:

- raw materials (which may, in fact, be incorporated into WIP)
- finished goods

Variant 2

This has only one trigger point – the completion of good units. The FG account is debited with the standard cost of units produced, with corresponding credits to the CC account and the creditors account.

Thus the cost records exclude:

- raw materials purchased but not yet used for complete production
- the creditors for these materials (and any price variance)

and there is only stock account, carrying the standard cost of finished goods stock.

Other variants include those using the sale of complete goods units as a trigger point for the attachment of conversion cost to unit - thus there is no finished goods account, just a raw materials stock account, carrying the materials cost of raw materials, WIP and finished goods.

(d) Principles of Total Quality Management (TQM):

The philosophy of TQM rest on the following principles, which are enlisted below:

- (i) Clear exposition of the benefits of a project.
- (ii) Total Employee Involvement (TEI).
- (iii) Process measurement.
- (iv) Involvement of all customers and contributors.
- (v) Elimination of irrelevant data.
- (vi) Understanding the needs of the whole process.
- (vii) Use of errors to prompt continuous improvement.
- (viii) Use of statistics to tell people how well they are doing.

(e) **Uses of Learning curve**

Learning curve is now being widely issued in business. Some of the uses are as follows:

1. Where applicable the learning curve suggests great opportunities for cost reduction to be achieved by improving learning.
2. The learning curve concept suggests a basis for correct staffing in continuously expanding production. The curve shows that the work force need not be increased at the same rate as the prospective output. This also helps in proper production planning through proper scheduling of work; providing manpower at the right moment permitting more accurate forecast of delivery dates.
3. Learning curve concept provides a means of evaluating the effectiveness of training programs.
4. Learning curve is frequently used in conjunction with establishing bid price for contracts. Usually, the bid price is based on the cumulative average unit cost for all the units to be produced for a given contract. If production is not interrupted. Additional units beyond this quantity should be costed at the increment costs incurred, and not at the previous cumulative average. If the contract agreement so provides, a contract may be cancelled and production stopped before the expected efficiency is reached.
5. The use of learning curve, where applicable, is important in the working capital required. If the requirement is based on average cumulative unit cost, the revenues from the first few units may not cover the actual expenditures.
6. As employees become more efficient, the rate of production increases and so more materials are needed, the work-in-progress inventory turns over faster, and finished goods inventory grows at an accelerated rate.
7. Learning curve techniques are useful in exercising control, Variable norms can be established for each situation, and a comparison between these norms and actual expenses can be made. Specific or average incremental unit cost should be used for this purpose.
8. The learning curve may be used for make-or- buy decisions especially if the outside manufacturer has reached the maximum on the learning curve. Help to calculate the sensitive rates in wage bargaining.

Paper 15 – Strategic Cost Management – Decision Making



Paper – 15

Strategic Cost Management – Decision Making

Full Marks : 100

Time allowed: 3 hours

Section - A

1. Answer the following and each question carries 2 marks. [10×2=20]

- (i) A company produces a product which is sold at a price of ₹80. Its Variable cost is ₹32. The company's Fixed cost is ₹11, 52,000 p.a. The company operates at a margin of safety of 40%.

The total sales of the company are:

- (a) 4000 units
(b) 40,000 units
(c) 30,000 units
(d) 20,000 units

- (ii) For a Learning Curve percentage of 72%, the time to be taken to complete the 4th unit of a 12-unit job involved in the assembly line, if the initial unit requires 80 hours, will be

- (a) 43.50 hrs
(b) 41.47 hrs
(c) 46.71 hrs
(d) 40.95 hrs

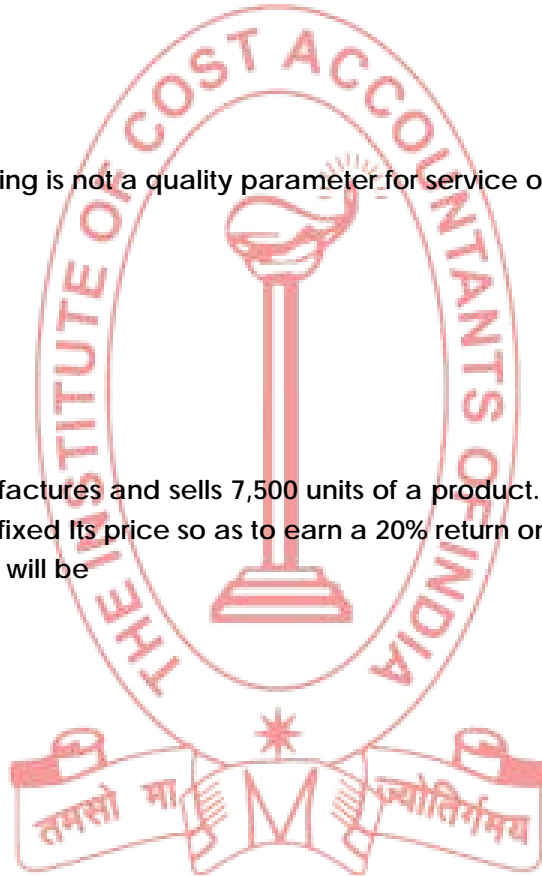
- (iii) The following information relates to ABC Ltd.

Activity level	60%	80%
Variable costs (₹)	12,000	16,000
Fixed costs (₹)	20,000	22,000

The differential cost for 20% capacity is:

- (a) ₹4,000
(b) ₹2,000
(c) ₹6,000
(d) ₹5,000

- (iv) Which of the following is NOT a method of transfer pricing?
- (a) Cost plus transfer price
 - (b) Internal price plus transfer price
 - (c) Market-based transfer price
 - (d) Two part transfer price
- (v) If project A has a net present value (NPV) of ₹ 30,00,000 and project B has an NPV of ₹ 50,00,000, what is the opportunity cost if project B is selected?
- (a) ₹ 23,00,000
 - (b) ₹ 30,00,000
 - (c) ₹ 20,00,000
 - (d) ₹ 50,00,000
- (vi) Which of the following is not a quality parameter for service organizations?
- (a) Consistency
 - (b) Friendliness
 - (c) Durability
 - (d) Promptness
- (vii) Desktop Co. manufactures and sells 7,500 units of a product. The full cost per unit is ₹100. The Company has fixed its price so as to earn a 20% return on an investment of ₹9,00,000. Target selling price will be
- (a) ₹ 100
 - (b) ₹ 124
 - (c) ₹ 200
 - (d) None of these
- (viii) Twin Ltd. uses JIT and back flush accounting. It does not use a raw material stock control account. During March 2019, 10000 units were produced and sold. The standard cost per unit is ₹ 150 which includes materials of ₹ 60. During March 2019, ₹ 9,90,000 of conversion costs were incurred. The debit balance in cost of goods sold account for March 2019 should be
- (a) ₹ 14,10,000
 - (b) ₹ 14,80,000
 - (c) ₹ 15,90,000
 - (d) ₹ 16,20,000



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(ix) The preparation and use of standard costs, their comparison with actual costs and the measurement and analysis of variances to originating causes is defined as:

- (a) Marginal Costing
- (b) Standard Costing
- (c) Throughput Costing
- (d) Kaizen Costing

(x) In the context of Critical Path Analysis, the portion of the float of an activity which cannot be consumed without affecting adversely the float of the subsequent activities is called

- (a) Free float
- (b) Interfering float
- (c) Independent float
- (d) Total float

Answer:

(i) (b) $SP ₹ 80 - VC ₹ 32 = \text{Contribution } ₹ 48$

F.C. ₹ 11,52,000

B.E.P. = $₹ 11,52,000 / ₹ 48 = 24,000$ units

MOS = 40% and hence B.E.P. = 60%

Total sales = = 40,000 units. $(24,000 \times 100/60 = 40,000)$

(ii) (b) At 72% Learning Curve, T-4 - Time taken by the 4th Unit = $80 (.72)(.72) = 41.47$ hrs.

Note: In the arithmetic method followed above, every time the number of repetitions doubles, the time to perform the activity is reduced by the Learning Curve Coefficient.

(iii) (c) Explanation: Differential Costs = Differences in Fixed and Variable Cost = $₹(4000 + 2,000) = ₹6,000$.

(iv) (b) Internal price plus transfer price

The internal price is just another name for the TP. So it is not a method of transfer pricing.

(v) (b) ₹ 30,00,000

Explanation: Opportunity cost represents the next best alternative foregone.

If B is chosen, A is being foregone and hence the NPV of 30,00,000 is the present value of the opportunity lost.

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(vi) (c) Durability

Opportunity Cost of Project B is ₹ (50,00,000 – 30,00,000) = ₹ 20,00,000

(vii) (b) ₹ 124

Target Sale Price per unit = Full Cost + Target Profit

$$= ₹ 100 + \{(9,00,000 \times 20\%)\} / 7500 = ₹ (100 + 24) = ₹ 124$$

(viii) (c) ₹ 15,90,000

Standard cost of goods sold (10,000 units @ ₹150)	₹15,00,000
Less : Std. material cost (10,000 @ ₹ 60)	<u>₹6,00,000</u>
Standard conversion cost	₹9,00,000
Conversion cost incurred	<u>9,90,000</u>
Excess charged to cost of goods sold a/c. (debit)	90,000
Total debit balance of cost of goods sold Account = ₹ 15,00,000 + ₹90,000	
	= ₹ 15,90,000

(ix) (b) Explanation: It is standard costing that involves the process described.

(x) (b) Explanation : Interfering float is that part of the total float which causes a reduction in the float of the successor activities. It is the difference between the latest finish time of the activity in question and the earliest starting time of the following activity or zero, whichever is larger.

Section – B

Answer any five questions from question nos. 2 to 8. Each question carries 16 marks.

2. (a) Explain the concepts of Throughput Accounting. 8

(b) Explain Network Analysis narrating its practical applications. 8

Answer:

(a) **Throughput Accounting (TA):** Variable cost accounting presentation based on the definition of throughput (sales minus material and component costs). Sometimes, it is referred to as super variable costing because only material costs are treated as variable.--- CIMA

Throughput Accounting is a management accounting technique used as a performance measure in the theory of constraints. It is the business intelligence used for maximizing profits. It seeks to increase the velocity or speed of production of products and services keeping in view the constraints. It is based on the concept that a company must determine its overriding goal and then it should create a system that clearly defines the main capacity constraint that allows it to maximize that goal. The changes that this concept causes are startling.

Throughput Concepts

- (i) **Throughput:** Throughput is the excess of sales value over the totally variable cost.
- (ii) **Totally Variable Cost:** This cost is incurred only if a product is produced. In many cases only direct materials are considered as totally variable cost. Direct labour is not totally variable, unless piece rate wages are paid.
- (iii) **Bottleneck Resource:** It is a resource within a company that limits its total output. For example, it can be a machine that can produce only a specified amount of a key component in a given time period, thereby keeping overall sales from expanding beyond the maximum capacity of that machine. There may be more than one capacity constraint in a company.
- (iv) **Throughput (or Cycle) Time:** Throughput (or cycle) time is the average time required to convert raw materials into finished goods ready to be shipped to customer. It includes the time required for activities such as material handling, production processing, inspecting and packaging.
- (v) **Throughput Time Ratio:** It is the ratio of time spent adding customer value to products and services divided by total cycle time. It is also known as the 'ratio of work content to lead time'.
- (vi) **Total Factory Cost:** With the exception of material costs, in the short run, most factory costs (including direct labour) are fixed. These fixed costs can be grouped together and called total factory costs (TFC).

(b) Net Work Analysis

Network analysis is the general name given to PERT and CPM techniques which can be used for planning, management and control of a project.

Network is a graphical representation of all the activities and events of a project arranged in a logical and sequential order. In this context, activity is the actual performance of the job which consumes resources like time, human resources, money, material, etc. An event refers to the starting point or completion point of a job.

Net work Analysis acts as a management tool for breaking down projects into components or individual activities and recording the result on a flow chart or network diagram. These results generally reveal information that is used to determine duration, resource limitations and cost estimates associated with the project.

A project is a combination of interrelated activities all of which must be executed in a certain order for its completion. Project management and efficient resource allocation are two critical aspects of the production and operations managers' responsibilities. Since a project is non-repetitive and temporal in nature, the mode of management differs from the usual job shop or other related types of scheduling.

Network analysis enables us to take a systematic quantitative structural approach to the problem of managing a project through to successful completion. Also, since it has a graphical representation, it can be easily understood and used by those with a less technical background.

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Avenues of Application

1. Construction of Buildings and Complexes
2. Ship building
3. Satellite mission development
4. Installation of a pipe line project
5. Research & Development
6. Inventory Planning & Control
7. Traffic flow Control
8. Long Range Planning
9. And so on ...

PERT has the ability to cope with uncertainty in activity completion times while CPM emphasizes on the trade-off between cost of the project and its overall completion time.

3. (a) A Company manufactures two products X and Y. Product X requires 8 hours to produce while Y requires 12 hours. In April, 2018, of 22 effective working days of 8 hours a day, 1,200 units of X and 800 units of Y were produced. The company employs 100 workers in production department to produce X and Y. The budgeted hours are 1, 86,000 for the year. Calculate Capacity, Activity and Efficiency ratios and establish their relationship. 8
- (b) Explain and enumerate 'Costs of Quality' under different groups. 8

Answer:

(a)

		(Hours)
Standard hours of production		
Product X	(1,200 units x 8 hrs.)	9,600
Product Y	(800 units x 12 hrs.)	9,600
Total standard hours		19,200
Actual hours worked		17,600
Budgeted hours per month		15,500

$$\text{Capacity Ratio} = \frac{\text{Actual Hours Worked}}{\text{Budgeted hours p.m.}} \times 100 = \frac{17,600 \times 100}{15,500} = 113.55\%$$

$$\text{Efficiency Ratio} = \frac{\text{Standard hours of production}}{\text{Actual Hours Worked}} \times 100 = \frac{19,200 \times 100}{17,600} = 109.09\%$$

$$\text{Activity Ratio} = \frac{\text{Standard hours of production}}{\text{Budgeted hours p.m.}} \times 100 = \frac{19,200 \times 100}{15,500} = 123.87\%$$

Relationship of Ratios

$$\text{Activity Ratio} = \frac{\text{Efficiency Ratio} \times \text{Capacity Ratio}}{100} = \frac{109.09 \times 113.55}{100} = 123.87$$

(b) Costs of Quality

Costs of quality have a great implication in overall cost of the product or services. Off late, organizations have started appreciating the high cost of poor quality. The most obvious consequence occurs when poor quality creates dissatisfied customers and eventually leads to loss of business. However quality has many other costs, which can be divided into two categories. The first category consists of quality control costs necessary for achieving high quality. These are of two types viz. prevention costs and appraisal costs. The second category consists of the cost consequences of poor quality, which are called quality failure costs. These include external failure costs and internal failure costs.

Prevention costs are all costs incurred in the process of preventing quality lapses to occur. They include quality planning costs, such as the costs of developing and implementing a quality plan. Also included are the costs of product and process design, from collecting customer information to designing processes that achieve conformance to specifications. Employee training in quality measurement is included as part of this cost, as well as the costs of maintaining records of information and data related to quality.

Appraisal costs are incurred in the process of uncovering defects. They include the cost of quality inspections, product testing, and performing audits to make sure that quality standards are being met. Also included in this category are the costs of worker time spent measuring quality and the cost of equipment used for quality appraisal.

Internal failure costs are associated with discovering poor product quality before the product reaches the customer site. One type of internal failure cost is rework, which is the cost of correcting the defective item. Sometimes the item is so defective that it cannot be corrected and must be thrown away. This is called scrap, and its costs include all the material, labour, and machine cost spent in producing the defective product.

External failure Costs are incurred when inferior products are delivered to customers. They include cost of handling customer complaints, warranty replacements, repairs of returned products and costs arising from a damaged company reputation.

4. XYZ. Limited makes three main products, using broadly the same production methods and equipment for each. A conventional product costing system is used at present, although Activity Based Costing (ABC) system is being considered. Details of the three products, for a typical period are:

	Labour Hours per Unit	Machine Hours per unit	Material (₹ Per unit)	Volumes (Units)
Product X	1 ½	3 ½	25	3,500
Product Y	½	2	15	2,250
Product Z	2	5	30	6,000

Direct labour costs are ₹8 per hour and production overheads are absorbed on a machine hour basis. The rate for the period is ₹18 per machine hour.

Answer_MTP_Final_Syllabus-2016_June 2019_Set -1

Further analysis shows that the total of production overheads can be divided as follows

	%
Costs relating to set-ups	30
Costs relating to machinery	25
Costs relating to materials handling	22
Costs relating to inspection	23
Total production overhead	100

The following activity volumes are associated with the product line for the period as a whole.

	Number of Set-ups	Number of movements of materials	Number of Inspections
Product X	65	15	150
Product Y	110	26	190
Product Z	485	79	570
	660	120	910

You are required:

- (a) To calculate the cost per unit for each product using conventional methods.
- (b) To calculate the cost per unit for each product using ABC principles. 4+12

Answer:

- (a) Computation of cost per unit using Conventional Methods:

Computation of Cost

	X	Y	Z
	₹	₹	₹
Materials	25	15	30
Labour	12	4	16
Overheads	63	36	90
Factory Cost	100	55	136

- (b) Under ABC Costing

Total overheads		₹
X	= 3500 x 3.5 x 18	= 2,20,500
Y	= 2250 x 2 x 18	= 81,000
Z	= 6000 x 5 x 18	= 5,40,000
		8,41,500

Answer_MTP_Final_Syllabus-2016_June 2019_Set -1

	Setup Cost (₹)	Machine Cost (₹)	Material Handling Cost (₹)	Inspection Expenses (₹)	Total (₹)
Costs	2,52,450 (30%)	2,10,375 (25%)	1,85,130 (22%)	1,93,545 (23%)	8,41,50 0 (100%)
Cost Driver	No. of setups	Machine hours	No. of Moment of Materials	No. of Inspections	
Cost driver rates	382.50 (252450/660)	4.5 (210375/46750)	1542.75 (185130/120)	212.69 (193545/910)	

Computations per unit

Product / Element	X	Y	Z
Units Produced	3500	2250	6000
Set up cost per unit (₹)			
i. Number of Set ups	65	110	485
ii. Set up Cost for the Product	24863	42075	185512
iii. Set up Cost per Unit	7.10	18.70	3092
Machine cost per unit (₹)			
iv. Machine Hours	12250	4500	30000
v. Machine Cost for the Product	55125	20250	135000
vi. Machine Cost per Unit	15.75	9.00	22.50
Material handling cost per unit (₹)			
i. Number of Movements	15	26	79
ii. Material handling Cost for the Product	23141	40112	121877
iii. Material handling Cost per Unit	6.61	17.82	20.31
Inspection cost per unit (₹)			
i. Number of Inspections	150	190	570
ii. Inspection Cost for the Product	31903	40411	121233
iii. Inspection Cost per Unit	9.12	17.96	20.21

Cost per unit under ABC costing

Product / Element	X (₹)	Y (₹)	Z (₹)
Materials	25.00	15.00	30.00
Labour	12.00	4.00	16.00
Overheads			
Setup Cost	7.10	18.70	30.92
Machine cost	15.75	9.00	22.50
Material Handling Cost	6.61	17.82	20.31
Inspection Cost	9.12	17.96	20.21
Total Cost	75.58	82.48	139.94

Answer_MTP_Final_Syllabus-2016_June 2019_Set -1

5. (a) SV Ltd, engaged in the manufacture of four products, has prepared the following budget for 2018.

Products	A	B	C	D
Production Units	20,000	5,000	25,000	15,000
Selling Price ₹/unit	21.75	36.75	44.25	64.00
Direct Materials ₹/unit	6.00	13.50	10.50	24.00
Direct Wages ₹ /unit	7.50	10.00	18.00	24.00
Variable Overheads ₹ /unit	2.25	5.00	6.00	6.50
Fixed Overheads ₹ p.a.	75,000	25,000	2,25,000	1,80,000

When the budget was discussed, it was proposed that the production of C should be increased by 10,000 units for which capacity existed in 2018.

It was also decided that for the next year i.e. 2019, the production capacity should be further increased by 25,000 units over and above the increase of 10,000 units envisaged as above for 2018. The additional production capacity of 25,000 units should be used for the manufacture of product 'B' for which new production facilities were to be created at an annual fixed overhead cost of ₹35,000. The direct material costs of all the four products were expected to increase by 10% in 2019 while the other costs and selling prices would remain the same.

Required:

- (i) Find the profit for 2018 on the assumption that the existing capacity of 10,000 units is utilised for product 'C' to maximize the profit.
 - (ii) Prepare a statement of profit for 2019.
 - (iii) Assuming that the increase in the output of product 'B' may not fully materialise in the year 2019, find the number of units of product B to be sold in 2019 to earn the same overall profit as in 2018. 3+3+3
- (b) What is Benchmarking? What are the types of Benchmarking? 2+ 5

Answer:

5. (a)

- (i) Statement showing computation of profit for the year 2018

Sr.	Particulars		A	B	C	D	Total
i	No. of Units		20000	5000	35000	15000	
ii	Selling Price	₹/unit	21.75	36.75	44.25	64.00	
iii	Variable Cost	₹/unit	16.35	28.50	34.50	54.50	
iv	Contribution	₹/unit	6.00	8.25	9.75	9.50	
v	Total Contribution	₹	1,20,000	41,250	3,41,250	1,42,500	6,45,000
vi	Fixed Cost	₹	75,000	25,000	2,25,000	1,80,000	5,05,000
vii	Profit	₹					1,40,000

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(ii) Statement showing computation of profit for the year 2019

Sr.	Particulars		A	B	C	D	Total
i	No. of Units		20000	30000	35000	15000	
ii	Selling Price	₹/unit	21.75	36.75	44.25	64.00	
iii	Contribution	₹/unit	5.40	6.90	8.70	7.10	
iv	Total Contribution	₹	1,08,000	2,07,000	3,04,500	1,06,500	7,26,000
v	Fixed Cost	₹	75,000	60,000	2,25,000	1,80,000	5,40,000
vi	Profit	₹					1,86,000

(iii) In order to get profit of 2018, the contribution to be recovered is as follows:

Particulars	₹
Profit for the year 2018	1,40,000
Revised fixed cost	5,40,000
Total contribution required	6,80,000
Contribution of A,C & D	5,19,000
Contribution to be recovered from B	1,61,000

No. of units required to be sold of B – $161000/6.90 = 23,333$ units.

Additional units required – $23333-5000 = 18333$

(b) **Benchmarking**: The practice of setting targets using external information is known as 'Bench marking'. Benchmarking is the continuous process of enlisting the best practices in the world for the process, goals and objectives leading to world-class levels of achievement.

Types of Benchmarking:

- (i) **Product Benchmarking (Reverse Engineering)**: is an age old practice of product oriented reverse engineering. Every organization buys its rival's products and tears down to find out how the features and performances etc., compare with its own products. This could be the starting point for improvement.
- (ii) **Competitive Benchmarking**: This has moved beyond product-oriented comparisons to include comparisons of the processes with those of the competitors. In this type, the processes studied may include marketing, finance, HR, R&D etc.,
- (iii) **Process Benchmarking**: is the activity of measuring discrete performance and functionality against organizations' performance in excellent analogous business process e.g. for supply chain management – the best practice would be that of Mumbai Dubbawallas.
- (iv) **Internal Benchmarking**: is an application of process benchmarking, within an organization by comparing the performance of similar business units or business process.
- (v) **Strategic Benchmarking**: differs from operational benchmarking in its scope. It helps to develop a vision of the changed organizations. It will develop core competencies that will help sustained competitive advantage.

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- (vi) **Global Benchmarking:** is an extension of Strategic Benchmarking to include benchmarking partners on a global scale. e.g. Ford Co. of USA benchmarked its A/c payable functions with that of Mazada in Japan and found to its astonishment that the entire function was managed by 5 persons as against 500 in Ford.

6. (a) A small maintenance project consists of the following twelve jobs whose precedence relations are identified with their node number:

Job (i,j) : (1,2) (1,3) (1,4) (2,3) (2,5) (2,6)

Duration (in days) : 10 4 6 5 12 9

Job (i,j) : (3,7) (4,5) (5,6) (6,7) (6,8) (7,8)

Duration (in days) : 12 15 6 5 4 7

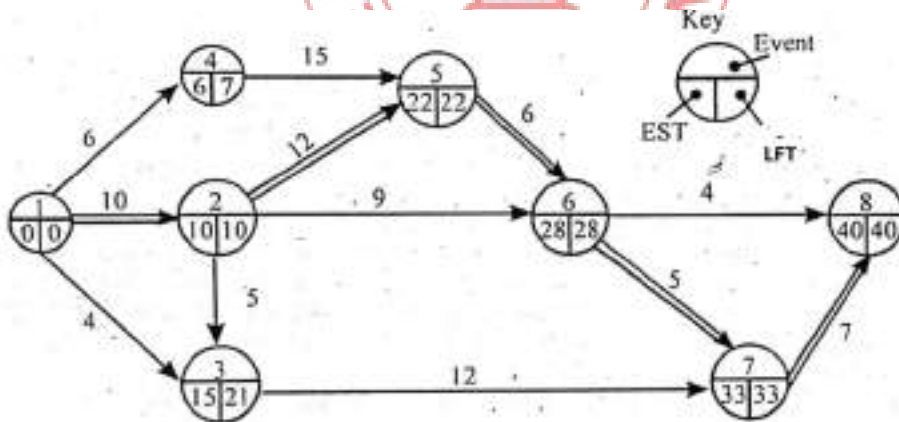
- (i) Draw an arrow diagram representing the project.
- (ii) Calculate earliest start, earliest finish, latest finish time for all the jobs.
- (iii) Find the critical path and project duration.
- (iv) Tabulate total float, free float and independent float. 3+3+3+3

(b) Narrate 2 routine business situations, where Pareto Analysis is useful. 2+2

Answer:

(a)

- (i) The network diagram of the project corresponding to normal duration is given below:



- (ii) Statement showing Earliest Start Time (EST), Earliest Finish Time (EFT), Latest Start Time (LST) and Latest Finish Time (LFT) for all jobs.

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Jobs	Duration in days	Earliest Time		Latest Time		Slack of event		Total Float (TF)	Free Float (FF)	Independen t Float
		Start (EST)	Finish (EFT)	Start (LST)	Finish (LFT)	at start of activity	at end of activity			
1	2	3	4	5	6	7	8	9	10	11
1-2	10	0	10	0	10	0	0	10-10=0	0-0=0	0-0=0
1-3	4	0	4	17	21	0	6	21-4=17	17-6=11	11-0=11
1-4	6	0	6	1	7	0	1	7-6=1	1-1=0	0-0=0
2-3	5	10	15	16	21	0	6	21-15=6	6-6=0	0-0=0
2-5	12	10	22	10	22	0	0	22-22=0	0-0=0	0-0=0
2-6	9	10	19	19	28	0	0	28-19=9	9-0=9	9-0=9
3-7	12	15	27	21	33	6	0	33-27=6	6-0=6	6-6=0
4-5	15	6	21	7	22	1	0	22-21=1	1-0=1	1-1=0
5-6	6	22	28	22	28	0	0	28-28=0	0-0=0	0-0=0
6-7	5	28	33	28	33	0	0	33-33=0	0-0=0	0-0=0
6-8	4	28	32	36	40	0	0	40-32=8	8-0=8	8-0=8
7-8	7	33	40	33	40	0	0	33-33=0	0-0=0	0-0=0

(iii) Critical Path is 1 → 2 → 5 → 6 → 7 → 8

And project duration is $10 + 12 + 6 + 5 + 7 = 40$ days

(iv) Total Float, Free Float and Independent Float has been shown in the table at (ii).

Note:

- EST of the activity of the EST of node at the start of activity.
- EFT of activity is the EST of the activity plus time duration of the activity.
- LFT of the activity is the LFT of the node at the end of the activity.
- LST of the activity is difference between LFT of the activity minus time duration of the activity.
- Total Float (TF) is the difference between:
 - (LFT - EFT) of the activity or
 - (LST - EST) of the activity
- Free Float = Total Float - Slack of event at end of the activity
- Independent Float = Free Float - Slack of the event at start of the activity

(b) Business situations where Pareto Analysis is useful

(i) **Pricing of a product:** In the case of a firm dealing with multi products, it would not be possible for it to analyse cost-profit- price-volume relationships for all of them. In practice, in case of such a firm, approximately 20% of products may account for about 80% of total sales revenue. Such analysis helps the top management to delegate the pricing decision for approximately 80% of its products to the lower levels of management, thus freeing them to concentrate on the pricing decisions for products approximately 20% which are essential for the company's survival.

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- (ii) **ABC analysis- Stock Control:** Another application of Pareto Analysis is in stock control where it may be found that only a few of the goods in stock make up most of the value. In practice approximately 20% of the total quantity of stock may account for about 80% of its value. The outcome of such analysis is that by concentrating on small proportion of stock items that jointly accounts for 80% of the total value, a firm may, well, be able to control most of the monetary investment in stocks.

7. (a) A Departmental head has four subordinates and four tasks to be performed. The subordinates differ in efficiency, and the tasks differ in their intrinsic difficulty. His estimate, of the time each man would take to perform each task, is given in the matrix below:

Tasks	Men				Hour
	E	F	G	H	
A	18	26	17	11	
B	13	28	14	26	
C	38	19	18	15	
D	19	26	24	10	

How should the tasks be allocated to a man, so as to minimize the total man-hours?

- (i) Calculate total man hours required to complete all the tasks as per assignment. 8+2
- (b) The following is the pattern for demand of cars rented out by a tourist operator observed for 100 days:

No. of cars	5	7	10	15
No. of days	20	30	40	10

The random numbers are 88, 76, 10, 05, 23

Required: Simulate the demand for cars over five days.

6

Answer:

- (a) Subtracting the smallest elements of each row from every element of the corresponding row, we get the reduced matrix:

Tasks	Men			
	E	F	G	H
A	7	15	6	0
B	0	15	1	13
C	23	4	3	0
D	9	16	14	0

Subtracting the smallest element of each column of the reduced matrix from every element of the corresponding column, we get the following reduce matrix

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7	11	5	0
0	11	0	13
23	0	2	0
9	12	13	0

Three lines are required to cover all zeros, whereas the order of the matrix is 4. Therefore, optimum assignment cannot be made at this stage. The minimum uncovered element is 5. Therefore, subtracting this element from all the uncovered elements and adding the same to all the elements lying at the intersections of the lines, we obtain the following reduced matrix:

2	6	0	0
0	11	0	18
23	0	2	5
4	7	8	0

Four lines are required to cover all zeros and order of the matrix is also 4. Therefore, Optimum assignment can be made at this stage as follows.

2	6	0	0
0	11	0	18
23	0	2	5
4	7	8	0

Now, each row and each column has one and only one assignment. Therefore, optimal solution is reached.

Optimum assignment is as follows:

A → G , B → E , C → F and D → H

The minimum total time for the assignment schedule is as follows:

Tasks	Men	Man-hours
A	G	17
B	E	13
C	F	19
D	H	<u>10</u>

Total man – hours = 59

(b)

No. of cars	No. of Days	Probability	Cumulative Prob	Random No. Interval
5	20	0.20	0.20	00-19
7	30	0.30	0.50	20-49
10	40	0.40	0.90	50-89
15	10	0.10	1.00	90-99

Day	Random No.	Demand
1	88	10
2	76	10
3	10	5
4	05	5
5	23	7

Demand for 5 days will be for 10, 10, 5, 5 & 7 Cars respectively.

8. Write Short Notes on any four:

4×4 = 16

- (a) Value Analysis
- (b) Cost Reduction
- (c) Transfer Pricing
- (d) Sunk Cost
- (e) Target Costing

Answer:

(a) Value Analysis

Value Analysis (VA) is one of the important techniques of cost reduction and control. It is a scientific approach that ensures all the functions of a product or service are carried out at the minimum cost without compromising quality, reliability, performance and appearance.

Value Analysis may consist of the following seven phases.

- (i) Origination
- (ii) Information
- (iii) Functional Analysis
- (iv) Innovation
- (v) Evaluation
- (vi) Choice
- (vii) Implementation

The core advantage of using value analysis is its potential for reducing costs, which is a benefit that permeates all advantages of the system. Because of the fact that value analysis breaks down a product or service into components, it enables the analysis of each of the components on its own, evaluating its importance and efficiency.

(b) Cost Reduction

The term 'Cost Reduction' refers to the attempts to reduce the costs. Cost reduction may be defined as the real and permanent reduction in the unit costs of goods manufactured or services rendered without impairing their suitability for the use intended. Cost reduction would mean maximization of profits by reducing cost through economics and savings in costs of manufacture, administration, selling and distribution.

The goal of cost reduction can be achieved either by reducing the cost per unit or by increasing the productivity or doing both at the same time. Reducing wastages, improving efficiency, searching for alternative materials, and a constant drive to reduce costs, can lead to cost reduction.

A research study by PWC puts forward the following five steps for strategic cost reduction to ensure that the business can sustain competitive relevance and maximise its potential.

1. Start with strategy: Have a clear view of cost reduction strategy and ensure it is consistently understood across the organisation.
2. Align costs to strategy: Look across the whole organisation and differentiate the strategically-critical 'good costs' from the non-essential 'bad costs'.
3. Aim high: Be bold, be brave and be creative – use technology, innovation and new ways of working to radically optimise the cost base.
4. Set direction and show leadership: Deliver cost optimisation as a strategic, business transformation program.
5. Create a culture of cost optimisation: Ensure that a culture of ownership is embedded and continuous improvement is incentivised.

There are several tools and techniques that are adopted in achieving cost reduction. Some of the vital ones which are normally used are listed below.

- (i) Value Analysis
- (ii) Simplification & Standardisation
- (iii) Business Process Re-engineering.
- (iv) Benchmarking
- (v) Financial Restructuring
- (vi) Work Study
- (vii) Job Evaluation
- (viii) Quality Control
- (ix) Inventory Control
- (x) Credit Control

(c) Transfer Pricing:

Transfer price is the price that one segment (sub unit, department, division etc.,) of an organization charges for a product or services supplied to another segment of the same organization. Transfer prices are used when individual entities of a larger multi entity firm are treated and measured as separately run entities.

The benefits of Transfer Pricing Policy are as under:

- (i) Divisional performance evaluation is made easier.
- (ii) It will develop healthy inter-divisional competitive spirit.
- (iii) Management by exception is possible.
- (iv) It helps in co-ordination of divisional objectives in achieving organizational goals.
- (v) It provides useful information to the top management in making policy decisions like expansion, sub-contracting, closing down of a division, make or buy decisions, etc,
- (vi) Transfer Price will act as a check on supplier's prices.
- (vii) It fosters economic entity and free enterprise system.
- (viii) It optimizes the allocation of company's financial resources based on the relative performance of various profit centres, which in turn, are influenced by transfer pricing policies.

(d) Sunk Costs

Sunk costs are costs that were incurred in the past. Sometimes, accountants use the term "sunk costs" to encompass committed costs as well. Committed costs are costs that will occur in the future, but that cannot be changed. Practically speaking, sunk costs and committed costs are not relevant with respect to any decision, because they cannot be changed. Experiments have been conducted that identify situations in which individuals, including professional managers, incorporate sunk costs in their decisions. One common example from business is that a manager will often continue to support a project that the manager initiated, long after any objective examination of the project seems to indicate that the best course of action is to abandon it. A possible explanation for why managers exhibit this behaviour is that there may be negative repercussions to poor decisions, and the manager might prefer to attempt to make the project *look* successful, than to admit to a mistake.

(e) Target Costing

Target Costing is considered as a philosophy in which product development is based on what the customer wants and is willing to pay for and not what it costs to produce. Hence it starts with the market determined price; then deducts the desired profit margin; and works back the target cost. Peter Drucker calls this "price-led costing." And that is how the formulation:

"Target Cost = Target Price – Target Profit" in place of the traditional approach of "Cost + Profit = Selling Price".

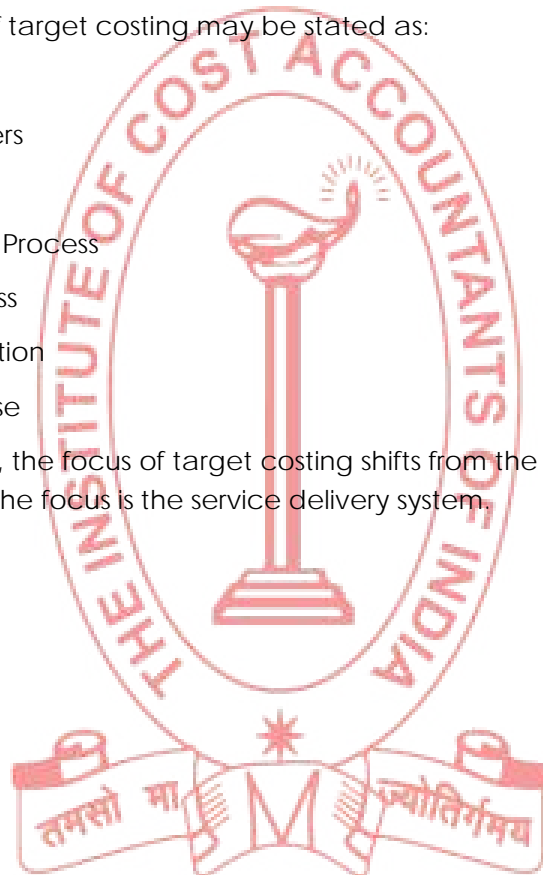
The stages in the process of target costing may be summarised as:

1. Selling Price
2. Target Profit
3. Target Cost
4. Cost Comparison
5. Iteration
6. Launching the Product
7. Product Cost Management
8. Consumption Cost Management

The distinct features of target costing may be stated as:

1. Price-Led Costing
2. Focus on Customers
3. Focus on Design
4. A Multidisciplinary Process
5. An Iterative Process
6. Life Cycle Orientation
7. Extended Enterprise

For process businesses, the focus of target costing shifts from the product to the process, and for service businesses the focus is the service delivery system.



Paper 15 – Strategic Cost Management – Decision Making



Paper – 15

Strategic Cost Management – Decision Making

Full Marks : 100

Time allowed: 3 hours

Section - A

1. Answer the following. Each question carries 2 marks.

[10×2= 20]

- (i) Company 'B' uses throughput accounting system. The details of product X per unit are as follows:

Selling price	₹ 50
Material cost	₹ 16
Conversion costs	₹ 20
Time on bottleneck resource	8 minutes

The throughput return per hour for product X is:

- (a) ₹ 105
(b) ₹ 225
(c) ₹ 255
(d) ₹ 375
- (ii) Back flush costing is most likely to be used when
- (a) Management desires sequential tracking of costs
(b) A Just-in-Time inventory philosophy has been adopted
(c) The company carries significant amount of inventory
(d) Actual production costs are debited to work-in-progress
- (iii) Empire Hotel has a capacity of 100 single rooms and 20 double rooms. Average occupancy is 70% for 365 days of the year. The rent for a double room is kept at 130% of a single room. The total room occupancy days in a year in terms of single room is
- (a) 32193
(b) 30660
(c) 31660
(d) 30993

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- (iv) Which of the following is correct in the context of network analysis?
- (a) There can be one or more activities without a predecessor in a network.
 - (b) Where two activities have the same start and end events, the end event of one activity is numbered differently and then connected by a dummy to the original start event.
 - (c) When crashing is carried out, the non-critical paths have to remain non critical.
 - (d) If the critical path is longer than the other paths, the project may be completed by using a path having a shorter duration.
- (v) A Ltd. manufactures 4 products A,B,C & D with sales value mix of 33 1/3%, 41 2/3%, 16 2/3% & 8 1/3% and variable cost of 60%, 68%, 80% & 40% of selling price respectively. Budgeted sale value is ₹ 60,000. Overall P/V ratio is
- (a) 40%,
 - (b) 35%,
 - (c) 28%
 - (d) 32%
- (vi) Which of the following statements is correct?
- (a) Standard costing facilitates the integration of accounts so that reconciliation between cost accounts and financial accounts may be eliminated.
 - (b) Standard costs are planned costs determined on a scientific basis and they are based upon certain assumed conditions of efficiency and other factors.
 - (c) Standard costing is defined as the preparation and use of standard costs, their comparison with actual cost and the measurement and analysis of variances to their cause and points of incidence.
 - (d) All of the above.
- (vii) Efficiency Ratio is
- (a) $\frac{\text{Available working days}}{\text{Budgeted working days}} \times 100$
 - (b) $\frac{\text{Budgeted hours}}{\text{Maximum hours in budgeted period}} \times 100$
 - (c) $\frac{\text{Standard hours}}{\text{Actual hours}} \times 100$
 - (d) None of the above
- (viii) Linear Programming is a technique for
- (a) Optimization
 - (b) Minimization
 - (c) Maximization
 - (d) None of These

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- (ix) Hungarian method is a way to solve problem related to:
- Transportation
 - Assignment
 - Learning Curve
 - None of These
- (x) A company produces two joint products, P and V. In a year, further processing costs beyond split-off point spent were ₹ 8,000 and ₹ 12,000 for 800 units of P and 400 units of V respectively. P sells at ₹ 25 and V sells at ₹ 50 per unit. A sum of ₹ 9,000 of joint cost were allocated to product P based on the net realization method. What was the total joint cost for the year?
- ₹ 20,000
 - ₹ 10,000
 - ₹ 15,000
 - None of these

Answer:

- (i) (c) Explanation:

Return per minute = $(\text{Selling price} - \text{Material cost}) / \text{Time on bottleneck resource} = (50 - 16) / 8 = 4.25$; Return per hour = $4.25 \times 60 = 255$

- (ii) (b) A Just-in-Time inventory philosophy has been adopted

- (iii) (a) Explanation:

1 double room = 1.3 single in terms of revenue.

Capacity = $100 + 1.3 \times 20 = 100 + 26 = 126$ equivalent single rooms.

Total Room Occupancy p.a. = $126 \times 365 \times 70\% = 32193$ days.

Note: This can be arrived at by other ways also, taking for example 70% of only single rooms and then double rooms, etc.

- (iv) (a) Explanation:

More than 1 activity can begin at the first node, say 1 – 2, 1 – 3, 1 – 4, etc. Each of these will have no predecessor.

- (v) (b)

Product	A (₹)	B (₹)	C (₹)	D (₹)	Total (₹)
Sale value	20,000	25,000	10,000	5,000	60,000
Variable cost	12,000	17,000	8,000	2,000	39,000
Contribution					21,000

P/V ratio = $21000 / 60000 \times 100 = 35\%$

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- (vi) (d) All of the above.
- (vii) (c) Standard hours / Actual hours x 100
- (viii) (a) Optimization
- (ix) (b) Assignment
- (x) (c)

Products	P	V	Total (₹)
Units	800	400	
S.P. (₹)	25	50	
Sales (₹)	20,000	20,000	
Further Costs (₹)	8,000	12,000	
NRV (₹)	12,000	8,000	20,000

Joint cost to be allocated in 3: 2

Total Joint cost = $9000 / 3 \times 5 = 15000$

Section – B

Answer any five questions from question nos. 2 to 8. Each question carries 16 marks.

2. (a) Explain the concept of Life Cycle Costing. 8
- (b) The Learning curve as a management accounting has now become or going to become an accepted tool in industry, for its applications are almost unlimited. When it is used correctly, it can lead to increased business and higher profits; When used without proper knowledge, it can lead to lost business and bankruptcy. Illustrate the use of learning curve for calculating the expected average units cost of making (a) 4 machines and (b) 8 machines by using the data below:
- Direct labour need to make first machine = 1000 hrs.
- Learning curve = 90%
- Direct labour cost = ₹ 15 per hour.
- Direct material cost = ₹ 1,50,000
- Fixed cost for either size orders = ₹ 60,000. 8

Answer:

(a) Life Cycle Costing

CIMA defines Life-Cycle Costing as ' Maintenance of physical asset cost records over entire asset lives, so that decisions concerning the acquisition, use or disposal of assets can be made in a way that achieves the optimum asset usage at the lowest possible cost to the

entity. The term may be applied to the profiling of cost over a product's life, including the pre-production stage (*terotechnology*), and to both company and industry life cycles'.

Many a product are observed to possess a distinctive life cycle comprising six clearly defined phases comprising:

- (i) Development
- (ii) Introduction
- (iii) Growth
- (iv) Maturity
- (v) Decline
- (vi) Extinction

Each phase has its own characteristics. Older, long-established products eventually become less popular, while in contrast, the demand for new, more modern goods usually increases quite rapidly after they are launched. The time line commencing from the innovation of a new product and ending with its degeneration into a common product and the eventual extinction is termed as the life cycle of a product.

Life Cycle Cost (LCC) may, thus, be stated as "The total cost throughout the life of an asset including planning, design, acquisition and support costs and any other costs directly attributable to owning or using the asset". Life Cycle Cost (LCC) of any item represents costs of its acquisition, operation, maintenance and disposal.

Production Costs are accounted and recognized by the routine accounting system. However non-production costs like R&D, design, marketing, distribution, customer service, etc. are less visible on a product-by-product basis. Product Life Cycle Costing focuses on recognizing both production and non-production costs.

Product life cycle thinking can promote long-term rewarding in contrast to short-term profitability rewarding. It provides an overall framework for considering total incremental costs over the entire life span of a product, which in turn facilitates analysis of parts of the whole where cost effectiveness might be improved.

Life Cycle Budgeting, i.e. Life Cycle Costing with Target Costing principles, facilitates scope for cost reduction at the design stage itself. Since costs are avoided before they are committed or locked in, the Company is benefited.

Life Cycle Costing aids decision makers in considering all present and future costs related to new construction, renovation, equipment replacement, or any other project that involves upfront and ongoing expenditure thereby covering the period from 'Cradle to Grave'.

The concept of Life-Cycle Costing may be explored in relation to a product, project or an industry as such.

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(b) Statement showing computation of cost of making 4 machines & 8 machines:

No. of machines	Average Time	Lobour Cost	Material	Fixed Cost	Total
	Hours	(₹)	(₹)	(₹)	(₹)
1	1000	15000	150000	60000	225000
2	900	13500	150000	30000	193500
4	810	12150	150000	15000	177150
8	729	10935	150000	7500	168435

Average cost of making 4 machines ₹ 1,77,150

Average cost of making 8 machines ₹ 1,68,435

3. (a) Amit Co. manufactures and sells 15,000 units of a product. The full cost per unit is ₹ 200. The Company has fixed its price so as to earn a 20% return on an Investment of ₹ 18,00,000.

Required:

- (i) Calculate the selling price per unit from the above. Also, calculate the mark-up % on the full cost per unit.
- (ii) If the selling price as calculated above represents a mark-up % of 40% on variable cost per unit, calculate the variable cost per unit.
- (iii) Calculate the Company's contribution if it had increased the selling price to ₹ 230. At this price, the Company would have sold 13,500 units. Should the Company have increased the selling price to ₹ 230?
- (iv) In response to competitive pressures, the Company must reduce the price to ₹ 210 next years, in order to achieve sales of 15,000 units. The Company also plans to reduce its investment to ₹ 16,50,000. If a 20% Return on Investment should be maintained, what is the Target Cost per unit for the next year? 3×4=12

(b) What is Target Cost? How would you determine it?

2+2=4

Answer:

(a) Target costing of the product

(i) Target sale Price per unit = Full Cost + Target profit
 = ₹ 200 + (18,00,000 × 20%) / 15,000 units = 200 + 24 = ₹ 224

Mark up on Full Cost = (24 ÷ 200) × 100 = 12%

(ii) Sale of ₹ 224 = VC + 40% there on i.e. 140% of VC

Hence, Variable Cost = 224 ÷ 140% = ₹ 160

(iii) Revised Sale Price = ₹ 230

Contribution per unit = 230 - 160 = ₹ 70

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Total Contribution = 70×13500 units = ₹ 9,45,000

Existing Contribution = $(224 - 160) \times 15,000$ units = ₹ 9,60,000

As the contribution comes down by ₹ 15,000 the revision in the sale price is not recommended.

(iv) Sale Price for next year = ₹ 210

Target Profit for next year = $(16,50,000 \times 20\%) \div 15000$ units = ₹ 22

Target Cost = $(SP - Profit) = (210 - 22)$ ₹ 188

(b) Target Cost

Target Cost is the cost at which a proposed product with specified functionality and quality must be produced to generate a desired level of profitability at its anticipated selling price. Target cost is Target selling price less the required profit margin

The target selling price is the price that is dictated by competition in case there are comparable products, or the perceived value that a customer will pay for the product in case there is no competition.

The desired profit level is fixed by the seller. The difference between the selling price and the profit margin represents the target cost to be achieved by design or cost reduction or by economies of scale or by other means.

Determination of Target Cost

The market requirement is identified regarding design, utility, need for the product. Target selling price is determined based on customer expectation and sales forecast. Target production volume is set based on price volume relationship. Target profit margin is established based on the company's long term profit objectives, projected volumes, course of action, etc.

The target cost or allowable cost is determined as the target selling price minus the target profit margin.

4. (a) The Budgeted overheads and Cost driver volumes of XYZ are as follows:

Cost pool	Budgeted Overheads (₹)	Cost Driver	Budgeted Volume
Material Procurement	5,80,000	No. of orders	1,100
Material Handling	2,50,000	No. of movements	680
Set-up	4,15,000	No. of set-ups	520
Maintenance	9,70,000	Maintenance hours	8,400
Quality Control	1,76,000	No. of inspection	900
Machinery	7,20,000	No. of M/c hours	24,000

The company has produced a batch of 2,600 components of AX-15. Its material cost was ₹ 1,30,000 and labour cost ₹ 2,45,000. The usage activities of the said batch are as follows: Material orders-26, Maintenance hours-690, Material movements-18, Inspection-28, Set ups-25 and M/c hours-1,800.

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Calculate Cost Driver Rates that are used for tracing appropriate amount of overheads to the said batch and ascertain the cost of batch of components, using Activity Based Costing.

- (b) Krish of India presently operates its plant at 80% of the normal capacity to manufacture a product exclusively to meet the demand of Government of India under a rate contract. He supplies the product for ₹ 4,00,000 and earns a profit margin of 20% on sales realizations. Direct Cost per unit is constant.

The indirect costs as per his budget projection are:

Indirect Costs	20,000 units (80% capacity) (₹)	22,500 units (90% capacity) (₹)	25,000 units (100% capacity) (₹)
Variable	80,000	90,000	1,00,000
Semi-Variable	40,000	42,500	45,000
Fixed	80,000	80,000	80,000

He received an export order for the product equal to 20% of its present operations. Additional packing charges on this order will be ₹1,000.

As a Management Accountant, calculate the differential costs and the price to be quoted for the export order so as to give his a profit margin of 10% on the export price. 8

Answer:

- (a) Computation of Cost Driver Rates

Cost pool	Budgeted Overheads (₹)	Cost Driver	Budgeted Volume	Cost Driver Rate
1	2	3	4	5 (5 = 2÷3)
Material Procurement	5,80,000	No. of orders	1,100	527.27
Material Handling	2,50,000	No. of movements	680	367.65
Set-up	4,15,000	No. of set-ups	520	798.08
Maintenance	9,70,000	Maintenance hours	8,400	115.48
Quality Control	1,76,000	No. of inspection	900	195.56
Machinery	7,20,000	No. of M/c hours	24,000	30.00

Computation of Batch Cost of 2,600 units of AX-15

Serial	Element	Working	Amount (₹)	Amount (₹)
1	Material Cost			1,30,000
2	Labour Cost			2,45,000
3	Prime Cost			3,75,000
4	Overheads			
	Material Procurement	26 x 527.27	13,709	
	Material Handling	18 x 367.65	6,618	

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	Set-up	25 x 798.08	19,952	
	Maintenance	690 x 115.48	79,681	
	Quality Control	28 x 195.56	5,476	
	Machinery	1800 x 30.00	54,000	
	Sub Total			1,79,436
5	Total			5,54,436

(b) Computation of Direct Cost:

Element	Workings	₹ Per unit
Selling Price	₹ 4,00,000 ÷ 20,000 units	20
Less: Profit Margin	@ 20% on selling price i.e. on ₹ 20	4
Total Cost		16
Less: Indirect Costs	(80,000 + 40,000 + 80,000) ÷ 20,000 units	10
Direct Cost		6

Statement showing Differential Cost for production of additional 4,000 units:

Element / Production Units	Present 20,000 (₹)	Proposed 24,000 (₹)	Differential 4,000 (₹)
Direct Cost @ ₹ 6 per unit	1,20,000	1,44,000	24,000
Indirect Costs:			
Variable Cost @ ₹ 4 per unit	80,000	96,000	16,000
Semi-Variable (@ ₹1 per unit for the additional units)	40,000	44,000	4,000
Fixed	80,000	81,000	1,000
Total Costs	3,20,000	3,65,000	45,000

Quotation for the Export Order (with a desired profit of 10% on Export Price)

Differential Cost	45,000
Add: Profit (10% of Export Price or 1/9 of Cost)	5,000
Export Price to be quoted	50,000

Export Price to be quoted per unit = ₹ 50,000 ÷ 4,000 units = ₹ 12.50.

5. (a) Seema Ltd., has prepared the following budget for the year:

Particulars	Activity Level	
	60%	80%
Raw Materials (₹)	30,00,000	40,00,000
Direct Wages (₹)	18,00,000	24,00,000
Factory Overheads (₹)	32,00,000	36,00,000
Total (₹)	80,00,000	1,00,00,000

The policy of the company is to charge 25% on variable costs to cover profit. Raw material is in short supply and the company wants to utilize its available supply of raw materials in an optimum manner. Planned operating capacity is 80%.

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The company has to execute a job, as per details given below:

Raw Materials (₹) : 40,000

Direct Wages (₹) : 30,000

You are required to quote the price of the job, in accordance with the policy of the company. 10

(b) What are the advantages of Inter-firm comparison? 6

Answer:

(a) Segregation of Factory Overheads into Fixed and Variables:

Activity Level	Factory Overheads (₹)
80%	36,00,000
60%	32,00,000
Difference of 20%	4,00,000
Variability for 1%	20,000(V)

At 80% of the activity, the variable factory overheads would have been $80 \times 20,000 = ₹16,00,000$ Total Factory Overheads at this level are ₹ 36,00,000.

Hence, the Fixed Overheads would be ₹ 36,00,000 – ₹16,00,000 i.e., ₹ 20,00,000.

Variable Overheads as % of Direct Wages = $16,00,000 / 24,00,000 \times 100 = 66.67\%$.

Variable Costs at 80% of the Activity

Raw Materials	₹ 40,00,000
Direct Wages	₹ 24,00,000
Variable Overheads	₹ 16,00,000
Total Variable Cost	₹ 80,00,000

At 80% of the activity, Profit = 25% of VC = 25% of 80,00,000 = ₹ 20,00,000

Contribution = Fixed Costs + Profit = 20,00,000 + 20,00,000 = ₹ 40,00,000.

Raw Materials are in short supply and hence are the constraint.

Ratio of Contribution to Raw Material = $40,00,000 \div 40,00,000 = 100\%$.

Price Quotation

(₹)

Raw Materials	40,000
Direct Wages	30,000
Variable Overheads @ 66.67% of Direct Wages	20,000
Contribution @ 100% of Raw Materials	40,000
Total	1,30,000

(b) The advantages of Inter-firm Comparison are as below:

(i) Inter-firm Comparison makes the management of the organisation aware of strengths and weakness in relation to the other organisations in same industry.

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- (ii) As only important items are reported to the Management time and efforts are not wasted.
- (iii) The management is able to keep up-to-date information of the trends and ratios and it becomes easier for them to take the necessary steps for improvement.
- (iv) It develops cost consciousness among the members of the industry.
- (v) Information about the organisation is made available freely without the fear of disclosure of confidential data to the outside market or the public.
- (vi) Specialized knowledge and experience of professionally run and successful organisations are made available to smaller units who can take the advantages.
- (vii) The industry as a whole benefits from the process due to increased productivity, standardization of products, elimination of unfair comparison and the trade practices.
- (viii) Reliable and collective data enhance the organisation's ability to deal with various authorities and Government bodies.
- (ix) Inter firm comparison assists in a big way in identifying industry sickness and gives a timely warning so that effective remedial steps can be taken to save the organisation.

6. (a) DM is a denim brand specializing in the manufacture and sale of hand-stitched jeans trousers. DM manufactured and sold 10,000 pairs of jeans during a period. Information relating to the direct labour cost and production time per unit is as follows:

	Actual Hours Per Unit	Standard Hours Per Unit	Actual Rate Per Hour	Standard Rate Per Hour
Direct Labour	0.65	0.60	₹120	₹100

Note: 0.65 hours per unit of actual time includes the idle time.

During the period, 800 hours of idle time was incurred. In order to motivate and retain experienced workers, DM has devised a policy of paying workers the full hourly rate in case of any idle time.

Required:

- (i) Idle time Variance
- (ii) Labour Efficiency variance

3+5=8

- (b) What are the advantages of Standard Costing?

8

Answer:

(a)

- (i) Idle Time Variance:

$$\begin{aligned}\text{Idle time variance} &= \text{number of idle hours} \times \text{standard rate} \\ &= 800 \text{ hours} \times ₹ 100 \\ &= ₹ 80,000 \text{ (A)}\end{aligned}$$

(ii) Labour Efficiency Variance:

$$\begin{aligned}\text{Total Hours} &= 10,000 \text{ units} \times 0.65 \text{ hours per unit} \\ &= 6,500 \text{ hours.}\end{aligned}$$

$$\begin{aligned}\text{Active Hours} &= 6,500 \text{ hours} - 800 \text{ idle hours} \\ &= 5,700 \text{ hours.}\end{aligned}$$

$$\begin{aligned}\text{Standard Cost of Active Hours} &= \text{Active Hours} \times \text{Standard Rate} \\ &= 5,700 \text{ hours} \times ₹ 100 \text{ per hour} \\ &= ₹ 5,70,000\end{aligned}$$

$$\begin{aligned}\text{Standard Hours} &= 10,000 \text{ units} \times 0.60 \text{ hours per unit} \\ &= 6,000 \text{ hours.}\end{aligned}$$

$$\begin{aligned}\text{Standard Cost} &= \text{Standard Hours} \times \text{Standard Rate} \\ &= 6,000 \text{ hours} \times ₹ 100 \text{ per hour} \\ &= ₹ 6,00,000\end{aligned}$$

$$\begin{aligned}\text{Labour Efficiency Variance} &= \text{Standard Cost} - \text{Standard Cost of Active Hours} \\ &= 6,00,000 - 5,70,000 \\ &= ₹ 30,000 \text{ (F)}\end{aligned}$$

(b) The advantages derived from a system of standard costing are stated below:

- (i) Standard Costing system establishes yard-stick against which the efficiency of actual performance is measured.
- (ii) This system increases all round efficiency and productivity.
- (iii) At the very stage of setting the standards, waste of time and materials is eliminated. This assists in managerial planning for efficient operation and benefits all the divisions of the concern.
- (iv) Costing procedure is simplified.
- (v) Cost data is available for various management purposes like fixation of selling prices, transfer price and valuation of stocks i.e. work-in-progress and finished stock and determining idle capacity.
- (vi) Standard costing is a planning exercise - in helps in budgetary controls.
- (vii) Standard costing system facilitates the fixation of responsibility for each department or individual.
- (viii) Variance analysis and reporting is based on the principles of management by exception. Variance analysis provides the ground for corrective measures to be taken in time.
- (ix) When constantly reviewed, the standards provide means for achieving cost reduction.

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- (x) Standard costs assist in performance analysis by providing ready means for preparation of information.
- (xi) Production and pricing policies may be formulated in advance before production starts. This helps in prompt decision-making.
- (xii) Standard costing facilitates the integration of accounts so that reconciliation between cost accounts and financial accounts may be eliminated.
- (xiii) Standard costing helps in optimizing the use of plant capacities, current assets and working capital.

7. ABC Pvt. Ltd., which has a satisfactory preventive maintenance system in its plant has installed a new Hot Air Generator based on electricity instead of fuel oil for drying its finished products. The Hot Air Generator requires periodic shutdown maintenance. If the shutdown is scheduled yearly, the cost of maintenance will be as under:

Maintenance Cost	Probability
₹15,000	0.3
₹20,000	0.4
₹25,000	0.3

The costs are expected to be almost linear i.e. if the shutdown is scheduled twice a year the maintenance cost will be double.

There is no previous experience regarding the time taken between breakdowns. Costs associated with breakdown will vary depending upon the periodicity of the maintenance. The probability distribution of breakdown cost is estimated as under.

Break down cost p.a.	Yearly Shut down	Half yearly shut down
₹75,000	0.2	0.5
₹80,000	0.5	0.3
₹1,00,000	0.3	0.2

Simulate the total costs – maintenance and breakdown costs – and recommend whether shutdown overhauling should be resorted to once a year or twice a year? 16

Answer:

Assigning numbers to maintenance cost once a year basis:

Cost (₹)	Probability	Cumulative Probability	Random Numbers (R.N.)
15,000	0.30	0.30	00-29
20,000	0.40	0.70	30-69
25,000	0.30	1.00	70-99

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Assigning random numbers to maintenance costs, on twice a year basis:

Cost (₹)	Probability	Cumulative Probability	Random Numbers (R.N.)
30,000	0.30	0.30	00-29
40,000	0.40	0.70	30-69
50,000	0.30	1.00	70-99

Assigning random numbers to breakdown costs when overhauling is done once a year basis:

Cost (₹)	Probability	Cumulative Probability	Random Numbers (R.N.)
75,000	0.20	0.20	00-19
80,000	0.50	0.70	20-69
1,00,000	0.30	1.00	70-99

Assigning random numbers to breakdown costs when overhauling is done twice a year basis:

Cost (₹)	Probability	Cumulative Probability	Random Numbers (R.N.)
75,000	0.50	0.50	00-49
80,000	0.30	0.80	50-79
1,00,000	0.20	1.00	80-99

Total Costs if shut down is taken once a year:

Year	R.N.	Maintenance Cost (₹)	R.N.	Breakdown Cost (₹)	Total (₹)
1	27	15,000	03	75,000	90,000
2	44	20,000	50	80,000	1,00,000
3	22	15,000	73	1,00,000	1,15,000
4	32	20,000	87	1,00,000	1,20,000
5	97	25,000	59	80,000	1,05,000
Average :					1,06,000

Total Costs if shut down is taken twice a year:

Year	R.N.	Maintenance Cost (₹)	R.N.	Breakdown Cost (₹)	Total (₹)
1	42	40,000	54	80,000	1,20,000
2	04	30,000	65	80,000	1,10,000
3	82	50,000	49	75,000	1,25,000
4	38	40,000	03	75,000	1,15,000
5	91	50,000	56	80,000	1,30,000
Average :					1,20,000

[Note: R.N.s. are taken from table]

Recommendation: From the above working it may be seen that shutdown maintenance/overhauling once a year will be more economical. The average annual cost will only be ₹ 1.06 lakhs as against 1.20 lakhs when shutdown is twice a year.

8. Write Short Notes on any four:

4 × 4 = 16

- (a) Principles of Business Process Re-engineering
- (b) Relevant Costs
- (c) PRAISE Analysis
- (d) Vogel's Approximation Method (VAM)
- (e) PERT & CPM

Answer:

(a) Principles Business Process Re-engineering (BPR)

Business Process Re-engineering (BPR) refers to the fundamental rethinking and redesign of business processes to achieve improvement in critical measures of performance such as costs, quality, efficiency, service, speed and customer satisfaction. It (BPR) is the practice of rethinking and redesigning the process to support an organization's mission and reduce costs.

The stepwise process of BPR consists of:

- (i) Creation of Vision
- (ii) Selection of Team
- (iii) Analysis of the Existing Process
- (iv) Development of a New Process
- (v) Implementation of the New Process
- (vi) Evaluation

The key benefits include:

Key Benefits

- (i) Reduction in Costs and Cycle Times
- (ii) Improvement in Quality
- (iii) Customer Focus

Business Process Reengineering is a strategic tool towards cost reduction as also for increased customer focus and enhanced competitive advantage.

(b) Relevant Costs

Relevant Costs are costs appropriate to aiding the making of specific management decisions (CIMA). They are estimated future costs that differ among alternatives. Similarly, relevant revenues and expected future revenues differ among alternatives. The two key aspects of relevance are:

- (i) The costs and revenues must occur in future, and
- (ii) They must differ among alternatives.

In decision making process, the decision maker must be aware of some pitfalls on account of various costs.

Examples are:

- (i) Sunk costs - be ignored as not relevant.
- (ii) Fixed Costs - if they change for the decision at hand, the changed portion only becomes relevant.
- (iii) Opportunity costs - They need not be overlooked (e.g., to outsource an activity when there is no idle capacity). An opportunity cost is the cost of an opportunity foregone by not using a limited resource in its next best alternative use.

(c) PRAISE Analysis

PRAISE Analysis is a six step process of the Total Quality Management where identification of improvement opportunities and implementation of quality improvement process takes place. Six Steps are : Problem identification, Ranking, Analysis, Innovation, Solution and evaluation. These steps are represented by acronym PRAISE.

Process involves

- (i) Problem identification of customer dissatisfaction
- (ii) Ranking of the problems and opportunities as per priorities
- (iii) Analysis of possible causes of problem, potential implications and quantification of cause and effect
- (iv) Innovation by creative thinking to generate potential solutions
- (v) Solution implementation by making required changes in the systems and reinforcing the same with training and documentation backup
- (vi) Evaluation by monitoring the effectiveness of the actions and identify the potential for further improvements and return to step 1.

(d) Vogel's Approximation Method (VAM):

This method is preferred over the other methods because the initial basic feasible solution obtained is either optimum or very close to the optimum solution. Therefore, the amount of time required to arrive at the optimum solution is greatly reduced. Various steps of this method are summarized as under:

Step 1: Compute a penalty for each row and column in the transportation table. The penalty for a given row and column is merely the difference between the smallest cost and the next smallest cost in that particular row or column.

Step 2: Identify the row or column with the largest penalty. In this identified row or column, choose the cell which has the smallest cost and allocate the maximum possible quantity to the lowest cost cell in that row or column so as to exhaust either the supply at a particular

source or satisfy demand at a warehouse. If a tie occurs in the penalties, select that row/column which has minimum cost. If there is a tie in the minimum cost also, select that row/column which will have maximum possible assignments. It will considerably reduce computational work.

Step 3: Reduce the row supply or the column demand by the amount assigned to the cell.

Step 4: If the row supply is now zero, eliminate the row, if the column demand is now zero, eliminate the column, if both the row supply and the column demand are zero, eliminate both the row and column.

Step 5: Recompute the row and column difference for the reduced transportation table, omitting rows or columns crossed out in the preceding step.

Step 6: Repeat the above procedure until the entire supply at factories are exhausted to satisfy demand at different warehouses.

(e) **PERT & CPM**

PERT: Project Evaluation and Review Techniques (PERT) is a method of analysing the tasks involved in completing a given project, especially the time needed to complete each task, and to identify the minimum time needed to complete the total project. It incorporates uncertainty by making it possible to schedule a project while not knowing precisely the details and durations of all the activities. It is more of an event-oriented technique rather than start- and completion-oriented, and is used more in projects where time is the major factor rather than cost. It is applied to very large-scale, one-time, complex, non-routine infrastructure and Research and Development projects.

CPM: Critical Path Method (CPM) or Critical Path Analysis (CPA) is a project management tool that helps determination of the minimum time needed to complete a project. The CPM:

- (i) Sets out all the individual activities that make up a larger project.
- (ii) Shows the order in which activities have to be undertaken.
- (iii) Shows which of the activities can be taken up only when the other activities have been completed.
- (iv) Shows which of the activities can be undertaken simultaneously, thereby reducing the overall time taken to complete the whole project.
- (v) Pinpoints the time schedules needed for the specified resources, for example, a crane to be hired for a building site.

PERT and CPM are complementary tools. CPM employs one time estimate and one cost estimate for each activity. PERT may utilize three time estimates (optimistic, expected, and pessimistic) and no costs for each activity. Although these are distinct differences, the term PERT is applied increasingly to all critical path scheduling.



Paper 15- Strategic Cost Management- Decision Making

Paper-15: Strategic Cost Management- Decision Making

Time allowed:3 hours

Full Marks: 100

The figures in the margin on the right side indicate full

Answer Question No. 1 in Section A, which is compulsory, carrying 20 marks. Further, answer any 5(five) Questions from Section B, each carrying 16 marks

Section A (20 marks)

1. Choose the most appropriate answer to the following questions giving justification. $10 \times 2 = 20$

- (i) Stock Control data for Material P are: Annual usage: 3600 units; Cost per unit: ₹100/-; Cost of placing an order: ₹40; Stockholding Cost: 20% of the overall stock volume; Lead time: One month .The EOQ based on the above data is:
- (a) 210 units
 - (b) 175 units
 - (c) 90 units
 - (d) 120 units
- (ii) A company produces a product which is sold at a price of ₹ 160. Its Variable cost is ₹64. The company's Fixed cost is ₹23,04,000 p.a. The company operates at a margin of safety of 40%. The total sales of the company is:
- (a) 42,000 units
 - (b) 40,000 units
 - (c) 60,000 units
 - (d) 50,000 units
- (iii) For a Learning Curve percentage of 80%, the time to be taken to complete the 4th unit of a 12-unit job involved in the assembly line, if the initial unit requires 80 hours, will be
- (a) 51.52 hrs
 - (b) 41.47 hrs
 - (c) 46.71 hrs
 - (d) 40.95 hrs
- (iv) The P/V ratio of a firm dealing in Electrical equipment is 50% and the margin of safety is 40%. BEP of the firm at a sales volume of ₹ 50,00,000 will be
- (a) ₹ 25,00,000
 - (b) ₹35,00,000
 - (c) ₹30,00,000
 - (d) ₹ 36,00,000

(v) The following information relate to ABC

Activity level	60%	80%
Variable costs (₹)	24,000	32,000
Fixed costs (₹)	40,000	44,000

The differential cost for 20% capacity is

- (a) ₹8,000
- (b) ₹4,000
- (c) ₹12,000
- (d) ₹10,000

(vi) Empire Hotel has a capacity of 100 single rooms and 20 double rooms. Average occupancy is 70% for 365 days of the year. The rent for a double room is kept at 150% of a single room. The total room occupancy days in a year in terms of single room is

- (a) 32193
- (b) 30660
- (c) 31660
- (d) 33215

(vii) By making and selling 9,000 units of a product, a company makes a profit of ₹10,000, whereas in the case of 7,000 units, it would lose ₹10,000 instead. The number of units to break-even is

- (a) 7,500 units
- (b) 8,000 units
- (c) 7,750 units
- (d) 8,200 units

(viii) If project A has a net present value (NPV) of ₹60,00,000 and project B has an NPV of ₹1,00,00,000, what is the opportunity cost if project B is selected?

- (a) ₹40,00,000
- (b) ₹60,00,000
- (c) ₹1,00,00,000
- (d) ₹1,60,00,000

(ix) AB company is a supermarket group that incurs the following costs :

- (A) The bought-in price of the goods
 - (B) Inventory finance costs
 - (C) Self refilling costs
 - (D) Costs of repacking or 'pack out' prior to storage before sale
- AB company's calculating of direct product profit (DPP) would include
- (a) Costs (A) and (C) only.
 - (b) All of the above cost except (B)
 - (c) All of the above costs except (d)
 - (d) All of the above costs

(x) In the context of Critical Path Analysis, the portion of the float of an activity which

cannot be consumed without affecting adversely the float of the subsequent activities is called

- (a) Free float
- (b) Interfering float
- (c) Independent float
- (d) Total float

Answer:

1

(i) d

$$EOQ = \sqrt{\frac{2 \times 3,600 \times 40}{100 \times 20\%}} = 120 \text{ units}$$

(ii) b

SP 160 – VC 64 = Contribution 96

F.C. 23,04,000 B.E.P. = 23,04,000/96 = 24,000 units

MOS = 40%; B.E.P. = 60%

∴ Total sales = 24,000 × 100/60 = 40,000 units

(iii) a

At 80% Learning Curve,

T-4 - Time taken by the 4th Unit = 80 (.80) (.80) = 51.20 hrs.

Note: In the arithmetic method followed above, every time the number the number of repetitions doubles, the time to perform the activity is reduced by the Learning Curve Coefficient.

(iv) c

Actual Sales - M.O.S. = BEP Sales

Sales = ₹ 50,00,000

Less: Margin of safety 40% on sales = ₹ 20,00,000

Break even sales = ₹ 30,00,000

(v) C

Differential Costs = Differences in Fixed and Variable Cost = ₹ 8000 + ₹ 4,000 = ₹ 12,000

(vi) d

1 double room = 1.5 single in terms of revenue.

Capacity = 100 + 1.5 × 20 = 100 + 30 = 130 equivalent single rooms.

Total Room Occupancy p.a. = 130 × 365 × 70% = 33215 days.

Note: This can be arrived at by other ways also, taking for example 70% of only single rooms and then double rooms, etc

(vii) b

Contribution for 2000 units = 20,000 (difference in profits for two output levels)

Hence, contribution per unit = 10.

Substituting in equation $1,00,000 = F + 10,000$.

Or $F = 80,000$. $BEP = 80000 / 10 = 8000$.

(viii) b

Opportunity cost represents the next best alternative foregone. If B is chosen, only A is being foregone and hence the NPV of ₹60,00,000 is the present value of the opportunity lost.

(ix) d

Because all of the costs mentioned can be identified with specific goods/product and would be deducted from the selling price to determine the direct product profit.

(X) b

Interfering float is that part of the total float which causes a reduction in the float of the successor activities. It is the difference between the latest finish time of the activity in question and the earliest starting time of the following activity or zero, whichever is larger.

Section-B

Answer any five questions.

Each Question carries 16 marks

16 X 5 = 80

2(a) A factory has a key resource (bottleneck) of Facility A which is available for 31,300 minutes per week. Budgeted factory costs and data on two products, X and Y, are shown below

Product	Selling Price/Unit (₹)	Material Cost/Unit (₹)	Time Facility A
X	35	20.00	5 minutes
Y	35	17.50	10 minutes

Budgeted factory costs per week:

	₹
Direct labour	25,000
Indirect labour	12,500
Power	1,750
Depreciation	22,500
Space costs	8,000
Engineering	3,500
Administration	5,000

Actual production during the last week is 4,750 units of product X and 650 units of product Y.

Actual factory cost was ₹78,250.

Calculate:

- (i) Total factory costs (TFC)
- (ii) Cost per Factory Minute
- (iii) Return per Factory Minute for both products
- (iv) TA ratios for both products.
- (v) Throughput cost per the week.
- (vi) Efficiency ratio

10

(b) A practicing Cost and Management Accountant now spends ₹0.90 per K.m on taxi fares for his client's work. He is considering two other alternatives the purchase of a new small car or an old bigger car.

Item	New Small Car (₹)	Old Bigger Car(₹)
Purchase Price	35,000	20,000
Sale price after 5 years	19,000	12,000
Repairs and Servicing p.a	1,000	1,200
Taxes and insurance p.a	1,700	700
Petrol consumption per liter (k.m)	10	7
Petrol price per liter	3.5	3.5

He estimates that he does 10,000 Km annually. Which of the three alternatives will be cheaper? If his practice expands he has to do 19,000 Km p.a. where will the cost of the two cars break even and why? Ignore interest and Income-tax.

6

Answer:2(a)

- (i) Total Factory Costs = Total of all costs except materials.
 $= ₹ 25,000 + ₹ 12,500 + ₹ 1,750 + ₹ 22,500 + ₹ 8,000 + ₹ 3,500 + ₹ 5,000 = ₹ 78,250$
- (ii) Cost per Factory Minute = Total Factory Cost ÷ Minutes available = $₹ 78,250 ÷ 31,300 = ₹ 2.50$
- (iii)
 - (a) Return per bottleneck minute for Product X = $\frac{\text{Selling Price} - \text{Material Cost}}{\text{Minutes in bottleneck}}$
 $= (35 - 20) / 5 = ₹ 3$
 - (b) Return per bottleneck minute for Product Y = $\frac{\text{Selling Price} - \text{Material Cost}}{\text{Minutes in bottleneck}}$
 $= (35 - 17.5) / 10 = ₹ 1.75$
- (iv) Throughput Accounting (TA) Ratio for Product X = Return per Minute/Cost per Minute
 $= (3 / 2.5) = ₹ 1.2$
Throughput Accounting (TA) Ratio for Product Y = Return per Minute/Cost per Minute
 $= (1.75 / 2.5) = ₹ 0.7$

Based on the review of the TA ratios relating to two products, it is apparent that if we only made Product Y, the enterprise would suffer a loss, as its TA ratio is less than 1. Advantage will be achieved, when product X is made.

- (v) Standard minutes of throughput for the week := $[4,750 \times 5] + [650 \times 10]$
 $= 23,750 + 6,500 = 30,250$ minutes

Answer_MTP_Final_Syl2016_December, 2019_Paper_15_Set 1

Throughput cost per week:= 30,250 x ₹ 2.5 per minutes = ₹ 75,625

(vi) Efficiency % = (Throughput cost / Actual TFC)

$$= (\text{₹ } 75,625 / \text{₹ } 78,250) \times 100$$

$$= 96.6\%$$

The bottleneck resource of Facility A is available for 31,300 minutes per

week but produced only 30,250 standard minutes. This could be due to:

(a) the process of a 'wandering' bottleneck causing facility A to be underutilized.

(b) inefficiency in facility A

2(b) Statement Showing computation of break even point for three alternatives

	Taxi Amount(₹)	New Smaller Car Amount(₹)	Old Bigger Car Amount(₹)
Fixed Cost:			
Depreciation		16000/5=3200	8000/5=1600
Repairs		1000	1200
Taxes and Insurance		1700	700
Total Fixed Cost(A)		5900	3500
Variable Cost Per KM(B)	0.9	0.35	0.5
Total Variable Cost for 10,000 KM)(C)	9000	3500	5000
Total Variable Cost for 19,000 KM)(D)	17100	6650	9500
Total Cost For 10,000 KM(A+C)	9000	9400	8500
Total Cost For 19,000 KM(A+D)	17100	12550	13000

(a) At 10000 KMS old bigger car is cheaper than the other two alternatives.

(b) At 19000 KMS it is better and cheaper to purchase the new smaller car.

Indifference point = (difference in fixed cost / difference in variable cost per unit) = (2400/0.15)

$$= 16000\text{kms}$$

3(a) Accelerate Co. Ltd., manufactures and sells four types of products under the brand names of A, B, C and D. The sales mix in value comprises 33 1/3%, 41 2/3%, 16 2/3% and 8 1/3% of products A, B, C and D, respectively. The total budgeted sales (100%) are ₹ 1,20,000 p.m.

Operating Costs are—Variable costs: Product A 60% of selling price, Product B 68% of selling price, Product C 80% of selling price, Product D 40% of selling price; Fixed costs: ₹ 29,400 p.m.

Required:

Calculate the break-even-point for the products on overall basis.

8

(b) The profit for The Forward Look Ltd. works out to 12.5% of the capital employed and the relevant figures are as under :

₹

Answer_MTP_Final_Syl2016_December, 2019_Paper_15_Set 1

Sales	5,00,000
Direct Material	2,50,000
Direct Labour	1,00,000
Variable Overheads	40,000
Capital Employed	4,00,000

The new Sales Manager who has recently joined the Company estimates for the next year a profit of about 23% on the capital employed provided the volume of Sales is increased by 10% and simultaneously there is an increase in Selling Price of 4% and an overall cost reduction in all the elements of cost by 2%.

Verify the contention of the Sales Manager by computing in detail the cost and profit for the next year and state whether his proposal can be adopted by the management.

8

Answer 3(a)

(₹)

Particulars		A	B	C	D	Total
a	Sales	40,000	50,000	20,000	10,000	1,20,000
b	Variable cost	24,000	34,000	16,000	4,000	78,000
c	Contribution	16,000	16,000	4,000	6,000	42,000
d	Fixed cost					29,400
e	Profit					12,600
f	P/V ratio	40%	32%	20%	60%	35%
g	Break even sales	29,400/35%				84,000

(b) Computation of Fixed Cost:

(₹)

Annual Sales	5,00,000
Less Profit: 4,00,000 X 12.5%	50,000
Total Cost	4,50,000
Less Variable Cost	
Direct Material	2,50,000
Direct labour	1,00,000
Variable Overhead	40,000
	3,90,000
	60,000

Statement showing Profit obtained upon adopting Sales Manager's proposal

(i) Revised Sales: 5,00,000 X 110% X 104%	5,72,000
(ii) Variable Cost: 3,90,000 X 110% X 98%	4,20,400
(iii) Contribution	1,51,580
(iv) Fixed Cost 60,000 X 98%	58,800
(v) Profit	92,780

Percentage of Profit on Capital Employed = (Rs.92,780 / 4,00,000) × 100 = 23.195 > 23%

Conclusion : The Sales Manager's proposal can be adopted.

4(a) A brass foundry making castings which are transferred to the machine shop of the company at standards in regard to material stocks which are kept at standard price are as follows:-

Answer_MTP_Final_Syl2016_December, 2019_Paper_15_Set 1

Standard Mixture 70% Copper : 30% Zinc

Standard Price Copper ₹2,400 per ton

Zinc ₹ 650 per ton

Standard loss in melting 5% of input

Figures in respect of a costing period are as follows:

Commencing stocks	Copper	100 tons	
	Zinc	60 tons	
	Copper	110 tons	
	Zinc	50 tons	
	Copper	300 tons	
	Zinc	100 tons	
Metal Melted	400 tons		
Casting produced	3758 tons		

Present figures showing : Material Price, Mixture and Yield Variance. **8**

(b) Requisites for Installation of a Uniform Costing System. **8**

Answer:4(a)

	Copper		Zinc	
	Q	V	Q	V
Opening Stock	100	240000	60	39000
Add: Purchases	300	732500	100	62500
	400	972500	160	101500
Less :Closing Stock	110	264000	50	32500
	290	708500	110	69000

	Standard			Actual		
	Q	P	V	Q	P	V
Copper	280	2400	672000	290		708500
Zinc	120	650	78000	110		69000
	400		750000	400		777500
less: Standard loss @5%	20			25		
	380		750000	375		777500

Copper	6276.31 X 2400 =663157		290 X 2400 =696000	
Zinc	118.42 X 650 =76975		110 X 650 = 71500	
Total	740132	750000	767500	777500

Material yield variance = 9868 (A)

Answer_MTP_Final_Syl2016_December, 2019_Paper_15_Set 1

Material price variance = 10000 (A)
Material mix variance = 17500(A)

4(b)

Requisites for Installation of a Uniform Costing System:

The organisational set up for implementing the principles and methods of Uniform Costing may take different forms. It may range from a small association of a number of concerns who agree to have uniform information regarding a few specific cost accounting respects, to be a large organisation which has a fully developed scheme covering all the aspects of costing. The success of a uniform costing system will depend upon the following:

- (a) There should be a spirit of mutual trust, co-operation and a policy of give and take amongst the participating members.
- (b) There should be a free exchange of ideas and methods.
- (c) The bigger units should be prepared to share with the smaller ones, improvements, achievements of efficiency, benefits of research and know-how.
- (d) There should not be any hiding or withholding of information.
- (e) There should be no rivalry or sense of jealousy amongst the members.

In the application of Uniform Costing, the fundamental requirement is, therefore, to locate such differences and to eliminate or overcome, as far as practicable, the causes giving rise to such differences. The basic reasons for the differences may be as follows:

(a) Size and organisational set up of the business:

The number and size of the departments, sections and services also vary from one concern to another according to their size and organisation. The difficulty in operating Uniform Cost Systems for concerns which vary widely in regard to size and type of business may to some extent be overcome by arranging the various units in a number of size or type ranges, and applying different uniform systems for each such type.

(b) Methods of production:

The use of different types of machines, plant and equipments, degree of mechanization, difference in materials mix and sequence and nature of operations and processes are mainly responsible for the difference in costs.

(c) Methods and principles of cost accounting applied:

It is in this sphere that the largest degree of difference arises. Undertakings manufacturing identical or similar products and having the same system of cost accounting would generally employ different methods of treatment of expenditure on buying, storage and issue of materials, pricing of stores issues, payment to workers, basis of classification and absorption of overhead, calculation of depreciation, charging rent on freehold or leasehold assets etc.

5(a) XYZ Ltd which has a system of assessment of Divisional Performance on the basis of residual income has two Divisions, Alfa and Beta. Alfa has annual capacity to manufacture 15,00,000 numbers of a special component that it sells to outside customers, but has idle capacity. The budgeted residual income of Beta is ₹ 1,20,00,000 while that of Alfa is ₹ 1,00,00,000. Other relevant details extracted from the budget of Alfa for the current year were as follows

Particulars	
Sale (Outside Customer)	12,00,000 @ ₹ 180
Variable cost p.u	160

Answer_MTP_Final_Syl2016_December, 2019_Paper_15_Set 1

Divisional fixed cost	₹ 80,00,000
Capital employed	9,00,00,000
Cost of Capital	10%

Beta has just received a special order for which it requires components similar to the ones made by Alfa. Fully aware of the idle capacity of Alfa, beta has asked Alfa to quote for manufacture and supply of 3,00,000 numbers of the components with a slight modification during final processing. Alfa and Beta agree that this will involve an extra variable cost of ₹ 6 per unit.

You are required to calculate

Calculate the transfer price which Alfa should quote to Beta to achieve its budgeted residual income.

8

(b) PB Ltd. has decided to adopt JIT policy for materials. The following effects of JIT policy are identified-

(1) To implement JIT, the company has to modify its production and material receipt facilities at a capital cost of ₹10,00,000. The new machine will require a cash operating cost ₹1,08,000 p.a. The capital cost will be depreciated over 5 years.

(2) Raw material stockholding will be reduced from ₹40,00,000 to ₹10,00,000.

(3) The company can earn 15% on its long-term investments.

(4) The company can avoid rental expenditure on storage facilities amounting to ₹33,000 per annum. Property Taxes and insurance amounting to ₹ 22,000 will be saved due to JIT programme.

(5) Presently there are 7 workers in the store department at a salary of ₹5,000 each per month. After implementing JIT scheme, only 5 workers will be required in this department. Balance 2 workers' employment will be terminated.

(6) Due to receipt of smaller lots of Raw Materials, there will be some disruption of production. The costs of stock-outs are estimated at ₹77,000 per annum.

Determine the financial impact of the JIT policy. Is it advisable for the company to implement JIT system?

8

Answer:5(a)

	₹
Fixed Cost	80,00,000
Return on 9,00,00,000 X 10%	90,00,000
Residual Income	1,00,00,000
Total Contribution Required	2,70,00,000

Contribution derived from existing units = 12,00,000 X 20 = ₹2,40,00,000

Contribution required on 3,00,000 units = 2,70,00,000 - 2,40,00,000 = ₹30,00,000

Contribution per unit = ₹30,00,000 / 3,00,000 = ₹10

Increase in Variable cost = ₹ 6

∴ Transfer price = V.C + Desired Residual Income + Increase in VC

Answer_MTP_Final_Syl2016_December, 2019_Paper_15_Set 1

$$= 160+10+6$$

$$= ₹176$$

5(b)

Costs		Benefit	
Interest on capital for modifying production facilities (₹10,00,000×15%)	1,50,000	Interest on investment on released funds (₹40,00,000-`10,00,000) ×15%	4,50,000
Operating Costs of new production facilities	1,08,000	Saving in salary of 2 workers terminated (₹5,000×12 months×2)	1,20,000
Depreciation of new production facilities	Nil	Saving in rental Expenditure	33,000
Stock-Outs Costs (given)	77,000	Saving in Property Tax & Insurance	22,000
Net Benefit due to JIT policy	2,90,000	Total	
Total	6,25,000		6,25,000

Conclusion: The JIT policy may be implemented, as there is a Net Benefit of ₹2,90,000 per annum.

Note: Depreciation, being apportionment of capital cost, is ignored in decision-making, Tax Saving on Depreciation is not considered in the above analysis.

6(a) The following was the pattern for demand of cars rented out by a tourist operator observed for 100 days :

No of Cars	5	7	10	15
No of Days	20	30	40	10

The random numbers are 88, 76, 10, 05, 23 Required :

- (i) Simulate the demand for cars over five days.
- (ii) How many cars should the operator have in order to have at least 75% probability of fulfilling the demand based on your simulated results ?

5+3=8

(b) A company has four zones open and four salesmen available for assignment. The zones are not equally rich in their sales potentials. It is estimated that a typical salesman operating in each zone would bring in the following annual sales:

Zone: A: 1,26,000; Zone B: 1,05,000; Zone C: 84,000; Zone D: 63,000.

The four salesmen are also considered to differ in ability. It is estimated that working under the same condition their yearly sales would be proportionately as follows:

Salesman P:7; Salesman Q: 5; Salesman R:5; Salesman S:4. If the criterion is maximum expected total sales, the intuitive answer is to assign the best salesman to the richest zone, the next best to the second richest zone and so on. Verify this by the method of assignment.

8

Answer:

6(a)

No. of cars	No. of Days	Probability	Cumulative Prob	Random No. Interval	Day	Random No.	Demand
5	20	0.2	0.2	00-19	1	88	10
7	30	0.3	0.5	20-49	2	76	10

Answer_MTP_Final_Syl2016_December, 2019_Paper_15_Set 1

10	40	0.4	0.9	50-89	3	10	5
15	10	0.1	1	90-99	4	5	5
					5	23	7

(i) For 75% or more probability, we need more than 3 days when demand is fulfilled i.e. $3/5=60\%$, therefore at least 4 days' demand is fulfilled.

(ii) In this case, 10 cars when there is a 100% chance of all demand being fulfilled based on simulated results.

6(b)

Sales Matrix

Sales				
Man	A	B	C	D
P	42	35	28	21
Q	30	25	20	15
R	30	25	20	15
S	24	20	16	12

Loss Matrix

(Reducing all elements from highest element)

	0	7	14	21
	12	17	22	27
	12	17	22	27
	18	22	26	30

Row Operation

0	7	14	21
0	5	10	15
0	5	10	15
1	4	8	12

Column Operation

0	3	6	9
0	1	2	3
0	1	2	3
0	0	0	0

Improved Matrix 1

0	2	5	8
0	0	1	2
0	0	1	2
1	0	0	0

Improved Matrix 2

0	2	4	7
0	0	0	1
0	0	0	1
2	1	0	0

Allocation

P - A - 42

Q - B - 25

R - C - 20

S - D - 12

$99 \times 3000 = 2,97,000$ Maximum sales

7(a) Given the following information regarding a project and the time duration of each activity :

Activity	Preceding activity	Normal Time (days)
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Answer_MTP_Final_Syl2016_December, 2019_Paper_15_Set 1

A	-	16
B	-	20
C	A	8
D	A	10
E	B,C	6
F	D,E	12

Required :

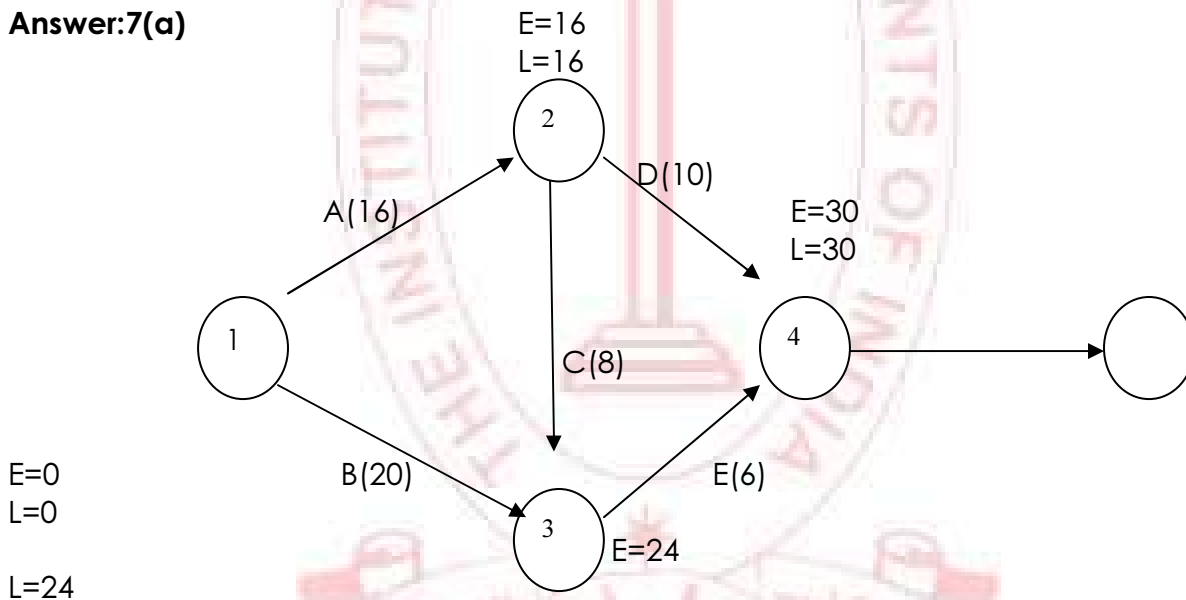
- (i) Draw the activity network of the project.
- (ii) Find critical path and duration of the project.
- (iii) Find the total float and free-float for each activity.

2+2+4 = 8

(b) A Company produces the products P, Q and R from three raw materials A, B and C. One unit of product P requires 2 units of A and 3 units of B. A unit of product Q requires 2 units of B and 5 units of C and one unit of product R requires 3 units of A, 2 unit of B and 4 units of C. The Company has 8 units of material A, 10 units of B and 15 units of C available to it. Profits/unit of products P, Q and R are ₹3, ₹5 and ₹4 respectively.

- (i) Formulate the problem mathematically,
- (ii) Write the Dual problem.

Answer:7(a)



A → D → F = 16 + 10 + 12 = 38

B → E → F = 20 + 6 + 12 = 38

(ii) A-C-E-F = 16 + 8 + 6 + 12 = 42 days (Critical Path)

(iii)

Activity	Normal time(Days)	EST	EFT	LST	Total Float	Free Float
A	16	0	0	16	0	0
B	20	0	4	24	4	4
C	8	16	24	24	0	0

Answer_MTP_Final_Syl2016_December, 2019_Paper_15_Set 1

D	10	16	26	30	4	4
E	6	24	30	30	0	0
F	12	30	42	42	0	0

7(b)

Raw Materials	P	Q	R	Available units
A	2	-	3	8
B	3	2	2	10
C	-	5	4	15

Profits 3/- 5/- 4/-

Let x_1 be the no. of units of P

Let x_2 be the no. of units of Q

Let x_3 be the no. of units of R

Objective function: Max. $Z = 3x_1 + 5x_2 + 4x_3$

Subject to constraints:

$$2x_1 + 3x_3 \leq 8$$

$$3x_1 + 2x_2 + 2x_3 \leq 10$$

$$5x_2 + 4x_3 \leq 15$$

$$\text{And } x_1, x_2, x_3 \geq 0.$$

Primal

$$\text{Max. } Z = 3x_1 + 5x_2 + 4x_3$$

Subject to

$$2x_1 + 3x_3 \leq 8$$

$$3x_1 + 2x_2 + 2x_3 \leq 10$$

$$5x_2 + 4x_3 \leq 15$$

$$\text{And } x_1, x_2, x_3 \geq 0$$

Dual

$$\text{Min. } Z = 8y_1 + 10y_2 + 15y_3$$

Subject to

$$2y_1 + 3y_2 \geq 3$$

$$2y_2 + 5y_3 \geq 5$$

$$3y_1 + 2y_2 + 4y_3 \geq 4$$

$$\text{And } y_1, y_2, y_3 \geq 0$$

$$2x_1 + 3x_2 + S_1 = 8$$

$$3x_1 + 2x_2 + 2x_3 + S_2 = 10$$

$$5x_2 + 4x_3 + S_3 = 15$$

$$\text{Max } Z = 3x_1 + 5x_2 + 4x_3 + 0.S_1 + 0.S_2 + 0.S_3$$

$$\therefore x_1 = 23/20$$

$$x_2 = 19/10$$

$$x_3 = 11/8$$

$$Z = 18.45$$

8. Write short notes on any four of the following:

4x4= 16

- (a) Back flush Accounting
- (b) Life Cycle Costing
- (c) Assignment
- (d) Features of Target Costing
- (e) Principles of Total Quality Management (TQM)

Answer:

8(a) Backflush accounting is when you wait until the manufacture of a product has been completed, and then record all of the related issuances of inventory from stock that were required to create the product. This approach has the advantage of avoiding all manual assignments of costs to products during the various production stages, thereby eliminating a large number of transactions and the associated labor. This system records the transaction only at the termination of the production and sales cycle. The emphasis is to measure cost at the beginning and at the end with greater emphasis on the end or outputs. Backflush accounting is entirely automated, with a computer handling all transactions.

The backflushing formula is: Number of units produced \times unit count listed in the bill of materials for each component.

(b) Life Cycle Costing; aims at cost ascertainment of a product, project etc. over its projected life. It is a system that tracks and accumulates the actual costs and revenues attributable to cost object (i.e., product) from its inception to its abandonment. Sometimes the terms; cradle-to-grave costing and womb-to-tomb costing convey the meaning of fully capturing all costs associated with the product from its initial to final stages.

Product Life Cycle is a pattern of expenditure, sale level, revenue and profit over the period from new idea generation to the deletion of product from product range. It spans the time from initial R&D on a product to when customer servicing and support is no longer offered for the product. Product life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their entire life cycle. Traces research, design and development costs and total magnitude of these costs for each individual product and compared with product revenue. Assists report generation for costs and revenues.

(c) Assignment is a special linear programming problem. There are many situations where the assignment of people or machines etc. may be called for. Assignment of workers to machines, clerks to various check-out counters, salesmen to different sales areas are typical examples of these. The Assignment is a problem because people possess varying abilities for performing different jobs and therefore the costs of performing jobs by different people are different. Thus, in an assignment problem, the question is how the assignments should be made in order that the total cost involved is minimized.

The following are the methods of solving an assignment problem. They are:

- (1) Complete Enumeration Method
- (2) Simplex Method
- (3) Transportation Method and
- (4) Hungarian Method

8(d) Target Costing is defined as "a structured approach in determining the cost at which a

proposed product with specified functionality and quality must be produced, to generate a desired level of profitability at its anticipated selling price." The main features or practices followed in Target Costing are:

Step 1: Identify the market requirements as regards design, utility and need for a new product or improvements of existing product.

Step 2: Set Target Selling Price based on customer expectations and sales forecasts.

Step 3: Set Target Production Volumes based on relationships between price and volume.

Step 4: Establish Target Profit Margin for each product, based on the company's long term profit objectives, projected volumes, and course of action, etc.

Step 5: Set Target Cost (or Allowable cost) per unit, for each product. Target cost = Target selling price less Target profit margin

Step 6: Determine Current Cost of producing the new product, based on available resources and conditions.

Step 7: Set cost reduction Target in order to reduce the Current Cost to the Target Cost.

Step 8: Analyze the Cost Reduction Target into various components and identify cost reduction opportunities using Value Engineering (VE) and Value Analysis (VA) and Activity Based Costing (ABC)

Step 9: Achieve cost reduction and Target profit by Effective Implementation of Cost Reduction decisions

Step 10: Focus on further possibilities of cost reduction ie Continuous Improvement program.

8(e) Principles of Total Quality Management (TQM):

The philosophy of TQM rest on the following principles, which are enlisted below:

- (i) Clear exposition of the benefits of a project.
- (ii) Total Employee Involvement (TEI).
- (iii) Process measurement.
- (iv) Involvement of all customers and contributors.
- (v) Elimination of irrelevant data.
- (vi) Understanding the needs of the whole process.
- (vii) Use of errors to prompt continuous improvement.
- (viii) Use of statistics to tell people how well they are doing.



Paper 15- Strategic Cost Management- Decision Making

Paper-15: Strategic Cost Management- Decision Making

Time allowed:3 hours

Full Marks: 100

The figures in the margin on the right side indicate full

Answer Question No. 1 in Section A, which is compulsory, carrying 20 marks. Further, answer any 5(five) Questions from Section B, each carrying 16 marks

Section A (20 marks)

1. Choose the most appropriate answer to the following questions giving justification. $10 \times 2 = 20$

- (i) ANC Co. manufactures and sells 7,500 units of a product. The full cost per unit is ₹100. The Company has fixed its price so as to earn a 30% return on an investment of ₹ 7,00,000. Target selling price will be
- (a) ₹ 120
 - (b) ₹ 130
 - (c) ₹ 128
 - (d) ₹ 210
- (ii) A Ltd. manufactures 4 products A,B,C & D with sales value mix of 33 1/3%, 41 2/3%, 16 2/3% & 8 1/3% and variable cost of 60%, 68%, 80% & 40% of selling price respectively. Budgeted sale value is ₹1,20,000. Overall P/V ratio is
- (a) 40%
 - (b) 35%
 - (c) 28%
 - (d) 32%
- (iii) PN Company makes a single product which it sells at ₹10 per unit. Fixed costs are ₹ 60,000 per month and the product has a contribution to sales ratio of 40%. In a period when actual sales were ₹1,70,000, the Company's margin of safety in units is:
- (a) 2,000 units
 - (b) 17,000 units
 - (c) 15,000 units
 - (d) 5,000 units
- (iv) A Company makes components and sells internally to its subsidiary and also to external market. The external market price is ₹ 24 per component, which gives a contribution of 40% of sales. For external sales, variable costs include ₹ 3.00 per unit towards distribution costs. This is, however not incurred in internal sales. There are no capacity constraints. To maximize company's profit, the transfer price to subsidiary should be
- (a) ₹ 24
 - (b) ₹ 21

- (c) ₹ 11.40
- (d) ₹ 14.40

(v) XYZ Ltd is a manufacturing company involved in the production of automobiles. Information from its last budget period is as follows:

Actual production 2, 75,000 Units

Budgeted Production 2, 50,000 Units

Actual fixed production Overheads ₹52, 60, 00,000

Budgeted fixed production Overheads ₹50, 00, 00,000

Then fixed overhead volume variance and expenditure variance will be:

- (a) ₹5,00,00,000 (A), ₹2,60,00,000 (F)
- (b) ₹5,00,00,000 (F), ₹2,60,00,000 (F)
- (c) ₹5,00,00,000 (F), ₹2,60,00,000 (A)
- (d) ₹5,00,00,000 (A), ₹2,60,00,000 (A)

(vi) The time taken to produce the first unit of a product is 4000 hrs. What will be the total time taken to produce the 5th to 8th unit of the product, when a 90% learning curve applies?

- (a) 10,500 hours
- (b) 12,968 hours
- (c) 9,560 hours
- (d) 10,368 hours

(vii) AB company is a supermarket group that incurs the following costs :

- (A) The bought-in price of the goods
- (B) Inventory finance costs
- (C) Self refilling costs
- (D) Costs of repacking or 'pack out' prior to storage before sale

AB company's calculating of direct product profit (DPP) would include

- (a) Costs (A) and (C) only.
- (b) All of the above cost except (b)
- (c) All of the above costs except (d)
- (d) All of the above costs.

(viii) ABC Limited has current PBIT of ₹19.20 lakhs on total assets of ₹96 lakhs. The company has decided to increase assets by ₹24 lakhs, which is expected to increase the operating profit before depreciation by ₹8.40 lakhs. There will be a net increase in depreciation by ₹4.80 lakhs. This will result in ROI

- (a) to increase by 1%
- (b) to decrease by 1%
- (c) to decrease by 1-5%
- (d) to remain the same

(ix) Marketing department of an organisation estimates that 40,000 of new mixers could be sold annually at a price of ₹60 each. To design, develop and produce these new mixers an investment of ₹40,00,000 would be required. The company desires a 15% return on investment (ROI). Given these data, the target cost to manufacture, sell, distribute and service one mixer will be

- (a) ₹ 37.50
- (b) ₹40.00
- (c) ₹45.00
- (d) ₹48.60

(x) The information relating to the direct material cost of a company is as follows:

Standard price per unit	₹ 7.20
Actual quantity purchased in units	1600
Standard quantity allowed for actual production in units	1450
Material price variance on purchase (Favourable)	₹ 480

What is the actual purchase price per unit?

- (a) ₹ 7.50
- (b) ₹ 6.40
- (c) ₹ 6.50
- (d) ₹ 6.90

Answer:

1

(i) c

$$\begin{aligned} \text{Target Sale Price per unit} &= \text{Full Cost} + \text{Target Profit} = ₹100 + \{(7,00,000 \times 30\%)\} / 7500 \\ &= 100 + 28 = ₹ 128 \end{aligned}$$

(ii) b

Product	A	B	C	D	Total
Sales	40,000	50,000	20,000	10,000	1,20,000
Variable Cost	24,000	34,000	16,000	4,000	78,000
Contribution					42,000

$$\text{P/V ratio} = 42,000 / 1,20,000 \times 100 = 35\%$$

(iii) a

$$\text{BEP} = \text{FC} / \text{CS ratio} = 60,000 / 0.40 = ₹ 150,000 \text{ or } 15,000 \text{ units}$$

$$\text{When sales is ₹170,000, Margin of safety} = (170,000 - 150,000) = ₹20,000 \text{ or } 2,000 \text{ units}$$

(iv) c

$$\text{Transfer Price} = \text{Marginal Cost} - \text{Opportunity Cost} = ₹24 \times 60\% - 3 = ₹ 11.40$$

(v) c

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Fixed Overhead Absorption Rate = budgeted fixed overheads/budgeted output
 = 50,00,00,000/2,50,000 units
 = ₹ 2,000 per unit

Fixed Overhead Volume Variance:

Budgeted Fixed Overheads	₹ 50,00,00,000
Less: Absorbed Fixed Overheads (275000x2000)	<u>₹ 55,00,00,000</u>
Variance	<u>₹ 5,00,00,000 (F)</u>

The variance is favourable because XYZ Ltd. yielded a higher output than anticipated in the budget.

Fixed Overhead Expenditure Variance:

Actual fixed production overheads	₹ 52,60,00,000
Less: Budgeted fixed production overheads	<u>₹ 50,00,00,000</u>
Variance	<u>₹ 2,60,00,000 (A)</u>

(vi) d

Units	Average Time per Unit (hours)	Total Time (hours)
1	4000	4000
2	3600	7200
4	3240	12960
8	2916	23328

Total time for 5th to 8 units = 23328 - 12960 = 10368 hrs

(vii) d

Because all of the costs mentioned can be identified with specific goods/product and would be deducted from the selling price to determine the direct product profit.

(viii) b

	Before installing new assets	After installing new assets
PBIT	₹ 19.20 lakhs	= ₹19.20 lakhs + (₹8.40lakhs - ₹4.80lakhs) = ₹22.80 lakhs
Value of Assets	₹ 96.00 lakhs	₹ 96.00 lakhs + ₹24.00 lakhs = ₹ 120lakhs
ROT	=20%	19%

Conclusion: There will be a decrease of 1 % in ROI under the proposed dispensation.

(xi) c

Projected sales (40,000 mixers X ₹60 per mixer) (A)	= ₹ 24,00,000
Less desired profit (15% of ₹ 40,00,000) (B)	= ₹ 6,00,000
Target Cost for 40,000 mixers (A – B)	= ₹ 18,00,000

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Target cost per mixer (₹ 18,00,000 / 40,000 mixer)	= ₹ 45.00 per unit
--	--------------------

(x)d

Material Price Variance (MPV) = Standard cost of Actual Quantity - Actual Cost
 $480 = 7.20 \times 1,600 - \text{Actual Cost}$
 $\text{Actual Cost} = 11,520 - 480 = 11,040$
 $\text{Actual Price / Unit} = 11,040 \div 1,600 = ₹ 6.90.$

Section-B

Answer any five questions.

Each Question carries 16 marks

16 X5=80

2(a). P Ltd. manufactures three products. The material cost, selling price and bottleneck resource details per unit are as follows:

Particulars	Product X	Product Y	Product Z
Selling Price (₹)	66	75	90
Material and other variable cost (₹)	24	30	40
Bottleneck resource time (minutes)	15	15	20

Budgeted factory costs for the period are ₹ 2,21,600. The bottleneck resources time available is 75,120 minutes per period.

Required:

(i) Company adopted throughput accounting and products are ranked according to 'product return per minute'. Select the highest rank product.

(ii) Calculate throughput accounting ratio and comment on it.

8

(b) Transferor Ltd. has two processes Preparing and Finishing. The normal output per week is 7,500 units (Completed) at a capacity of 75%

Transferee Ltd. had production problems in preparing and requires 2,000 units per week of prepared material for their finishing processes.

The existing cost structure of one prepared unit of Transferor Ltd. at existing capacity

Material	₹ 2.00 (Variable 100%)
Labour	₹2.00 (Variable 50%)
Overhead	₹4.00 (Variable 25%)

Construct the effect on the profits Transferor Ltd., for six months (25 weeks) of supplying units to Transferee Ltd. with the following alternative transfer prices per unit:

(i) Marginal Cost

(ii) Marginal Cost + 25%

(iii) Marginal Cost + 15% Return on capital (assume capital employed ₹20 lakhs)

(iv) Existing Cost

(v) Existing Cost + a portion of profit on the basis of (preparing cost / Total Cost) x Unit Profit

(vi) At an agreed market price of ₹8.50 Assume no increase in fixed cost

8

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Answer:2(a)

(i) Calculation of Rank According to product return per minute (₹)

Particulars	X	Y	Z
Selling Price	66	75	90
Less: Variable cost	24	30	40
Throughput Contribution (a)	42	45	50
Minutes per unit (b)	15	15	20
Contribution per minute (a)/(b)	2.8	3	2.5
Ranking	II	I	III

(ii) Calculation of Throughput Accounting Ratio (₹)

Particulars	X	Y	Z
Factory cost per minutes (2,21,600/75,120 minutes)(l)	2.95	2.95	2.95
TA ratio (contribution per minute/Cost per minute)	0.95	1.02	0.85
Ranking based TA ratio	II	I	III

Analysis –Product Y yields more contribution compared to average factory contribution per minute, whereas X and Z yield less.J

2(b)

Transferred units	25X2000	50000
Existing Profit	7500 X 25 X4	₹7,50,000

Effect on profit if= transfer price is

(i) Marginal cost	₹
Material	2.00
Labour	1.00
OHs	<u>1.00</u>
	<u>4.00</u>

At this transfer price there is no effect on profit of transferor Ltd.

(ii) Profit = 50,000

(iii) Profit per unit = $4 + \{(2000000 \times 15\% \times 5) / 50000\} = 7$

Under this method profit of transferor Ltd is increases by 150000 i.e 50000 X (7-4)

(iv) Profit increases by $50000 \times (8-4) = 200000$

(v) Transfer price	₹
{8+(8/12)4}	=10.67
(-)Profit	=4.00
	<u>6.67</u>

Profit increases by $50000 \times 6.67 = ₹ 3,33,500/-$

(vi) Transfer price = ₹ 8.50

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Profit increase by $4.5 \times 50000 = ₹ 2,25,000$

3(a) XYZ Ltd .produces three products.The cost data are as under:

Particulars	X	Y	Z
Direct Materials (₹)	64	152	117
Direct Labour			

Dept	Rate per Hour(₹)	Hrs	Hrs	Hrs
1	5	18	10	20
2	6	5	4	6.5
3	4	10	5	20
		16	9	24

Fixed overheads ₹ 4,00,000 per annum.

The budget was prepared at a time, when market was sluggish. The budgeted quantities and selling prices are as under :

Product	Budget Quantity	Selling Price(/per unit)
X	9,750	270
Y	7,800	280
Z	7,80	400

Later the market improved and the sale quantities could be increased by 20% for product X and 25% each for products Y and Z. The Sales Manager confirmed that the increased quantities could be achieved at the prices originally budgeted. The Production Manager has stated that the output cannot be increased beyond the budgeted level due to limitation of direct labour hours in Department 2.

Required :(i)Set optimal product mix.

(ii)State profit under optimal product mix.

6+6 = 12

(b) A company is producing and selling three products. How would you determine relative profitability of products in each of the following independent situation ?

- (i) Total sales potential in unit is limited,
- (ii) Total sales potential in value is limited,
- (iii) Raw materials are in short supply,
- (iv) Production capacity (machine hours) is limited.

4

Answer:3(a)

Product	X	Y	Z
Budged Quantity (units):	9,750	7,800	7,800
Selling price (p.u): (i)	270	280	400
Variable cost (p.u):			
Direct materials	64	152	117
Direct labour	160	94	219
Variable overheads	16	9	24
Total variable cost(p.u) (ii)	244	255	360
Contribution(p.u) (₹) (i)-(ii)	30	25	40

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Statement of optima product mix and profit.

Product:	X	Y	Z	Total
Contribution (p.u) (Rs.) (a)	30	25	40	
Direct labour hours in Dept.2 (b)	5	4	6.5	
Contribution per hr: (a)/(b)	6	6.25	6.15	
	III	I	II	
Optimal product mix units (c)	5655 (28275 hrs)	9750 (39000 hrs)	9750 (63375 hrs)	
Total Contribution (Rs) (a) X(C)	169650	243750	390000	803400
Less: Fixed Cost (Rs)				400000
Optimal Profit				403400

Working Notes

(1) Total Hours available in Department 2

Product (a)	Units(b)	Hrs(p.u)(c)	Total hrs.(d) =(b) X(c)
X	9,750	5	48,750
Y	7,800	4	31,200
Z	7,800	6.5	50,700
Total available hrs for budgeted production			1,30,650

(2) Maximum Sales Quantities of Products (under improved market conditions)

Product	Units	Increase in %	Total Number of Units
X	9,750	20	11,700
Y	7,800	25	9,750 X4 =39,000
Z	7,800	625	9,750 X6.5=63,375

Required hours for Y+Z =1,02,375

Hours available for X:1,30,650-1,02,375 =28,275

Production for X 28275/5 =5655units

The Section process will be based on optimization of contribution in relation to constraint.

- (i) Unit contribution
- (ii) P/V or C/S ratio
- (iii) Contribution per Kg of RM
- (iv) Contribution per machine hour

4(a) A company manufacturing a special type of fencing tile 12" × 8" × 1/2" used a system of standard costing. The standard mix of the compound used for making the tiles is:

1,200 kg. of material A @ ₹0.30 per kg.

500 kg. of Material B @ ₹0.60 per kg

800 kg. of Material C @ ₹0.70 per kg

The compound should produce 12,000 square feet of tiles of 1/2" thickness. During a period in which 1,00,000 tiles of the standard size were produced, the material usage was:

Kg		
7,000	Material A @ ₹0.32 per kg	2,240
3,000	Material B @ ₹0.65 per kg	1,950

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5,000	Material C @ ₹ 0.75 per kg.	3,750
15,000		7,940

Present the cost figures for the period showing Material price, Mixture, Sub-usage Variance. **10**
(b) What is the Difference between Standard Costing and Budgetary Control? **6**

Answer:4(a)

Area of tile = 12" X 8" = 2/3 sq ft

No of tiles that can be laid in 12000 sq ft is 12000/(2/3)=18000

	Standard Data			Actual Data		
	Quantity	Price	Value	Quantity	Price	Value
A	6,666.67	0.30	2000	7,000	0.32	2,240
B	2,777.77	0.60	16,667	3,000	0.65	1,950
C	4444.44	0.70	3,111	5,000	0.75	3,750
	13,888.89		6,778	15,000		7,940

Q for A = 1200 X 1,00,000/18,000 = 6,666.67

Q for B = 500 X 1,00,000/18,000 = 2,777.77

Q for C = 800 X 1,00,000/18,000 = 4,444.44

	SQSP	RSQP	AQSP	AQAP
A		7,200 X 0.3 = 2,160	7,000 X 0.3 = 2,100	
B		3,000 X 0.6 = 1,800	3,000 X 0.6 = 1,800	
C		4,800 X 0.7 = 3,360	5,000 X 0.7 = 3,500	
	6,778	7,320	7,400	7,940

RSQ for A = (15000/13888.89) x 666667

- Material sub usage variance = ₹ 542(A)
- Material mix variance = ₹ 80(A)
- Material usage variance = ₹ 622(A)
- Material price variance = ₹ 540(A)
- Material cost variance = ₹ 1162(A)

4(b) Like Budgetary Control, principles of Standard Costing assume that costs are controllable along definite lines of supervision and responsibility and it aims at managerial control by comparison of actual performances with suitable predetermined yardsticks. The basic principles of cost control, viz., setting up of targets or standards, measurement of performance, comparison of actual with the targets and analysis and reporting of variances are common to both standard costing and budgetary control systems. Both techniques are of importance in their respective fields and are complementary to each other. Thus, conceptually there is not much of a difference between standard costs and budgeted and the terms budgeted performance and standard performance mean, for many concerns one and the same thing

Despite the similarity in the basic principles of Standard Costing and Budgetary Control, the two systems vary in scope and in the matter of detailed techniques. The difference may be summarized as follows:

(a) A system of Budgetary Control may be operated even if no Standard Costing system is prevailing in the concern.

Answer_MTP_Final_Syl2016_December, 2019_Paper_15_Set 2

- (b) While standard is a unit concept, budget is a total concept.
- (c) Budgets are the ceilings or limits of expenses above which the actual expenditure should not normally rise; if it does, the planned profits will be reduced. Standards are minimum targets to be attained by actual performance at specified efficiency.
- (d) Budgets are complete in as much as they are framed for all the activities and functions of a concern such as production, purchase, selling and distribution, research and development, capital utilization, etc. Standard Costing relates mainly to the function of production and the related manufacturing costs.
- (e) A more intensive analysis of the variances from standards is necessary than in the case of variations from the budget.
- (f) Budgets are indices, adherence to which keeps a business out of difficulties. Standards are pointers for further possible improvements.

5(a) P.H. Ltd. has two manufacturing departments organised into separate profit centres known as the Basic unit and Processing unit. The Basic unit has a production capacity of 4,000 tonnes per month of Chemvax but at present its sales are limited ₹ 2,000 tonnes to outside market and 1,200 tonnes to the Processing unit.

The transfer price for the year 1986 was agreed at ₹400 per tonne. This price has been fixed in line with the external wholesale trade price on 1st January 1986. However due to heavy competition the Basic unit has been forced to reduce the wholesale trade price to ₹360 per tonne with effect from 1st June, 1986. This price however was not made applicable to the sales made to the Processing unit of the company. The Processing unit applied for revision of the price as applicable to the outside market buyers as from 1st June 1986 but the same was turned down by the basic unit.

The Processing unit refines Chemvax and packs the output Known as Colour-X in drums of 50kgs each. The selling price of colour-X is ₹40 per drum. The Processing unit has a potential of selling a further quantity of 16,000 drums of colour-X provided the overall price is reduced to ₹ 32 per drum. In that event it can buy the additional 800 tonnes of Chemvex from the basic unit whose capacity can be fully utilised. The outside market will not however absorb more than the present quantity of 2,000 tonnes

The cost data relevant to the operations are:

	Basic Unit(₹)	Processing Unit(₹)
Raw Materials/tonne	70	Transfer Price
Variable Cost/tonne	140	170
Fixed Cost/month	3,00,000	1,20,000

You are Required:

(i) Prepare statement showing the estimated profitability for June 1986 for each unit and the company as a whole on the following bases:

- (a) At 80% and 100% capacity utilisation of the Basic unit at the market price and transfer price to the Processing unit of ₹400 per tonne.
- (b) At 80% capacity utilisation of the basic unit at the market price of ₹360 per tonne and the transfer price to the Processing unit of ₹ 400 per tonne.
- (c) At 100% capacity utilisation of the Basic unit at the market price and transfer price to the Processing unit of ₹ 360 per tonne.

(ii) Comment on the effect of the company's transfer pricing policy on the profitability of the

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Processing Unit.

10

(b) Discuss the Advantages & limitations of Activity Based Costing.

6

Answer:5(a)

Statement showing computation of profit at 80% capacity when transfer price is ₹ 400/- ton:

	Basic Unit	Processing Unit	Total
i) No. of Units	3,200	(1200X1000)/50	24,000
ii) Contribution per units	{400-(140+70)}=190	{40-(570/20)}	11.5
iii) Total Contribution	608000	276000	884000
iv) Fixed cost	300000	120000	420000
v) Profit	308000	156000	464000

At 100% capacity:

	Basic Unit	Processing Unit	Total
i) No. of Units	4000	40000	
ii) Contribution per units	190	3.5	
iii) Total Contribution	760000	140000	900000
iv) Fixed cost	300000	120000	420000
v) Profit	460000	20000	480000

(b) computation of profit

	Basic Unit		Processing Unit	Total
	Out Side sale	Internal Transfer		
i) No. of Units	2000	1200	24000	
ii) Contribution per units	150	190	11.5	
iii) Total Contribution	300000	228000	276000	
	528000		276000	804000
iv) Fixed cost	300000		120000	420000
v) Profit	228000		156000	3840000

(c) Computation of Profit:

	Basic Unit	Processing Unit	Total
i) No. of Units	4000	40000	
ii) Contribution per units	150	5.5	
iii) Total Contribution	600000	220000	820000
iv) Fixed cost	300000	120000	420000
v) Profit	300000	100000	400000

Overall profit is more at 100% capacity of basic unit with a transfer price of ₹ 400/- per ton being the market price. If individual interests are not considered this may be adopted. However, from the view point of the processing unit, it will not be interested to buy more than 1200 tonnes from the basic unit, because its profit gets reduced when it takes additional units. Therefore, the

present policy of the management is not at all attractive to the processing unit.

5(b) Advantages of Activity Based Costing

- (i) It provides more accurate product costing information by reducing arbitrary cost allocations.
- (ii) It improves the quality of information available for decision making by answering the questions such as what activities and events are driving cost and where efforts should be made to control cost ?
- (iii) It is easiest way to allocate overhead in the product.
- (iv) It helps to identify the activities that can be eliminated.
- (v) It links up cause and effect relationship.
- (vi) ABC helps to identify the value added activities (that increase the customer's satisfaction) and non- value added activities (that creates the problems in customer's satisfaction)
- (vii) ABC translates cost in to a language that people can understand and that can be linked up to business activities.

Limitations of Activity Based Costing

- (i) More time consuming to collect data
- (ii) Cost of buying, implementing and maintaining activity based system
- (iii) In some cases, the establishment of cause and effect relationship between cost driver and costs not be a simple affair.
- (iv) ABC does not conform to generally accepted accounting principles in some areas.

6(a) Patients arriving at a village dispensary are treated by a doctor on a first-come-first-served basis. The inter-arrival time of the patients is known to be uniformly distributed between 0 and 80 minutes, while their service time is known to be uniformly distributed between 15 and 40 minutes. It is desired to simulate the system and determine the average time a patient has to be in the queue for getting service and the proportion of time the doctor would be idle. Carry out the simulation using the following sequences of random numbers. The numbers have been selected between 00 and 80 to estimate inter-arrival times and between 15 and 40 to estimate the service time required by the patients.

Series 1	07	21	12	80	08	03	32	65	43	74
Series 2	23	37	16	28	30	18	25	34	19	21

8

(b) A manufacturer has distribution centres X, Y, and Z. These centres have 40,20 and 40 units of his product. His retail outlets at A, B, C, D and E require 25,10,20,30 and 15 units respectively. The transport cost in (Rupees/Unit) between each centre and each outlet is given in the following table:

Distribution Centre	Retail outlets				
	A	B	C	D	E
X	55	30	40	50	40
Y	35	30	100	45	60
Z	40	60	95	35	30

We have to find out the optimum distribution cost.

8

Answer_MTP_Final_Syl2016_December, 2019_Paper_15_Set 2

Answer:6(a)

Simulation of data village dispensary							
No.of patients	Inter arrival Time Random No. (minutes)	Entry time in to queue (hrs)	Service Time Random No. (minutes)	Service Start time (hrs)	End time (hrs)	Waiting time of patient (minutes)	Idle time of doctor (minutes)
1	07	8.07	23	8.07	8.30	-	07
2	21	8.28	37	8.30	9.07	2	-
3	12	8.40	16	9.07	9.23	27	-
4	80	10.00	28	10.00	10.28	-	37
5	08	10.08	30	10.28	10.58	20	-
6	03	10.11	18	10.58	11.16	47	-
7	32	10.43	25	11.16	11.41	33	-
8	65	11.48	34	11.48	12.22	-	07
9	43	12.31	19	12.31	12.50	-	09
10	74	01.45	21	01.45	02.06	-	55
						129	115

Average waiting time of patient = $19/10 = 12.9$ minutes
 Average waiting time of doctor = $115/10 = 11.5$ minutes

It has been assumed that starting time be 8.00 A.M

MTP_Final_Syl2016_December, 2019_Paper_15_Set 2

	A	B	C	D	E	
X	55	30	40	50	40	40/20/10/5/0
	5	10	20	5		10/10*/10*
Y	35	30	100	45	60	20/0
	20					5/5/10/10
Z	40	60	95	35	30	40/25/0
				25	15	5/5/5/5/5
	25		10	20	30	15
	5	0	0	5	0	
	0			0		
	5	0	55*	10	10	
	5	0		10	10	
	5			10	10*	
	5			10		
	15			15*		

U₅

	A	B	C	D	E	
	55	30	40	50	40	0
	5	10	20	5	10	
	35	30	100	45	60	-20
	20	20	80	15	30	
	40	60	95	35	30	-20
	0	45	70	25	5	
V ₁	55	30	40	50	50	

U₅

	A	B	C	D	E	
	55	30	40	50	40	0
	5	10	20	5	5	
	35	30	100	45	60	-20
	20	20	80	20	40	
	40	60	95	35	30	-10
	-5	40	65	30	10	
V ₂	55	30	40	45	40	

U₅

	A	B	C	D	E	
	55	30	40	50	40	0
	5	10	20	5	10	
	35	30	100	45	60	-15
	20	15	75	15	35	
	40	60	95	35	30	-10
	5	40	65	30	5	
V ₃	55	30	40	45	40	

Since τ_4 is ≥ 0

The solution is optimum

	Qty	Minimum Cost
X →	B — 10 x 30 =	300
→	C — 20 x 40 =	800
→	E — 10 x 40 =	400
Y →	A — 20 x 35 =	700
Z →	A — 5 x 40 =	200
→	D — 30 x 35 =	1050
→	E — 5 x 30 =	150
	100	₹ 3400

Answer_MTP_Final_Syl2016_December, 2019_Paper_15_Set 2

7(a) XYZ Auto-manufacturing company has to prepare a design of its latest model of motorcycle. The various activities to be performed to prepare a design are as follows:

Activity	Description of activity	Preceding activity
A	Prepare drawing	-
B	Carry out cost analysis	A
C	Carry out financial analysis	A
D	Manufacture tools	C
E	Prepare bill of material	B,C
F	Receive material	D,E
G	Order sub-accessories	E
H	Receive sub-accessories	G
I	Manufacture components	F
J	Final Assembly	I,H
K	Testing and Shipment	J

Prepare an appropriate network diagram.

8

(b) The management of SAB Ltd. has suggested that a linear programming model might be used for selecting the best mix of five possible products —A, B, C, D and E. The following information are available:

Particulars	Per Unit of Product				
	A	B	C	D	E
Selling Price(₹)	96	84	76	62	54
Cost(₹)					
Material	30	28	32	30	32
Direct Labour	36	32	12	8	8
Fixed Overhead	18	16	6	4	4
Total Costs	84	76	50	42	44

Expected maximum unit demand per week for each product at the prices indicated:

A	B	C	D	E
3000	24000	1800	1200	1200

Cost of material includes a special component which is in short supply. It costs ₹6 per unit. Only 11,600 units are available to the company during the week. The number of units of the special component needed for a unit of each product is:

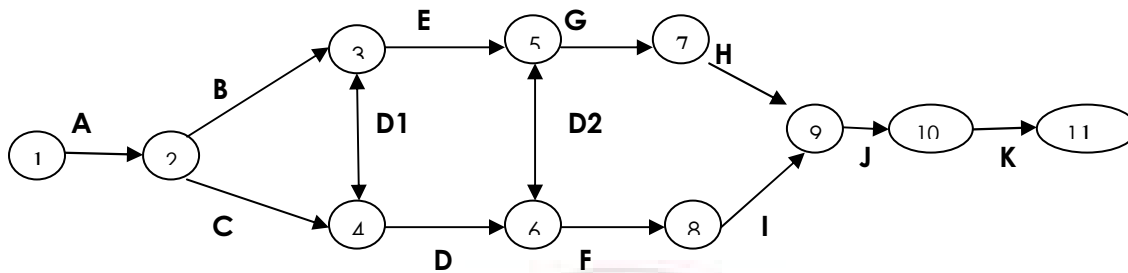
A	B	C	D	E
2	1	4	3	6

The management of SAB Ltd. has ruled that expenditure on materials must not exceed a sum of ₹60,000. All other resources are freely available in sufficient quantities for planned need.

Formulate a linear programming model stating clearly the criterion you use.

8

Answer:7(a)



(b) Let X_1, X_2, X_3 be the number of units produced of products A, B and C respectively. Objective function:

Then the profit gained by the industry is given by

$$Z = 3x_1 + 8x_2 + 2x_3$$

Here it is assumed that all the units of products A and B are sold.

Condition-1:

In first operation, A takes 3 hrs of manufacturer's time and B takes 4 hrs of manufacturer's time. Therefore, total number of hours required in first operation becomes - $3x_1 + 4x_2$

In second operation, per unit of A takes 3 hrs of manufacturer's time and per unit B takes 5 hrs of manufacturer's time. Therefore, the total number of hours used in second operation becomes - $3x_1 + 5x_2$

Since there are 18 hours available in first operation and 21 hours in second operation, the restrictions become

$$3x_1 + 4x_2 \leq 18$$

$$3x_1 + 5x_2 \leq 21$$

Condition-2: Since the maximum number of units of C that can be sold is 5, therefore, $X_3 \leq 5$

Condition-3: Further, the company gets three units of by product C for every unit of product B produced, therefore, $X_3 = 3X_2$

Now, the allocation problem of the industry can be finally put in the following linear programming problem: Maximise

$$Z = 3x_1 + 8x_2 + 2x_3$$

Subject to the Constraints

$$3x_1 + 4x_2 \leq 18$$

$$3x_1 + 5x_2 \leq 21$$

$$x_3 \leq 5$$

$$x_3 = 3x_2$$

$$x_1, x_2, x_3 \geq 0$$

7(b)

	A	B	C	D	E
Selling Price	96	84	76	62	54
Variable Cost	66	60	44	22	40
Contribution	30	24	32	40	14

Let a, b, c, d, e be the number of units respectively of A, B, C, D and E to be

Answer_MTP_Final_Syl2016_December, 2019_Paper_15_Set 2

produced. Objective function: Maximise contribution: $Z = 30a + 24b + 32c + 40d + 14e$

Subject to: Demand Constraint

a	≤	3000
b	≤	2400
c	≤	1800
d	≤	1200
e	≤	1200

Special Raw Material availability constraint
 $2a + b + 4c + 3d + 6e \leq 11600$

Special raw material cost constraint
 $12a + 6b + 24c + 18d + 36e \leq 60,000$,

Non negativity constraint: $a, b, c, d, e \geq 0$

8. Write short notes on any four of the following:

4x4= 16

- (a)** Usefulness of Pareto Analysis.
- (b)** Four P's of TQM
- (c)** Simulation Technique
- (d)** Value Engineering
- (e)** Business Process Re-engineering

Answer:

8(a) Pareto analysis is useful to:

1. Prioritize problems, goals, and objectives to identify root causes,
2. Select and define key quality improvement programs,
3. Select key customer relations and service programs,
4. Select key employee relations improvement programs,
5. Select and define key performance improvement programs,
6. Maximize research and product development time,
7. Verify operating procedures and manufacturing processes,
8. Product or services sales and distribution,
9. Allocate physical, financial and human resources.

8(b)

The 4P's	
People	To avoid misdirection, TQM teams should consist of team spirited individuals who have a flair for accepting and meeting challenges. Individuals who are not ideally suited to the participatory process of TQM. Should not be involved at all. e.g. lack of enthusiasm, non-attendance at TQM meetings, failure to complete delegated work, remaining a "Mute Spectator" at TQM meetings, etc.
Process	It is essential to approach problem-solving practically and to regard the formal process as a system designed to prevent participants from jumping to conclusions. As such, it will provide a means to facilitate the generation of alternatives while ensuring that important discussion stages are not omitted.
Problem	Problems need to be approached in a systematic manner, with teams tackling solvable problems with a direct economic impact, allowing for immediate feedback together with recognition of the contribution made by individual participants.

Preparation	Additional training on creative thinking and statistical processes are needed in order to give participants a greater appreciation of the diversity of the process. This training must quickly be extended beyond the immediate accounting circle to include employees at supervisory levels and also who are involved at the data input stage
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8(c) Simulation:

Simulation is a modelling and analysis tool that is widely used for the purpose of designing, planning and control of manufacturing systems. Simulation in general is to pretend that one deals with a real thing while really working with an imitation. In Operations Research, the imitation is a computer model of the simulated reality. The task of executing simulations provides insight and a deep understanding of physical processes that are being modelled.

Simulation is generally referred to as computer simulation, which simulates the operation of a manufacturing system. A computer simulation or a computer model is a computer program, which attempts to simulate an abstract model of a particular system.

A simple example of a simulation involves the tossing of a ball into the air. The ball can be said to "simulate" a missile, for instance. That is, by experimenting with throwing balls starting at different initial heights and initial velocity vectors, it can be said that we are simulating the trajectory of a missile.

Monte Carlo method of simulation is the most popular method of simulation. In Linear Programming, Simulation is called as the 'technique of last resort'. It means, when all other methods fail, we resort to Simulation as the last resort.

8(d) Value Engineering is an organized/systematic approach directed at analyzing the function of systems, equipment, facilities, services, and supplies for the purpose of achieving their essential functions at the lowest life-cycle cost consistent with required performance, reliability, quality, and safety. Value Engineering is an effective problem solving technique. Value engineering is essentially a process which uses function analysis, team-work and creativity to improve value. Value Engineering is not just —"good engineering"

It is not a suggestion program and it is not routine project or plan review. It is not typical cost reduction in that it doesn't —cheapen the product or service, nor does it —"cut corners".

Value Engineering methodology is a powerful tool for resolving system failures and designing improvements in performance of any process, product, service or organization.

8(e) Business Process Re-engineering (BPR) refers to fundamental rethinking and redesign of business processes to achieve improvement in critical measures of performance such as cost, quality, service, speed and customer satisfaction. In contrast, the concept of Kaizen, which involves small, incremental steps towards gradual improvement, re-engineering involves a giant leap. It is the complete redesign of a process with an emphasis on finding creative new way to accomplish an objective. It has been described as taking a blank piece of paper and starting from scratch to redesign a business process. Rather than searching continually for minute improvement, reengineering involves a radical shift in thinking about how an objective should be met. Re-engineering prescribes radical, quick and significant change. Admittedly, it can entail high risks, but it can also bring big rewards. These benefits are most dramatic, when new models are discovered for conducting business.

**Paper 15- Strategic Cost Management-
DecisionMaking**

Paper-15: Strategic Cost Management- Decision Making

Full Marks: 100

Time Allowed: 3 Hours

This paper contains two sections **A** and **B**. **Section A** is compulsory and contains question No.1 for 20 marks. **Section B** contains question Nos. 2 to 8, each carrying 16 marks. Answer any five questions from **Section B**.

Section – A [20 Marks]

1. Choose the most appropriate answer to the following questions giving justification
[10x2=20]

- (i) Ink Ltd. makes leather purses. It has drawn up the following budget for its next financial period:
Selling price per unit ₹11.60; Variable production cost per unit ₹3.40; Sales commission 5% of selling price; Fixed production costs ₹4,30,500; Fixed selling and administration costs ₹1,98,150; Sales 90,000 units. The margin of safety represents:
(a) 5.6% of budgeted sales
(b) 8.3% of budgeted sales
(c) 11.6% of budgeted sales
(d) 14.8% of budgeted sales
- (ii) A company uses a predetermined overhead recovery rate based on machine hours. Budgeted factory overhead for a year amounted to ₹7,20,000, but actual factory overhead incurred was ₹7,38,000. During the year, the company absorbed ₹7,14,000 of factory overhead on 1,19,000 actual machine hours. What was the company's budgeted level of machine hours for the year?
(a) 116098
(b) 119000
(c) 120000
(d) 123000
- (iii) A company uses standard absorption costing to value inventory. Its fixed overhead absorption rate is ₹12 per labour hour and each unit of production should take four labour hours. In a recent period when there was no opening inventory of finished goods, 20000 units were produced using 100000 labour hours. 18000 units were sold. The actual profit was ₹464000. What profit would have been earned under a standard marginal costing system?
(a) ₹368000
(b) ₹440000
(c) ₹344000
(d) ₹560000

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

- (iv) X plc intends to use relevant costs as the basis of the selling price for a special order: the printing of a brochure which requires a particular type of paper that is not regularly used by X plc although a limited amount is in X plc's inventory which was left over from a previous job. The cost when X plc bought this paper last year was ₹15 per ream and there are 100 reams in inventory. The brochure requires 250 reams. The current market price is ₹26 per ream and resale value is ₹10 per ream.

The relevant cost of the paper to be used in printing the brochure is:

- (a) ₹2500
(b) ₹4900
(c) ₹5400
(d) ₹6500
- (v) Alpha uses decision tree analysis to evaluate potential projects. The company has been looking at the launch of a new product which it believes has a 70% probability of success. The company is however considering undertaking an advertising campaign costing ₹50,000, which would increase the probability of success to 95%. If successful, the product would generate income of ₹200000 otherwise ₹70000 would be received. What is the maximum that the company would be prepared to pay for the advertising?
- (a) ₹32500
(b) ₹29000
(c) ₹17500
(d) ₹50000
- (vi) A company uses standard absorption costing. The following information was recorded by the company for October:

	Budget	Actual
Output and sales (units)	8700	8200
Selling price per unit	₹26	₹31
Variable cost per unit	₹10	₹10
Total fixed overheads	₹34800	₹37000

The sales price variance for October was:

- (a) ₹38500 adverse
(b) ₹38500 favourable
(c) ₹41000 adverse
(d) ₹41000 favourable
- (vii) Based on the data given, what is the amount of the overhead under/over absorbed?

Budgeted overheads	₹493200
Budgeted machine hours	10960
Actual machine hours	10493
Actual overhead	₹514157

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

- (a) ₹20957 under-absorbed
- (b) ₹20957 over-absorbed
- (c) ₹41972 over-absorbed
- (d) ₹41972 under-absorbed

(viii) Bunny uses a JIT system and backflush accounting. It does not use a raw material stock control account. During May, 8000 units were produced and sold. The standard cost per unit is ₹100; includes materials of ₹45. During May, ₹480000 of conversion costs were incurred. The debit balance on the cost of goods sold account for May was:

- (a) ₹800000
- (b) ₹840000
- (c) ₹880000
- (d) ₹920000

(ix) A company manufactures two products using common handling facility. The total budgeted material handling cost is ₹60000. The other details are:

Particulars	Product X	Product Y
Number of units produced	30	30
Material moves per product line	5	15
Direct labour hours per unit	200	200

Under ABC System, the material handling costs to be allocated to Product X (per unit) would be:

- (a) ₹1000
- (b) ₹500
- (c) ₹1500
- (d) ₹2500

(x) The selling price of Product P is set at ₹1500 for each unit and sales for the coming year are expected to be 500 units. If the company requires a return of 15% in the coming year on its investment of ₹1500000 in product P, the target cost for each unit for the coming year is:

- (a) ₹930
- (b) ₹990
- (c) ₹1050
- (d) ₹1110

Answer:

1. (i) (b) 8.3% of budgeted sales
Unit contribution = ₹(11.60 – 3.40 – 0.58) = ₹7.62
BEP = (430500 + 198150)/7.62 = 82500
Margin of safety = (90000 – 82500)/90000 = 8.3%

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

(ii) (c) 120000

Overhead absorbed = Actual hours x Pre-determined overhead rate

Or, 714000 = 119000 x Pre-determined overhead rate

Or, Pre-determined overhead rate = 714000/119000 = ₹6

Budgeted overhead = Budgeted machine hours x budgeted overhead rate

Or, Budgeted machine hours = 720000/6 = 120000 hours

(iii) (a) ₹368000

Standard absorption costing will include ₹96000 of the period's overhead (2000 units x 4 labour hours x ₹12 per hour) in the closing inventory valuation. Under standard marginal costing, ₹96000 would be charged against the period's profit resulting in profit being reduced by ₹96000 to ₹368000.

(iv) (b) ₹4900

The original purchase price is a sunk cost and therefore not a relevant cost. The relevant cost of the materials in stock is ₹1000 (100 reams @ ₹10 net realizable value). An additional 150 reams must be purchased for ₹3900 (150 x ₹26) resulting in a relevant cost of ₹4900.

(v) (a) ₹32500

Expected income with advertising = (200000 x 0.95) + (70000 x 0.05) = ₹193500

Expected income without advertising = (200000 x 0.7) + (70000 x 0.3) = ₹161000

The maximum amount the company should pay for advertising is the increase in expected value of ₹32500 (193500 – 161000).

(vi) (d) ₹41000 favourable

Sales price variance = (actual margin – budgeted margin) x actual sales volume
(₹17 – ₹12) x 8200 = ₹41000 favourable

Note that fixed overhead rate per unit is (₹34800/8700) = ₹4

Actual margin = 31-10-4 = ₹17

Budgeted margin = 26-10-4 = ₹12

(vii) (d) ₹41972 under-absorbed

Overhead absorption rate = 493200/10960 = ₹45

Overhead absorbed = 10493 x 45 = ₹472185

Overhead incurred = ₹514157

Under absorbed = ₹41972

(viii) (b) ₹840000

	₹
Cost of goods sold	800000
Less: Material cost	<u>360000</u>
Conversion cost allocated	440000
Conversion cost incurred	<u>480000</u>
Excess charged to Cost of goods sold A/c	40000

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

Total debit on Cost of goods sold A/c = ₹800000 + ₹40000 = ₹840000

(ix) (b) ₹500

Total moves in material handling = 5 + 15 = 20

Percentage move for Product A = $\frac{5}{20} = 25\%$

Material handling cost to be allocated to Product A = $60000 \times \frac{25}{100} = ₹15000$

Or, = ₹15000/30 units = ₹500 p.u.

(x) (c) ₹1050

		₹
Sales revenue	(500 units x ₹1500)	750000
Less: Return on investment	(₹1500000 x 15/100)	<u>225000</u>
Total cost allowed		<u>525000</u>
Target cost per unit	(₹525000/500 units)	₹1050

Section – B

Answer any five questions.

[16×5= 80]

2. (a) Amar Ltd. produces 4 products P, Q, R and S by using three different machines X, Y and Z. Each machine capacity is limited to 6000 hours per month. The details given below are for July-

Particulars	P	Q	R	S
Selling Price p.u. (₹)	10,000	8,000	6,000	4,000
Variable Cost p.u. (₹)	7,000	5,600	4,000	2,800
Machine Hours required p.u.				
Machine X	20	12	4	2
Machine Y	20	18	6	3
Machine Z	20	6	2	1
Expected Demand (units)	200	200	200	200

1. Find out the Bottleneck Activity.
2. Allocate the Machine Hours on the basis of the Bottleneck.
3. Ascertain the profit expected in the month if the monthly Fixed Cost amounts to ₹9,50,000.
4. Calculate the unused spare hours of each machine. [8]

- (b) A lodging home is being run in a small hill station with 50 single rooms. The home offers concessional rates during six off-season months in a year. During this period, half of the full room rent is charged. The management's profit margin is targeted at 20% of the room rent. The following are the cost estimates and other details for the year ending 31st march, 2019 (assume a month to be of 30 days):

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

(a) Occupancy during the season is 80%, while in the off-season is 40% only;

(b) Expenses:	₹
(i) Staff salary (excluding room attendants)	2,75,000
(ii) Repairs to buildings	1,30,500
(iii) Laundry and linen	40,000
(iv) Interior and tapestry	87,500
(v) Sundry expenses	95,400

(c) Room attendants are paid ₹5 per room-day on the basis of occupancy of the rooms in a month.

(d) Monthly lighting charges are ₹120 per room, except in four months of winter when it is ₹30 per room and this cost is on the basis of full occupancy for a month.

You are required to work out the room rent chargeable per day both during the season and the off-season months, on the basis of the above information. [8]

Answer:

2. (a)

1. Identification of Bottleneck Activity

Machine	Time required for products (Demand x M/Hrs p.u.)				Total time reqd (Hrs)	Time Available (Hrs)	Machine Utilization
	P	Q	R	S			
	(a)	(b)	(c)	(d)	(e)=(a+b+c+d)	(f)=given	(g)= (e/f)
X	4000	2400	800	400	7600	6000	126.67%
Y	4000	3600	1200	600	9400	6000	156.67%
z	4000	1200	400	200	5800	6000	96.67%

Since Machine Y has the highest machine utilization, it represents the Bottleneck Activity. Hence product, ranking & resource allocation should be based on contribution per machine hour of Machine Y.

2. Allocation of Resources and overall Profit

Particulars	P	Q	R	S	Total
(a) Contribution per unit (₹)	3000	2400	2000	1200	
(b) Time reqd. in Machine Y (Hrs)	20	18	6	3	
(c) Contribution per Machine hour	150	133.33	333.33	400	
(d) Rank based on (c)	III	IV	II	I	
(e) Allocation of Machine Y time (Hrs)	200x20 =4000	200 (bal.fig.)	200x6 =1200	200x3 =600	6000
(f) Production quantity (e/b)	200 units	11.11 units	200 units	200 units	

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

(g) Allocation of Machine X time (Hrs)	20x20 =4000	11.11x12 =133.32	200x4 =800	200x2 =400	5333.32
(h) Allocation of Machine Z time (Hrs)	200x20 =4000	11.11x6 =66.66	200x2 =400	200x1 =200	4666.66
(i) Contribution based on allocation	200x3000 =600000	11.11x2400 =26664	200x2000 =400000	200x1200 =240000	1266664
(j) Fixed cost for the month					(950000)
(k) Profit for the month					316664

Spare Capacity:

Machine X = 6000 – 5333.32 = 666.68 hours

Machine Z = 6000 – 4666.66 = 1333.34 hours

(b) (1) Calculation of No. of Room days in a year (Room days)

Season's occupancy	(50 rooms x 6 months x 30 days x 80/100)	7200
Off-season's occupancy	(50 rooms x 6 months x 30 days x 40/100)	<u>3600</u>
Total room days in a year		10800

(2) Calculation of lighting charges

Lighting charges ₹120 per room p.m. for 8 months = ₹120/30days = ₹4 per room day

Lighting charges ₹30 per room p.m. for 4 months = ₹30/30days = ₹1 per room day

		(₹)
During season for 6 months	(7200 x 4)	28800
During season for 2 months	(3600 x 2/6) x 4	4800
During winter for 4 months	(3600 x 4/6) x 1	<u>2400</u>
Total lighting charges p.a.		36000

Computation of Estimated costs for the year ending 31.03.2019 (₹)

Salary		275000
Repairs		130500
Laundry and linen		40000
Interior decoration		87500
Attendants' salary	(10800 room days @ ₹5)	54000
Lighting charges		36000
Sundry expenses		<u>95400</u>
Total estimated cost p.a.		718400

Total full room days p.a. (Room days)

Season		7200
Off-season	(3600 room days x 50%)	<u>1800</u>
Total full room days p.a.		9000

		(₹)
Cost per room day	(₹718400/9000 room days)	79.82

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

Add: Profit	(20% of rent or 25% of cost) <u>19.96</u>	
Room rent		99.78
<hr/>		
Room rent to be charged during season = ₹99.78 per room day		
During off-season = ₹99.78 X 50% = ₹49.89 per room day		

3. (a) A manufacturing unit of Ash Co. has presented the following details:

Average units produced and sold per month	240000
No. of workers	80
Sales value	₹60 Lakhs
Contribution	₹24 Lakhs
Wage rate	₹5 per unit

The production manager proposes to introduce a new automated machine due to which following changes will take place:

1. No. Of units produced and sold are expected to increase by 20%.
2. No. Of workers will be reduced to 60.
3. With a view to provide incentive for increased production, Production manager intends to offer 1% increase in wage rate for every 3% increase in average individual output achieved.
4. Decrease in selling price by 2%.

Required: Calculate amount of extra contribution after introduction of new automated machine and give your recommendations. [8]

(b) A manufacturing concerns has a multi-purpose Plant capable of operating at full capacity at 5000 machine hours per month. It may produce three products inter-changeably, for which the output and cost details are as follows:

Product	Output per Machine Hour	Material Costs
A	500 units	₹42.50 per 1000 units
B	250 units	₹17.50 per 1000 units
C	1000 units	₹30.00 per 1000 units

Labour Cost is ₹15 per machine hour while variable overheads will be ₹5 per machine hour. Fixed costs of this department are ₹100000 per monthly production period.

The company estimates from past experience that the full capacity can be used at all times if machine time can be freely moved from one product to another as dictated by demand and is anxious to establish suitable product selling prices (per 1000 units). The three price fixing methods under consideration are:

- To fix prices at product cost plus 20%
- To fix prices so as to give a contribution of ₹35 per machine hour

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

- To fix prices arbitrarily (per 1000 units) as Product A –₹150, Product B –₹230 and Product C –₹90.

Prepare a comparative statement of prices that would be charged under the three methods. Suggest which method should be adopted. [8]

Answer:

3. (a)

Particulars	Before Automation		After Automation	
1. Total Output	240000 units (Given)		240000 + 20% = 288000 units	
2. No. Of Employees	80		60	
3. Output per Employee (1/2)	3000 units		4800	
	Per Unit	Total	Per Unit	Total
4. Selling Price / Sales	₹6000000/240000 = ₹25	₹6000000 (Given)	₹25 – 2 = ₹24.5	288000 x 24.5 = ₹7056000
5. Variable Costs:				
(a) Labour	₹5 (Given)		₹5 + 20% = ₹6	
(b) Others (bal. Fig)	₹10 (bal. Fig)		₹10 (same)	
6. Contribution (4-5)	₹2400000/240000 = ₹10	₹2400000 (Given)	₹8.5	288000 x 8.5 = ₹2448000

Note: Average individual output increase = $\frac{4800 - 3000}{3000} = 60\%$

Since Average individual output has increased by 60%, Bonus entitlement will be 20%.

Decision: Increase in Monthly Contribution = ₹2448000 – ₹2400000 = ₹48000. Hence the project is acceptable.

(b) Statement of Selling Prices under alternative strategies (per 1000 units) (₹)

S. No.	Particulars	Product A	Product B	Product C
a	Output per machine hour	500 units	250 units	1000 units
b	Labour time reqd per 1000 units = (1000/a)	2 hours	4 hours	1 hour
c	Material cost (given)	42.5	17.5	30
d	Labour cost –₹15 per hour	30	60	15
e	Variable OH @ ₹5 per hour	10	20	5
f	Total variable cost (c+d+e)	82.5	97.5	50
g	Fixed OH (100000/5000 hrs) = ₹20 per hour	40	80	20
h	Total cost (f+g)	122.5	177.5	70
i	Profit margin at 20% of Total cost	24.5	35.5	14
j	Selling price based on Cost plus basis (h+i)	147	213	84

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

k	Contribution @ ₹35 per hour	70	140	35
l	Selling price to guarantee contribution (f+k)	152.5	237.5	85
m	Selling price fixed arbitrarily (given)	150	230	90
n	Best selling price (highest)	152.5	237.5	90
o	Best method of fixing the price	Guaranteed contribution	Guaranteed contribution	Arbitrary method

Decision: On an overall basis, the method which guarantees contribution of ₹35 per machine hour may be considered as ideal as it will ensure a profit of (₹35 x 5000 hrs) less Fixed Cost ₹100000 = ₹75000 per month. This profit will be earned irrespective of the product mix decision.

The effect of other methods of pricing depends upon the sale quantity, sales mix and the impact of key factor.

4. (a) StanleyCassette Ltd. Has budgeted the following sales for Feb 2020

Cassette A	1100 units @ ₹50 per unit
Cassette B	950 units @ ₹100 per unit
Cassette C	1250 units @ ₹80 per unit

As against this, the actual sales were:

Cassette A	1300 units @ ₹55 per unit
Cassette B	1000 units @ ₹95 per unit
Cassette C	1200 units @ ₹78 per unit

The cost per unit of Cassettes A, B and C was ₹45, ₹85 and ₹70 respectively.

Compute the different variances to explain the difference between the budgeted and actual profit. [10]

- (b) A firm of printer is contemplating joining the Uniform costing system being operated by its trade association but the Managing Director is doubtful about the advantages of becoming involved in the scheme. Prepare a report to the Managing Director describing the advantages that the firm is likely to gain. [6]**

Answer:

4. (a) Working Notes

(1) Calculation of Standard and Actual Profit Per Unit

Cassette	Standard			Actual		
	Selling Price	Cost	Profit	Selling Price	Cost	Profit
A	50	45	5	55	45	10
B	100	85	15	95	85	10
C	80	70	10	78	70	8

(2) Calculation of Budgeted and Actual Total Profit

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

Cassette	Budgeted			Actual		
	Sales qty. (units)	Profit per unit (₹)	Total Profit (₹)	Sales qty. (units)	Profit per unit (₹)	Total Profit (₹)
A	1100	5	5500	1300	10	13000
B	950	15	14250	1000	10	10000
C	1250	10	12500	1200	8	9600
			32250			32600

Calculation of Variances

(1) Total profit variance due to sales

$$\begin{aligned} \text{Actual profit} - \text{Budgeted profit} \\ = ₹32600 - ₹32250 &= ₹ 350(F) \end{aligned}$$

(2) Profit variance due to selling price

$$\begin{aligned} \text{Actual qty. (Actual selling price} - \text{Standard selling price)} \\ A = 1300(55 - 50) = ₹6500 (F) \\ B = 1000(95 - 100) = ₹5000 (A) \\ C = 1200(78 - 80) = ₹2400 (A) \\ \hline = ₹900(A) \end{aligned}$$

(2) Profit variance due to sales volume

$$\begin{aligned} \text{Std. Profit (Actual qty.} - \text{Budgeted qty.)} \\ A = 5(1300 - 1100) = ₹1000 (F) \\ B = 15(1000 - 950) = ₹750 (F) \\ C = 10(1200 - 1250) = ₹500 (A) \\ \hline = ₹1250(F) \end{aligned}$$

Profit variance due to sales is further analyzed into:

(a) Profit variance due to sales mix

$$\begin{aligned} \text{Std. Profit (Actual qty.} - \text{Standard proportion for actual sales)} \\ A = 5(1300 - 1167) &= ₹665 (F) \\ B = 15(1000 - 1008) &= ₹120 (A) \\ C = 10(1200 - 1325) &= ₹1250 (A) \\ \hline &= ₹705(A) \end{aligned}$$

Std. proportion for actual sales is calculated as below:	(Units)
$A = \frac{3500}{3300} \times 1100$	1167
$B = \frac{3500}{3300} \times 950$	1008
$C = \frac{3500}{3300} \times 1250$	<u>1325</u>
	3500

(b) Profit variance due to sales quantity

$$\text{Std. Profit (Standard proportion for actual sales} - \text{Budgeted qty.)}$$

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

A = 5(1167 - 1100)	= ₹335 (F)
B = 15(1008 - 950)	= ₹870 (F)
C = 10(1325 - 1250)	= ₹750 (F)
	= ₹1955(F)

Verification

Volume Variance = Mix variance + Qty. variance

₹1250 (F) = ₹705(A) + 1955 (F)

Statement of Profit showing Analysis of Variances (₹)

Particulars	Cassette		
	A	B	C
Budgeted sales	55000	95000	100000
Less: Budgeted cost	49500	80750	87500
Budgeted profit	5500	14250	12500
Variances			
Profit variance due to selling price	6500 (F)	5000 (A)	2400 (A)
Profit variance due to sales mix	665 (F)	120 (A)	1250 (A)
Profit variance due to sales qty.	335 (F)	870 (F)	750 (F)
	7500 (F)	4250 (A)	2900 (A)
Actual profit	13000	10000	9600

(b) For introduction of uniform costing in an industry, first of all, the top managements of the different concerns in the industry should understand the benefits that can be reaped by the individual firms and the total industry on implementation of the uniform costing. The benefits which may accrue to the participating concerns from the use of uniform costing are as follows:

1. It provides a standard system for the maintenance of cost accounts useful to all members of the industry, especially small and new members. This helps to compare the efficiency of individual units.
2. The members can pool their resources and get the benefit of better R&D efforts at cheaper rate.
3. It helps the firms to submit reliable cost data to price fixing bodies to determine the average cost and fixing the fair selling price of various products. It facilitates realistic pricing policies.
4. Greater ease in operating can be achieved by thorough understanding of costs and competitive spirit inculcated in the industry.
5. It facilitates improvement in labour, machinery and production methods and techniques.
6. It facilitates cost comparison among different concerns producing same products and enables each concern to measure its own efficiency with its competitors.

5. (a) There are two Profit Centres namely Division A and Division B in Ditya Ltd. Division A produces four products P, Q, R and S. Each product is sold in the external market also. The relevant data for Division A are as follows:

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

	P	Q	R	S
Market price per unit (₹)	700	690	560	460
Variable cost of production per unit (₹)	660	620	360	370
Labour hours required per unit (Hours)	6	8	4	6

The maximum sales in the external market are: P – 3000 units, Q – 3500 units, R – 2800 units and S – 1800 units.

Product S can be transferred to Division B also but the maximum quantity that might be required for transfer is 2200 units of S.

Division B can also purchase the same product at a price of ₹420 per unit from the market instead of receiving transfers of Product S from Division A.

Required:

- Calculate the Transfer Price for each unit for 2200 units of product S, if the Total Labour Hours available in Division A are – (i) 48000 hours, (ii) 64000 hours.
- Whether is it profitable for Division B to get transfer 2200 units of Product S from Division A in above (a) situation?

Show calculation of units to nearest unit and rest upto two decimal points. [8]

- (b) A Company produces three products P, Q and R for which the Standard Cost per unit and quantities produced are as under:

Products	P	Q	R
Units produced and sold	36000	48000	96000
Direct Material Cost per unit ₹	60	48	45
Direct Labour Cost per unit ₹	30	24	18
Machine Hours per unit (hours)	0.5	0.4	0.3

Total Production Overheads are absorbed on Machine Hour basis. The rate is ₹60 per Machine Hour.

The Company has analyzed its operations and determined that five activities act as Cost Drivers for Overheads. Data relating to five activities are given below:

Activity Area	Cost Driver	Cost of each activity as % of Total Production Overhead Cost
Store Receiving	Number of Requisitions	25%
Machine Set-up	Number of Set-ups	20%
Machine Running	Machine Hours worked	25%
Packing	Packing time in Hours	16%
Storage	Area in Square Meters	14%

The investigation into the Production Overhead Activities for the period revealed the following:

Activity	P	Q	R
Number of Requisitions	1200	1500	3900
Number of Machine Set-ups	60	120	320
Packing Hours	3000	4800	10200

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

Storage (sq. meters)	10800	12000	19200
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Required:

- 1) Calculate the Total Production Overheads.
- 2) Prepare Product Cost Statement showing per unit cost under Traditional Absorption Costing Method.
- 3) Calculate the Cost Driver Rates.
- 4) Prepare Product Cost Statement showing per unit cost under ABC Method.
- 5) What is the difference in Costs due to adoption of Traditional Absorption Costing Method and ABC Method? [8]

Answer:

5. (a)

1. Key factor allocation for external sales

S.No	Particulars	P	Q	R	S	Total
a	Maximum external sales	3000 units	3500 units	2800 units	1800 units	
b	Hours reqd per unit	6 hrs	8 hrs	4 hrs	6 hrs	
c	Total DLH reqd for external sales (axb)	18000 hrs	28000 hrs	11200 hrs	10800 hrs	68000 hrs
d	Selling price per unit	₹700	₹690	₹560	₹460	
e	Variable costs per unit	₹660	₹620	₹360	₹370	
f	Contribution per unit (d-e)	₹40	₹70	₹200	₹90	
g	Contribution per hour (f/b)	₹6.67	₹8.75	₹50	₹15	
h	Ranking for production	IV	III	I	II	
i	Allocation of 48000 hrs for external sale	Nil	26000 hrs	11200 hrs	10800 hrs	48000 hrs
j	Allocation of 64000 hrs for external sale	14000 hrs	28000 hrs	11200 hrs	10800 hrs	64000 hrs

Note: Total hours reqd for meeting external sale is 68000 hours. However, the total labour hours available is only 64000 hours. Hence, only 64000 hours are allocated in step (i) for meeting the external sales.

2. Computation of Transfer Prices

Hours Available	48000 hours	64000 hours
Internal transfer qty. & Hrs	2200 units of S x 6 = 13200 hours	2200 units of S x 6 = 13200 hours
Total Opportunity Costs	13200 hrs from Q at ₹8.75 ph = ₹115500	13200 hrs from P at ₹6.67 ph = ₹88044
Opportunity Costs	$\frac{115500}{2200} = ₹52.50 \text{ per unit}$	$\frac{88044}{2200} = ₹40.02 \text{ per unit}$
Variable Costs	₹370 per unit	₹370 per unit
Minimum Transfer Price	₹422.50 per unit	₹410.02 per unit
Outside Market Price	₹420 per unit	₹420 per unit

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

Profitability of Internal Transfer/Decision	Not profitable, since outside market price is less. It is preferable to buy S from outside at ₹420pu.	Profitable, since transfer price is less. It is preferable to transfer 2200 units of S.
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(b)

1. Total Machine Hours and POH

P	Q	R	Total
36000×0.5=18000 hrs	48000×0.4=19200 hrs	96000 × 0.30 =28800 hrs	66000 hours

So, Total POH = 66000 hours × ₹60 = ₹3960000

2. Computation of ABC Rates

Activity	%	Cost Pool (₹)	Cost Driver	Cost Driver Qty	ABC Rate
Store Receiving	25%	990000	Number of Requisitions	1200+1500+3900=6600	₹150 per reqn
Machine Set-up	20%	792000	Number of Set-ups	60+120+320=500	₹1584 per set-up
Machine Running	25%	990000	Machine Hours worked	18000+19200+28800=66000	₹15 per M/c Hour
Packing	16%	633600	Packing time in Hours	3000+4800+10200=18000	₹35.2 per Pkg Hour
Storage	14%	554400	Area in Square Metres	10800+12000+19200=42000	₹13.2 per Sq. M
Total		3960000			

3. Overhead Cost Allocation using ABC Rates (₹)

Activity Area	P	Q	R	Total
Store Receiving	1200×150=180000	1500×150=225000	3900×150=585000	990000
Machine Set-up	60×1584=95040	120×1584=190080	320×1584=506880	792000
Machine Running	18000×15=270000	19200×15=288000	28800×15=432000	990000
Packing	3000×35.2=105600	4800×35.2=168960	10200×35.2=359040	633600
Storage	10800×13.2=142560	12000×13.2=158400	19200×13.2=253440	554400
Total OH in ABC	793200	1030440	2136360	3960000
Production Qty.	36000 units	48000 units	96000 units	
OH Cost pu.	22.03	21.47	22.25	

4. Statement of Costs Per unit (₹)

S.No.	Particulars	P	Q	R
a	Direct Materials per unit	60	48	45
b	Direct labour per unit	30	24	18
c	Prime Cost per Unit (a+b)	90	72	63
d	OH Cost p.u. under Traditional System (Hrspu × ₹60)	0.5×60=30	0.5×60=24	0.3×60=18

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

e	Total Cost p.u. under Traditional System (c+d)	120	96	81
f	OH Cost p.u. under ABC System (as per WN3)	22.03	21.47	22.25
g	Total Cost p.u. under ABC System (c+f)	112.03	93.47	85.25
h	Difference between Traditional and ABC System (e-g)	7.97	2.53	4.25
i	Effect under Traditional System	Over costed	Over costed	Under costed

6. (a) A Company has just completed the manufacture of 40 units of a new product. The manufacturing costs are-

Direct Material	200000
Direct Labour: 8000 hours @₹20 per hour	160000
Variable Overheads	80000
Special Tools (re-usable)	10000
Fixed Overhead apportioned	100000
Total	550000

The Company's policy is to add a profit of 12% on Selling Price.

The Company received another order for 120 units of this product for which the Company quoted, based on its policy on absorption cost basis, a price of ₹15625 per unit. The Customer struck the order to ₹11000 per unit. The Company is short of work and so is keen to take up more orders but it is reluctant to accept this order price because it is against the policy to accept any price before its cost. The Company experiences a Learning Curve of 90%.

Compute the Gain or Loss arising from acceptance of the order of ₹11000 p.u. and advise the Company suitably. [8]

- (b) Aditya Enterprises is having three plants manufacturing dry-cells, located at different locations. Production cost differs from plant to plant. There are five sales offices of the company located in different regions of the country. The sales prices can differ from region to region. The shipping cost from each plant to each sales office and other data are given below:

Product Data

Production Cost per unit (₹)	Max. capacity in no. of units	Plant no.
20	150	1
22	200	2
18	125	3

Shipping Costs (₹)

	Sales Offices
--	---------------

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

	A	B	C	D	E
Plant 1	1	1	5	9	4
Plant 2	9	7	8	3	6
Plant 3	4	5	3	2	7

Demand and Sales Prices

Demand (units)	80	100	75	45	125
Sales Price (₹)	30	32	31	34	29

Find the production and distribution schedule most profitable to the company. [8]

Answer:

6. (a)

1. Computation of Selling Price of First Order for 40 units

a	Total Costs	₹550000
b	Number of units	40 units
c	Average Cost per unit = (a/b)	₹13750
d	Since Profit is 12% on Price, it is 12/88 on Cost of ₹13750	₹1875
e	Price Quoted (Cost + Profit) (c+d)	₹15625

2. Computation of Time required for 120 units

No. of units	Time reqd per unit	Total time reqd	Cumulative time
40	8000 hrs/40 units = 200 hrs	8000 hrs (given)	8000 hrs
80	200 x 90% = 180 hrs	80 units x 180 hrspu	14400 hrs
160	180 x 90% = 162 hrs	160 units x 162 hrspu	25920 hrs

Time required for 120 units = Cum. Time for 160 units – Time required for first 40 units
= 25920 – 8000 = 17920 hours.

3. Cost Sheet for order of 120 units

Particulars	Computation	₹
Direct Material	₹200000/40 = ₹5000 x 120 units	600000
Direct Labour	17920 hours x ₹20 per hour	358400
Variable Overheads	17920 hours x ₹10 per hour	179200
Special Tools (re-usable)	Hence, Relevant Cost is Nil	Nil
Fixed Overhead	Idle Capacity, hence Not Relevant	Nil
Total Cost		1137600
Cost per unit	₹1137600/120	9480
Price offered		11000
Profit per unit		1520

Decision: Total profit from 120 units is (₹1520 x 120 units) = ₹182400. Hence, the order should be accepted.

(b) In order to solve the transportation problem, we use the given information to derive the profit matrix. This is being done as follows:

Profit = Sales price – Production cost – Shipping cost

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

Thus, if we transport one unit of dry cell from each of the three plants to each of the five sales office, the following matrix is obtained:

Table 1

Plant	A	B	C	D	E	Capacity (units)
1	9	11	6	5	5	150
2	-1	3	1	9	1	200
3	8	9	10	14	4	125
Demands	80	100	75	45	125	475
						425

Here, if we transport one unit from plant 2 to sales office, the profit obtained will be calculated as follows (for above table):

$$\text{Profit} = ₹34 - ₹22 - ₹3 = ₹9$$

The objective of the company is to maximize profit. For achieving this objective, let us convert this maximization problem into minimization problem by subtracting all the elements of the above pay-off matrix from the highest pay-off, i.e., 14. Thus we have:

Table 2

Plant	Loss Matrix					Capacity (units)
	A	B	C	D	E	
1	5	3	8	9	9	150
2	15	11	3	5	13	200
3	6	5	4	0	10	125
Demands	80	100	75	45	125	475
						425

The problem is an unbalanced problem, i.e., capacity is 475 and demand is 425. Hence, a dummy sales office is added with cost equal to zero for all plants and demand equal to 50 units. Now let us apply Vogel's Approximation Method to the resultant balanced matrix for finding the initial feasible solution.

Table 3

Plant	Sales office							Capacity	Difference		
	A	B	C	D	E	Dummy					
1	50	100						150	3	3	2
	5	3	8	9	9	0					
2	25	1			125	50		200	5	11	2
	15	11	13	5	13	0					
3	5		75	45				125	0	4	1
	6	5	4	0	10	0					
Demand	80	100	75	45	125	50	475	475			

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

Difference	1	2	4	5	1	0	
	1	2	4	-	1	-	
	1	2	4	-	1	-	

The initial solution obtained by VAM is given below, which is tested for optimality.

Table 4

Plant	Sales office						Capacity (Units)
	A	B	C	D	E	Dummy	
1	50	100					150
	5	3	8	9	9	0	
2	25				125	50	200
	15	11	13	5	13	0	
3	5		75	45			125
	6	5	4	0	10	0	
Demand	80	100	75	45	125		

Since, there are 8 allocations, the solution is non-degenerate. Let us now introduce $U_i - V_j$, $i = (1,2,3)$; $j = (1,2,\dots,6)$ such that $\Delta_{ij} = C_{ij} - (U_i + V_j)$ for allocated cells. We assume $U_2 = 0$ and remaining U_i 's, V_j 's and Δ_{ij} 's are calculated as below:

Table 5

Plant	Sales office						Capacity	V_j 's
	A	B	C	D	E	Dummy		
1	50	100					150	-10
	5	3	8	9	9	0		
2	25				125	50	200	0
	15	11	13	5	13	0		
3	5		75	45			125	-9
	6	5	4	0	10	0		
Demand	80	100	75	45	125	50	475	475
V_j 's	15	13	13	9	13	0		

(Note: For values of occupied and unoccupied cells refer to Note 1.)

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

Table 6

Plant	Sales office							Capacity	V _i 's
	A	B	C	D	E	Dummy			
1	50	100	8	9	9	0	150	-6	
	5	3							5
2	15	11	13	25	125	50	200	0	
				4	2	4			5
3	30	5	75	20	10	0	125	-5	
	6		4	0					2
Demand	80	100	75	45	125	50	475		
V _j 's	11	9	9	5	13	0	475		

* Refer to Note 2 for values of occupied and unoccupied cells.

Since the values opportunity cost in all the unoccupied cells are positive, the solution obtained above is optimal. The allocation of plants to sales office and their profit amount is given below:

Plant	Sales office	Units	Profit per unit (₹)	Profit (₹)
1	A	50	9	450
1	B	100	11	1,100
2	D	25	9	225
2	E	125	1	125
2	Dummy	50	0	0
3	A	30	8	240
3	C	75	10	750
3	D	20	14	280
			Total profit	3,170

Working Notes

1. Values in Table 5 have been calculated as follows:

Occupied cells $C_{ij} = U_i + V_j$	Unoccupied cells $\Delta_{ij} = C_{ij} - (U_i + V_j)$
$C_{11} = U_1 + V_1 = 5$ or $U_1 = 5 - 15 = -10$	$C_{13} = 8 - (-10 + 13) = 5$
$C_{12} = U_1 + V_2 = 3$ or $V_2 = 3 + 10 = 13$	$C_{14} = 9 - (-10 + 9) = 10$
$C_{21} = U_2 + V_1 = 15$ or $V_1 = 15 - 0 = 15$	$C_{15} = 9 - (-10 + 13) = 6$
$C_{25} = U_2 + V_5 = 13$ or $V_5 = 13 - 0 = 13$	$C_{16} = 0 - (-10 + 0) = 10$
$C_{26} = U_2 + V_6 = 0$ or $V_6 = 0$	$C_{22} = 11 - (0 + 13) = -2$
$C_{31} = U_3 + V_1 = 6$ or $U_3 = 6 - 15 = -9$	$C_{23} = 13 - (0 + 13) = 0$
$C_{33} = U_3 + V_3 = 4$ or $V_3 = 4 + 9 = 13$	$C_{24} = 5 - (0 + 9) = -4$
$C_{34} = U_3 + V_4 = 0$ or $V_4 = 9$	$C_{32} = 5 - (-9 + 13) = 1$
	$C_{35} = 10 - (-9 + 13) = 6$

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

	$C_{36} = 0 - (-9) = 9$
--	-------------------------

2. Values in Table 6 have been calculated as follows:

Occupied cells $C_{ij} = U_i + V_j$	Unoccupied cells $\Delta_{ij} = C_{ij} - (U_i + V_j)$
$C_{11} = U_1 + V_1 = 5$ or $U_1 = 5 - 11 = -6$	$C_{13} = 8 - (-6 + 9) = 5$
$C_{12} = U_1 + V_2 = 3$ or $V_2 = 3 + 6 = 9$	$C_{14} = 9 - (-6 + 5) = 10$
$C_{24} = U_2 + V_4 = 5$ or $V_4 = 5$	$C_{15} = 9 - (-6 + 13) = 2$
$C_{25} = U_2 + V_5 = 13$ or $V_5 = 13$	$C_{16} = 0 - (-6 + 0) = 6$
$C_{26} = U_2 + V_6 = 0$ or $V_6 = 0$	$C_{21} = 15 - (0 + 11) = 4$
$C_{31} = U_3 + V_1 = 6$ or $V_1 = 6 + 5 = 11$	$C_{22} = 11 - (0 + 9) = 2$
$C_{33} = U_3 + V_3 = 4$ or $V_3 = 9$	$C_{23} = 13 - (0 + 9) = 4$
$C_{34} = U_3 + V_4 = 0$ or $U_4 = -5$	$C_{32} = 5 - (-5 + 9) = 1$
	$C_{35} = 10 - (-5 + 13) = 2$
	$C_{36} = 0 - (-5 + 0) = 5$

7. (a) You are provided with the following information:

Activity	Precedence	Time Estimates		
		Optimistic	Most likely	Pessimistic
A: 1-2	None	1	2	3
B: 2-3	A	1	4	7
C: 2-4	A	1	2	9
D: 3-5	B	1	2	9
E: 4-5	C	2	3	4
F: 5-6	D, E	2	3	4

Required:

- (i) Draw a project network. Identify the critical path and expected length of the project.
- (ii) Find out variance for different activities.
- (iii) Find out standard deviation of the network.
- (iv) What is the probability of completing the project in 12 days?
- (v) What is the probability of completing the project in 14 days?
- (vi) What is the probability of completing the project in 10 days? [8]

(b) Akash Ltd. manufactures 2 products X and Y and sells them at ₹90 and ₹80 respectively. Each product passes through two Departments P and Q before it becomes a finished product. The capacities of Departments P and Q are limited to 3400 hours and 3640 hours respectively. Each product requires 2 kg of Direct Materials "k", of which the maximum availability is 17000 kgs at ₹5 per kg. Product X and Y have a maximum market demand of 7400 units and 10000 units respectively. The time requirements of the products in the Production Department are as under-

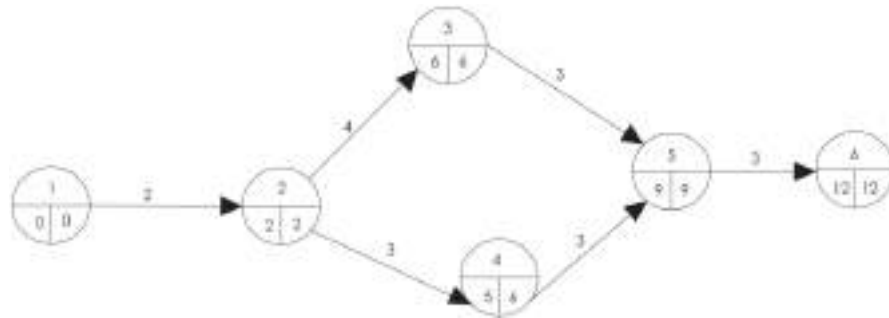
Answer to MTP_Final_Syllabus 2016_June2020_Set 1

Department	Machine Hour Rate	Product X	Product Y
P	₹40 per hour	0.50 hours	0.30 hours
Q	₹60 per hour	0.40 hours	0.45 hours

From the above data – (a) Identify the Limiting Factors, (b) Compute the Contribution per unit of P and Q, (c) Compute Contribution per unit of each Limiting Factor identified as above, (d) Determine what is the best possible combination of P and Q in order to maximize profit, if Fixed Costs for the period is ₹124750. [8]

Answer:

7. (a)(i)



Activity	Duration $[(t_o \times 1 + t_m \times 4 + t_p \times 1)]/6$
1-2	$12/6 = 2$
2-3	$24/6 = 4$
2-4	$18/6 = 3$
3-5	$18/6 = 3$
4-5	$18/6 = 3$
5-6	$18/6 = 3$

Critical path = 1-2-3-5-6

Critical path duration = 12

(ii) Variance of activities are as follows:

Activity	t_p	t_o	S.D. = $(t_p - t_o)/6$	Var = $(SD)^2$
1-2	3	1	$1/3$	$1/9$
2-3	7	1	1	1
2-4	9	1	$4/3$	$16/9$
3-5	9	1	$4/3$	$16/9$
4-5	4	2	$1/3$	$1/9$
5-6	4	2	$1/3$	$1/9$

(iii) SD of network:

$$\begin{aligned}
 \text{Variance of Critical path} &= \text{Project variance} \\
 &= 1/9 + 1 + 16/9 + 1/9 \\
 &= (1+9+16+1)/9 \\
 &= 3
 \end{aligned}$$

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

$$SD = \sqrt{3} = 1.732$$

$$(iv) Z = (x - T_{CP}) / \sigma_{CP} = (12 - 12) / 1.732 = 0$$

$$\begin{aligned} \text{Or, } P(x \leq 12) &= A(Z \leq 0) \\ &= 0.5 \\ &= 50\% \end{aligned}$$

$$(v) Z = (x - T_{CP}) / \sigma_{CP} = (14 - 12) / 1.732 = 1.15$$

$$\begin{aligned} \text{Or, } P(x \leq 14) &= A(Z \leq 1.15) \\ &= 0.5 + 0.3749 \\ &= 0.8749 \\ &= 87.49\% \end{aligned}$$

$$(vi) Z = (x - T_{CP}) / \sigma_{CP} = (10 - 12) / 1.732 = -1.15$$

$$\begin{aligned} \text{Or, } P(x \leq 10) &= A(Z \leq -1.15) \\ &= 0.5 - 0.3749 \\ &= 0.1251 \\ &= 12.51\% \end{aligned}$$

(b) 1. Identification of Key Factor(s)

Resource	Raw Material (kg)	Dept. P Hours	Dept. Q Hours
Requirement for 7400 units of X	7400 x 2 = 14800	7400 x 0.5 = 3700	7400 x 0.4 = 2960
Requirement for 10000 units of Y	10000 x 2 = 20000	10000 x 0.3 = 3000	10000 x 0.45 = 4500
Total Requirement	34800	6700	7460
Less: Availability	17000	3400	3640
Shortage	17800	3300	3820

Observation: Hence, all the 3 resources are Limiting Factors in this case.

2. Contribution and Ranking

Particulars	Product X	Product Y
Sale Price per unit	90	80
Variable Costs per unit		
Materials	2 kg x ₹5 = 10	2 kg x ₹5 = 10
Machine OH in Dept. P	0.50hrs x ₹40 = 20	0.30hrs x ₹40 = 12
Machine OH in Dept. Q	0.40 hrs x ₹60 = 24	0.45 hrs x ₹60 = 27
Sub-Total Variable Cost	54	49
Contribution per unit	36	31
Contribution per kg of Raw Material	$\frac{36}{2\text{kg}} = 18$	$\frac{31}{2\text{kg}} = 15.50$

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

Contribution per hour in Dept. P	$\frac{36}{0.50 \text{ hours}} = 72$	$\frac{31}{0.30 \text{ hours}} = 103.33$
Contribution per hour in Dept. Q	$\frac{36}{0.40 \text{ hours}} = 90$	$\frac{31}{0.45 \text{ hours}} = 68.89$

Product X has higher Ranking in terms of Raw materials and Dept. Q Resource, but Product Y has higher Ranking in Dept. P. In such case, i.e. multiple Key Factors with difference in Ranking Priority, Linear Programming Techniques are applied to arrive at the solution. This is a case of 2 Products – X and Y with 5 constraints.

3. Formulation of LPP

Objective Function: Maximise Profit $Z = 36X + 31Y - 124750$	
Constraints:	Subject to:
	$2X + 2Y \leq 17000$
	$0.50X + 0.30Y \leq 3400$
	$0.40X + 0.45Y \leq 3640$
	$X \leq 7400$
	$Y \leq 10000$
Non-Negativity Assumption	$X, Y \geq 0$

8. Write short notes on any four of the following:

4×4=16

- (a) Socio Economic Costing
- (b) Difference between Cost Control and Cost Reduction
- (c) Six Sigma
- (d) Applications of Learning curve
- (e) Limitations of Simulation

Answer:

8. (a) Socio economics is the social science that studies how economic activity affects and is shaped by social processes. In general it analyzes how societies progress, stagnate, or regress because of their local or regional economy, or the global economy. Socio economists focus on the social impact of some sort of economic change. Such changes might include a closing factory, market manipulation, the signing of international trade treaties, new natural gas regulation, etc. Such social effects can be wide ranging in size, anywhere from local effects on a small community to changes to an entire society.

(b)

Cost Control	Cost Reduction
Cost control represents efforts made towards achieving target or goal.	Cost reduction represents the achievement in reduction of cost.
Cost control assumes the existence of standards or norms which are not challenged.	Cost reduction assumes the existence of concealed potential savings in standards or norms which are therefore subjected to a constant challenge with a view to improvement by bringing out savings.
Cost control is a preventive	Cost reduction is a corrective function.

Answer to MTP_Final_Syllabus 2016_June2020_Set 1

function. Costs are optimized before they are incurred.	
Cost control lacks dynamic approach.	Cost reduction is a continuous process of analysis.

(c) Six Sigma is a set of practices originally developed by Motorola to systematically improve processes by eliminating defects. A defect is defined as non-conformity of a product or service to its specifications. Six sigma refers to the ability of highly capable processes to produce output within specification. In particular, processes that operate with six sigma quality produce at defect levels below 3.4 defects per one million opportunities. Six sigma's implicit goal is to improve all processes to that level of quality or better.

(d) Applications of Learning Curve are as follows:

- Learning curve helps to analyze CVP relationship during familiarization phase of product or process and thus is useful for cost estimates. It also assists in forecasting.
- Learning curve provides the base to set standards for the learning phase.
- It helps the Government to negotiate contracts. The Government receives full advantage of the decreasing unit cost in establishing the contract price.
- Cost data adjusted for learning effect helps in proper pricing decisions.

(e) Limitations of Simulations are:

- Simulations results are not precise. Unlike mathematical models, it does not give optimum solutions. At times one may not be able to assess the extent of error in a simulated result.
- Simulation may be expensive needing advanced computer supports.
- It is often long, complicated process to develop a model.
- Simulation by itself does not generate solutions, but only indicates a way of evaluating solutions.

Paper 15- Strategic Cost Management- Decision Making

Paper-15: Strategic Cost Management- Decision Making

Full Marks: 100

Time Allowed: 3 Hours

This paper contains two sections **A** and **B**. **Section A** is compulsory and contains question No.1 for 20 marks. **Section B** contains question Nos. 2 to 8, each carrying 16 marks.

Answer any five questions from **Section B**.

Section – A [20 Marks]

1. Choose the most appropriate answer to the following questions giving justification

[10x2=20]

- (i) A company has over-absorbed fixed production overheads for the period by ₹6,000. The fixed production overhead absorption rate was ₹8 per unit and is based on the normal level of activity of 5,000 units. Actual production was 4,500 units. What was the actual fixed production overheads incurred for the period?
- (a) ₹30,000
(b) ₹34,000
(c) ₹40,000
(d) ₹42,000
- (ii) Which of the following would decrease unit contribution margin the most?
- (a) 15% decrease in selling price
(b) 15% increase in variable costs
(c) 15% decrease in variable costs
(d) 15% decrease in fixed costs
- (iii) A company determines its selling price by marking up variable costs 60%. In addition, the company uses frequent selling price mark downs to stimulate sales. If the mark downs average 10%, what is the company's contribution margin ratio?
- (a) 27.5%
(b) 30.6%
(c) 37.5%
(d) 41.75%
- (iv) If the capacity usage ratio of a production department is 90% and activity ratio is 99%, then the efficiency ratio of the department is ____%.
- (a) 120
(b) 110
(c) 90
(d) 80

- (v) A chemical is manufactured by combining two standard items of input A (standard price ₹60/kg) and B (₹45/kg) in the ratio of 60%:40%. 10% of input is lost during processing. If during a month 1,200kg of the chemical is produced incurring a total cost of ₹69,600, the total material cost variance will be _____.
- (a) ₹2,400 (A)
(b) ₹2,400 (F)
(c) ₹3,000 (A)
(d) ₹2,000 (F)
- (vi) A company has 2,000 units of an obsolete item which are carried in inventory at the original purchase price of ₹30,000. If these items are reworked for ₹10,000, they can be sold for ₹18,000. Alternatively, they can be sold as scrap for ₹3,000 in the market. In a decision model used to analyze the reworking proposal, the opportunity cost should be taken as:
- (a) ₹8,000
(b) ₹3,000
(c) ₹10,000
(d) ₹30,000
- (vii) A company absorbs overheads on machine hours. In a period, actual machine hours were 17,285, actual overheads were ₹4,96,500 and there was under-absorption of ₹12,520. What was the budgeted overhead absorption rate per machine hour (to the nearest ₹)?
- (a) 29
(b) 28
(c) 27
(d) 26
- (viii) Z plc provides a single service to its customers. An analysis of its budget for the year ending 31st Dec shows that in period 4, when the budgeted activity was 5,220 service units with a sales value of ₹42 each, the margin of safety was 19.575%. The budgeted contribution to sales ratio of the service is 40%. Budgeted fixed costs in period 4 were nearest to:
- (a) ₹1,700
(b) ₹71,000
(c) ₹88,000
(d) ₹1,76,000
- (ix) ABC is defined as cost attribution to _____ on the basis of benefit received from indirect activities.
- (a) Cost units
(b) Cost objects
(c) Cost centres
(d) Production units

Answer_MTP_Final_Syllabus 2016_June20_Set 2

(x) A company operates through accounting system. The details of product X per unit are as under: selling price ₹50; Material cost ₹20; Conversion cost ₹15.

Time on bottleneck resources 10 minutes.

The return per hour for product X is:

- (a) ₹210
- (b) ₹180
- (c) ₹300
- (d) ₹90

Answer:

1. (i) (a) ₹30,000

Absorbed overheads (4,500 units x ₹8) = ₹36,000
 Over absorbed overheads = (₹6,000)
 Actual overheads incurred = ₹30,000

(ii) (a) 15% decrease in selling price

Unit contribution margin (UCM) equals unit selling price minus unit variable costs. It can be decreased by either lowering the price or raising the variable costs. As long as UCM is positive, a given percentage change in selling price must have a greater effect than an equal but opposite percentage change in variable cost.

(iii) (b) 30.6%

When,

Variable cost = 100 (assumed at 60%)

Selling price = 100 + 60 = 160

Contribution = 160 – 100 = 60

Selling price (after 10% markdown of selling price) = 160 x 90/100 = 144

Contribution (after 10% markdown of selling price) = 60 – 16 = 44

Contribution margin ratio = $\frac{44}{144} \times 100 = 30.555\%$ or 30.6%

(iv) (b) 110

Efficiency ratio = $\frac{\text{Activity ratio}}{\text{Capacity ratio}} = \frac{99\%}{90\%} = 110\%$

(v) (b) ₹2,400 (F)

Material	Quantity	Rate	Amount
	Kgs.	(₹)	(₹)
A	60	60	3,600
B	40	45	1,800
	100		5,400
Less:	10		
	90		

Standard cost of output = ₹5,400/90 kgs = ₹60/kg

Answer_MTP_Final_Syllabus 2016_June20_Set 2

$$\text{Material cost variance} = (1,200 \text{ kg} \times ₹60) - ₹69,600 = ₹2,400(F)$$

(vi) (b) ₹3,000

$$\begin{aligned}\text{Net inflow} &= \text{Rework income} - \text{Cost of rework} \\ &= ₹18,000 - ₹10,000 = ₹8,000\end{aligned}$$

The original price of ₹30,000 is not relevant and only ₹8,000 is relevant for decision making. The other alternative relevant cash flow is from sale of scrap i.e., ₹3,000. Hence, the opportunity cost is ₹3,000.

(vii) (b) 28

$$\begin{aligned}\text{Actual overheads incurred} & ₹4,96,500 \\ \text{Under-absorbed overhead} & ₹12,520 \\ \text{Actual overheads absorbed} & ₹4,83,980\end{aligned}$$

$$\begin{aligned}\frac{\text{Actual overheads absorbed}}{\text{Actual machine hours}} &= \text{Amount absorbed per machine hour} \\ \frac{4,83,980}{17,285} &= 28 \text{ per machine hour}\end{aligned}$$

(viii) (b) ₹71000

$$\begin{aligned}\text{Break-even point (units)} &= 5,220 - (19.575\% \times 5,220) \\ &= 4,198 \text{ units}\end{aligned}$$

$$\begin{aligned}\text{Fixed costs} &= \text{Contribution at the break-even point} \\ &= 4,198 \times ₹42 \times 40\% \\ &= ₹70,526\end{aligned}$$

(ix) (a) Cost units

ABC is defined as cost attribution to cost units on the basis of benefit received from indirect activities. It required to trace the significant activities in the organization and attempts to absorb the costs of such activities into product cost on the basis of benefit received by such unit.

(x) (b) ₹180

$$\text{Return per hour for Product X} = \frac{\text{Selling Price} - \text{Material Cost}}{\text{Time on bottleneck resource}}$$

$$= \frac{₹50 - ₹20}{10 \text{ minutes}} \times 60 = ₹180 \text{ per hour}$$

Answer_MTP_Final_Syllabus 2016_June20_Set 2

Section – B

Answer any five questions.

[16×5= 80]

2. (a) Jyoti Ltd. has developed a new product 'TRIO' which is to be launched soon. The company anticipated to sell 1,25,000 of these units at a sale price of ₹400 per unit over the Product Life Cycle of three years. The other data pertaining to Product TRIO are as under:

Calculate:

1. Life Cycle Cost of the Product 'TRIO'.
2. Revised Life Cycle Cost if Jyoti Ltd. increases sales by 12% through 5% reduction in sale price along with increase in Fixed Manufacturing Cost by ₹1,20,000 per year.
3. Should the company go for reduction in sale price? [10]

- (b) A machine manufactures 10,000 units of a part of a total cost of ₹21 of which ₹18 is variable. This part is readily available in the market at ₹19 per unit. If the part is purchased from the market then the machine can either be utilized to manufacture a component in same quantity contributing ₹2 per component or it can be hired out at ₹21,000. Recommend which of the alternatives is profitable. [6]

Answer:

2. (a) Income Statement

Particulars	As per Budget	At Reduced Prices
(a) Quantity sold	1,25,000 units (Given)	1,25,000 + 12% = 1,40,000 units
(b) Sales Price per unit	₹400 (Given)	₹400 – 5% = ₹380
(c) Sales revenue (axb)	5,00,00,000	5,32,00,000
Costs: R&D (Given)	32,50,000	32,50,000
Manufacturing variable	1,25,000 units x ₹175 = 2,18,75,000	1,40,000 units x ₹175 = 2,45,00,000
Manufacturing Fixed	₹12,75,000 x 3 = 38,25,000	(₹12,75,000 + ₹1,20,000) x 3 = 41,85,000
Marketing Variable (a) Commission	1,25,000 units x ₹400 x 4% = 20,00,000	1,40,000 units x ₹380 x 4% = 21,28,000
(b) Others (Note)	1,25,000 units x ₹74 = 92,50,000	1,40,000 units x ₹74 = 1,03,60,000
Marketing Fixed	₹6,72,000 x 3 = 20,16,000	₹6,72,000 x 3 = 20,16,000
Administration	₹6,60,000 x 3 = 19,80,000	₹6,60,000 x 3 = 19,80,000

Answer_MTP_Final_Syllabus 2016_June20_Set 2

Warranty	$\frac{1,25,000 \text{ units}}{50 \text{ units}} \times 4 \text{ parts} \times ₹30 = 3,00,000$	$\frac{1,40,000 \text{ units}}{50 \text{ units}} \times 4 \text{ parts} \times ₹30 = 3,36,000$
(d) Total Costs	4,44,96,000	4,87,55,000
(e) Profit (c-d)	55,04,000	44,45,000

Note: Marketing Cost per unit (given) is ₹90, of which Commission as per Budget is ₹400 x 4% = ₹16. Hence, other Variable marketing cost = 90 – 16 = ₹74 p.u., which will remain constant at reduced prices also.

Observation: price reduction decreases profit by 55,04,000 – 44,45,000 = ₹10,59,000, and is hence not desirable.

(b)

Particulars	Option 1	Option 2	Option 3
Description	Make	Buy & earn contribution on another component	Buy & hire out spare capacity
Relevant Costs	Variable Cost = 10,000 x 18 = ₹1,80,000	10,000 x 19 = ₹1,90,000	10,000 x 19 = ₹1,90,000
Relevant Benefits	Nil	10,000 x 2 = ₹20,000	Given Hire Revenue = ₹21,000
Net Costs	₹1,80,000	₹1,70,000	₹1,69,000

Decision: Purchasing this component and hiring out spare capacity is the best option, due to least costs.

Note: Fixed Costs of own production (i.e. ₹21 – ₹18 = ₹3p.u.) is an apportionment, and hence irrelevant for decision making purposes.

3. (a) A Gloves manufacturer has a net profit of ₹25 per pair on a selling price of ₹143. He is producing 6,000 pairs per annum which is 60% of the potential capacity. The cost per unit is as under:

Direct Materials	35
Direct Wages	12.5
Works Overheads (50% fixed)	62.5
Administrative Overheads (75% fixed)	6

During the current year, the manufacturer also estimates demand of 6,000 pairs but anticipates that the fixed charges to go up by 10% while the rate of Direct Labour and Direct Materials will increase by 8% and 6% respectively. But he has no option of increasing the selling price. Under this situation he obtains an offer to utilize further 20% of capacity. What minimum price will you recommend to ensure an overall profit of ₹1,67,300? [8]

- (b) Your company has a production capacity of 2,00,000 units per year. Normal capacity utilisation is reckoned as 90%. Standard variable production costs are ₹11 per unit. The fixed costs are ₹3,60,000 per year. Variable selling costs are ₹3 per unit and fixed selling costs are ₹2,70,000 per year. The unit selling price is ₹20. In the year just ended on 31st March, 2020 the production was 1,60,000 units and sales

Answer_MTP_Final_Syllabus 2016_June20_Set 2

were 1,50,000 units. The closing inventory on 31.03.2020 was 20,000 units. The actual variable production costs for the year were ₹35,000 higher than the standard.

(i) Calculate the profit for the year: (a) by the Absorption Costing Method, and (b) by the Marginal Costing Method.

(ii) Explain the difference in the profits.

[8]

Answer:

3. (a)

1. Present Cost Analysis

Particulars	Cost per pair (₹)	Variable Cost per pair (₹)	Fixed cost per pair (₹)
Direct materials	35	100% = 35	-
Direct wages	12.5	100% = 12.5	-
Works OH	62.5	50% = 31.25	50% = 31.25
AOH	6	25% = 1.5	75% = 4.5
SOH (bal.fig)	2	100% = 2 (assumed fully variable)	-
Total cost (bal.fig)	118		35.75
Add: Profit (Given)	25		
Sale price (Given)	143		

Present Total Fixed Cost = 6,000 pairs x ₹35.75 per pair = ₹2,14,500

(Note: 2 alternative assumptions exist.)

2. Proposed Costs

Particulars	₹ per pair
Variable Costs:	
Direct materials	35 + 6% = 37.10
Direct wages	12.50 + 8% = 13.50
Works OH	31.25
Admin OH	1.50
SOH	2
Total Variable Cost per pair	85.35

Revised Contribution per pair = selling price – variable cost = 143 – 85.35 = ₹57.65

Total Fixed Cost = ₹2,14,500 + 10% = ₹2,35,950

3. Selling price of the offer for required profit of ₹1,67,300

Computation	Result
(a) Reqd Contribution = Fixed Cost+Reqd Profit = ₹2,35,950+₹1,67,300	₹4,03,250
(b) Contribution from Existing Customers = 6,000 pairs x ₹57.65	₹3,54,900
(c) Contribution required from New Order = (a-b)	₹57,350
(d) New Order Quantity = $\frac{6,000}{60\%} \times 20\%$	2,000 pairs
(e) Contribution per pair from New Order = $\frac{57,350}{2,000}$	₹28.675
(f) Required Minimum Sale Price = VC+Contribution = ₹28.675+ ₹85.35	₹114.025

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Note: Possible Alternative Approaches:

1. Present Fixed Cost can also be taken at 100% Capacity=

$$\frac{6,000}{60\%} \times ₹35.75 = ₹3,57,500$$

2. SOH can be assumed as fully fixed.

(b) Statement of cost of production and profit for the year ended 31st March, 2020

(Under Absorption Costing Method)

₹

Sales (a)	(1,50,000 units x ₹20)		30,00,000
Cost of production:			
Std. Variable production cost	(1,60,000 units x ₹11)	17,60,000	
Add: increase in actual cost		35,000	17,95,000
Fixed cost			3,60,000
			21,55,000
Add: opening stock	(10,000 units x ₹13)		1,30,000
			22,85,000
Less: closing stock	$\frac{₹21,55,000}{1,60,000 \text{ units}} \times 20,000 \text{ units}$		2,69,375
Cost of output (b)			20,15,625
Gross profit (a-b)			9,84,375
Less: selling expenses			
Variable		4,50,000	
Fixed		2,70,000	7,20,000
Net profit			2,64,375

Note: opening stock is valued at variable cost per unit (₹11) + Fixed cost per unit at normal capacity (₹2)

Statement of contribution and profit for the year ended 31st March, 2020

(Under Marginal Costing Method)

₹

Sales (a)	(1,50,000 units x ₹20)		30,00,000
Variable cost			
Variable production cost	(1,60,000 units x ₹11)	17,60,000	
Add: increase in actual		35,000	17,95,000
Variable cost of opening stock			1,10,000
			19,05,000
Less: closing stock	$\frac{₹17,95,000}{1,60,000 \text{ units}} \times 20,000 \text{ units}$		2,24,375
			16,80,625
Add: Variable selling cost	(1,50,000 units x ₹3)		4,50,000
(b)			21,30,625
Contribution (a-b)			8,69,375
Less: Fixed costs			
Production cost		3,60,000	
Fixed		2,70,000	6,30,000
Net profit			2,39,375

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Analysis – The difference in profit under Absorption Costing and Marginal Costing statements is ₹25,000 (₹2,64,375 – ₹2,39,375). This is mainly due to inclusions of fixed cost in valuation of closing stock under Absorption Costing and its exclusion in Marginal Costing method.

4. (a) Akash makes and sells a single product. The company operates a standard marginal costing system and a just-in-time purchasing and production system. No inventory of raw materials or finished goods is held.

Details of the budget and actual data for the previous period are given below:

Budget data

Standard production costs per unit:

Direct material	8 kg @ ₹10.80 per kg	₹86.40
Direct labour	1.25 hours @ ₹18 per hour	₹22.5
Variable overheads	1.25 hours @ ₹6 per direct labour hour	₹7.50
Standard selling price	₹180 per unit	
Budgeted fixed production overheads	₹1,70,000	
Budgeted production and sales	10,000 units	

Actual data

Direct material	74,000 kg @ ₹11.20 per kg
Direct labour	10,800 hours @ ₹19 per hour
Variable overheads	₹70,000
Actual selling price	₹184 per unit
Actual fixed production overheads	₹1,68,000
Actual production and sales	9,000 units

Prepare a statement using marginal costing principles that reconciles the budgeted profit and the actual profit. Your statement should show the variances in as much detail as possible. [10]

- (b) “Standard costing system is not compatible with Activity based costing system”. Do you agree with this statement? Explain your answer. [6]

Answer:

4. (a)

Budgeted profit (W1)		4,66,000
Sales volume contribution variance (9,000 units – 10,000 units) X ₹63.60	63,600 (A)	
Selling price variance 9,000 units x (₹184 - ₹180)	36,000 (F)	27,600 (A)
Cost variances:		
Direct material price variance 74,000 kg x (₹10.80 – ₹11.20)	29,600 (A)	

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Direct material usage variance ((9,000 x 8kg) – 74,000kg) x ₹10.80	21,600 (A)	
Direct labour rate variance 10,800 x (₹18 – ₹19)	10,800 (A)	
Direct labour efficiency variance ((9,000x1.25)–10,800)x₹18	8,100 (F)	
Variable overhead expenditure variance (10,800 hours x ₹6) – ₹70,000	5,200 (A)	
Variable overhead efficiency variance ((9,000 x 1.25) – 10,800) x ₹6	2,700 (F)	
Fixed overhead expenditure variance (₹1,70,000 – ₹1,68,000)	2,000 (F)	54,400 (A)
Actual profit (W2)		3,84,000

Workings:

$$\begin{aligned}
 1. \text{ Budgeted profit} &= \text{Budgeted contribution} - \text{Fixed overheads} \\
 &= (\text{₹}63.60 \times 10,000) - \text{₹}1,70,000 = \text{₹}4,66,000 \\
 &\quad \{180 - 86.40 - 22.50 - 7.50\}
 \end{aligned}$$

2. Actual profit for the period

Sales (9,000 units x ₹184)		16,56,000
Direct materials (74,000kg x ₹11.20)	8,28,800	
Direct labour (10,800 hours x ₹19)	2,05,200	
Variable production overheads	70,000	(11,04,000)
Contribution		5,52,000
Fixed production overheads		(1,68,000)
Actual profit		3,84,000

(b) The Traditional Standard Costing system is not compatible with Activity Based Costing system due to the following reasons:

- Product costing based on manufacturing costs alone today represents an unacceptably low proportion of total cost.
- Non-manufacturing product costs such as product selling and distribution expenses are ignored for product costing purposes.
- ABC system addresses the treatment of all overhead related costs linking with cost drivers and cost pools.
- Greater variety, diversity and complexity of products are not taken in to consideration in traditional systems.
- The cost of technology is treated as product cost and consequently expensed on a straight line basis, irrespective of use.
- Customer related costs are not related to product cost object. Customer profitability has become as crucial as product profitability.

5. (a) A company is organized on decentralized lines, with each manufacturing division operating as a separate profit centre. Each division has full authority to decide on sale of the division's output to outsiders and to other divisions.

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Division C has always purchased its requirements of a component from Division A. but when informed that Division A was increasing its selling price to ₹150, the manager of Division C decided to look at outside suppliers. Division C can buy the components from an outside supplier for ₹135. But Division A refuses to lower its price in view of its need to maintain its return on the investment. The top management has the following information:

C's annual purchase of the component	1,000 units
A's variable costs per unit	₹120
A's fixed cost per unit	₹20

Required:

- (i) Will the company as a whole benefit, if Division C buys the component at ₹135 from an outside supplier?
- (ii) If Division A did not produce the material for Division C, it could use the facilities for other activities resulting in a cash operating savings of ₹18,000. Should Division C then purchase from outside sources?
- (iii) Suppose there is no alternative use of Division A's facilities and the market price per unit for the component drops by ₹20. Should Division C now buy from outside? [8]

- (b) Nestle has decided to increase the size of the store. It wants the information about the probability of the individual product lines: Kit Kat, Nescafe and Munch. It provides the following data for the year for each product line-

Particulars	Kit Kat	Nescafe	Munch
Revenues (₹)	79,350	2,10,060	1,20,990
Cost of goods sold (₹)	60,000	1,50,000	90,000
Cost of bottles returned (₹)	1,200	0	0
Number of purchase orders	36	84	36
Number of deliveries received	30	219	66
Hours of shelf stocking time	54	540	270
Items sold	12,600	1,10,400	30,600

Nestle also provides the following information for the year:

S.No	Activity	Description of Activity	Total Costs	Cost Allocation Basis
1	Bottle Returns	Returning of Empty Bottles to the store	1,200	Direct tracing to product line
2	Ordering	Placing of orders of purchases	15,600	156 orders
3	Delivery	Physical delivery & the receipts of merchandise	25,200	315 deliveries
4	Shelf Stocking	Stocking of merchandise on store and ongoing re-stocking	17,280	864 hours of time
5	Customer Support	Assistance provided to customers including bagging and check-out	30,720	1,53,600 items sold

Required:

1. Nestle currently allocates Store Support Costs (all Costs other than Cost Of Goods Sold) to the product lines on the basis of the Cost Of Goods Sold for each

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product line. Calculate the Operating Income and Operating Income as the percentage of revenue of each product line.

2. If Nestle allocates Store Support Costs (all Costs other than the Cost Of Goods Sold) to the product lines on the basis of ABC System, calculate the Operating Income and Operating Income as the percentage of revenue of each product line.
3. Compare both the systems. [8]

Answer:

5. (a) (i) ₹

Purchase cost (from outside supplier) (1,000 units x ₹135p.u.)	1,35,000
Less: Saving in variable cost of Division A by reducing division's output (1,000 units x ₹120 p.u.)	1,20,000
Net loss	15,000

The company as a whole will incur loss of ₹15,000 if Division C bought the component from an outside supplier at ₹135 p.u.

(ii) ₹

Purchase cost (from outside supplier) (1,000 units x ₹135p.u.)	1,35,000
Less: Saving in variable cost of Division A for the units purchased by Division C from outside (1,000 units x ₹120 p.u.)	1,20,000
Opportunity cost of facilities used in Division A	18,000
	1,38,000
Net Profit	3,000

It is suggested that Division C should purchase the component from outside sources as this decision will benefit the company by ₹3,000.

(iii) ₹

Purchase cost (from outside supplier) (1,000 units x ₹115p.u.)	1,15,000
Less: Saving in variable cost of Division A by reducing division's output (1,000 units x ₹120 p.u.)	1,20,000
Net Profit	5,000

It is suggested that Division C should purchase the component from outside sources as this decision will benefit the company by ₹5,000.

(b) 1. Allocation based on Cost of Goods sold

- Total support costs = ₹1,200 + ₹15,600 + ₹25,200 + ₹17,280 + ₹30,720 = ₹90,000
- Total cost of goods sold = ₹60,000 + ₹1,50,000 + ₹90,000 = ₹3,00,000
- Hence, ratio of support costs to COGS = ₹90,000/₹3,00,000 = 30%
- The product profit statement is as under:

Particulars	Kit Kat (₹)	Nescafe (₹)	Munch (₹)	Total (₹)
Revenues	79,350	2,10,060	1,20,990	4,10,400
Less: Cost of Goods	60,000	1,50,000	90,000	3,00,000

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Sold				
Gross Margin	19,350	60,060	30,990	1,10,400
Less: Support Costs at 30%	18,000	45,000	27,000	90,000
Operating Income	1,350	15,060	3,990	20,400
Operating Income as % of Sales	1.70%	7.17%	3.30%	4.97%

Note: Cost of Bottles returned is presumed to have been already adjusted against COGS given above.

2. Allocation based on Activity Based Costing

(a) Computation of Activity Based Cost Driver Rates

Activity	Total Costs	Cost Allocation Base	ABC Rate
Bottle Returns	1,200	Direct tracing to product line	Directly allocated
Ordering	15,600	156 orders	₹100 per purchase order
Delivery	25,200	315 deliveries	₹80 per delivery
Shelf Stocking	17,280	864 hours of time	₹20 per hour
Customer Support	30,720	1,53,600 items sold	₹0.20 per item sold

(b) Product Profit Statement under ABC System is as under-

Particulars	Kit Kat (₹)	Nescafe (₹)	Munch (₹)	Total (₹)
Revenues	79,350	2,10,060	1,20,990	4,10,400
Less: Cost of Goods Sold	60,000	1,50,000	90,000	3,00,000
Gross Margin	19,350	60,060	30,990	1,10,400
Less: Activity Based Cost				
Bottle Returns	1,200	Nil	Nil	1,200
Ordering	3,600	8,400	3,600	15,600
Delivery	2,400	17,520	5,280	25,200
Shelf Stocking	1,080	10,800	5,400	17,280
Customer Support	2,520	22,080	6,120	30,720
Total Support Costs	10,800	58,800	20,400	90,000
Operating Income	8,550	1,260	10,590	20,400
Operating Income as % of Sales	10.78%	0.60%	8.75%	4.97%

Note: Cost of Bottles returned is presumed to have been already adjusted.

3. Comments:

- Under COGS - based OH Allocation, OH are taken at 30% of COGS, without recognizing the extent of resources consumed for each product line. Hence, ABC based OH Allocation provides a better analysis of costs.
- Under ABC System, "Nescafe" has a higher share of OH, on account of higher resource consumption. Hence, it shows a lower operating income % than under the earlier COGS – based Allocation System. The company should

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identify possibilities of price increase in "Nescafe" to recover resource – based costs.

- c) "Kit Kat" has a higher operating income % and is most profitable. Hence, the company should explore avenues for increasing sales of "Kit Kat".

6. (a) A company manufactures 30 items per day. The sale of these items depends upon demand which has the following distribution:

Sales (units)	27	28	29	30	31	32
Probability	0.10	0.15	0.20	0.35	0.15	0.05

The production cost and sales price of each unit are ₹40 and ₹50 respectively. Any unsold product is to be disposed of at a loss of ₹15 per unit. There is a penalty of ₹5 per unit if the demand is not met.

Using the following random numbers estimate total profit/loss for the company of the next 10 days: 10,99,65,99,95,01,79,11,16,20.

If the company decides to produce 29 items per day, what is the advantage or disadvantage to the company? [8]

- (b) An organization producing 4 different products, viz., A, B, C and D having 4 operators viz., P, Q, R and S, who are capable of producing any of the four products, works effectively 7 hours a day. The time (in minutes) required for each operator for producing each of the products are given in the cells of the following matrix along with profit: (₹ per unit)

Operators	Products			
	A	B	C	D
P	6	10	14	12
Q	7	5	3	4
R	6	7	10	10
S	20	10	15	15
Profit (₹/unit)	3	2	4	1

Find out the assignments of operators to products which will maximize the profit. [8]

Answer:

6. (a) First of all, random number 00-99 are allocated in proportion to the probabilities associated with the sale of the items as given below:

Sales	Probability	Cum. Probability	Random numbers assigned
27	0.10	0.10	00-09
28	0.15	0.25	10-24
29	0.20	0.45	25-44
30	0.35	0.80	45-79
31	0.15	0.95	80-94
32	0.05	1.00	95-99

Now demand for next 10 days can be simulated using the given number in order to estimate the total profit/loss for the company. It is given that production cost of each item is ₹40 and sale price is ₹50. Therefore, the profit per unit of sold item is

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₹10. There is a loss of ₹15 per unit associated with each unsold unit and a penalty of ₹5 per unit, if the demand is not met. Accordingly, profit and loss for next 10 days is calculated as under:

Day	Random number	Estimated sale	Profit/loss per day when production = 30 items per day	Profit/loss per day when production = 29 items per day
1	10	28	$28 \times ₹10 - 2 \times 15 = 250$	$28 \times ₹10 - 1 \times 15 = 265$
2	99	32	$30 \times ₹10 - 2 \times 5 = 290$	$29 \times ₹10 - 3 \times 5 = 275$
3	65	30	$30 \times ₹10 = 300$	$29 \times ₹10 - 1 \times 5 = 285$
4	99	32	$30 \times ₹10 - 2 \times 5 = 290$	$29 \times ₹10 - 3 \times 5 = 275$
5	95	32	$30 \times ₹10 - 2 \times 5 = 290$	$29 \times ₹10 - 3 \times 5 = 275$
6	01	27	$27 \times ₹10 - 3 \times 15 = 225$	$27 \times ₹10 - 2 \times 15 = 240$
7	79	30	$30 \times ₹10 = 300$	$29 \times ₹10 - 1 \times 5 = 285$
8	11	28	$28 \times ₹10 - 2 \times 15 = 250$	$28 \times ₹10 - 1 \times 15 = 265$
9	16	28	$28 \times ₹10 - 2 \times 15 = 250$	$28 \times ₹10 - 1 \times 15 = 265$
10	20	28	$28 \times ₹10 - 2 \times 15 = 250$	$28 \times ₹10 - 1 \times 15 = 265$
		Total profit	₹2,695	₹2,695

The total profit for 10 days will be ₹2,695, if the company manufactures 30 items per day. In case the company decides to produce 29 items per day then the profit of the company for next 10 days will be ₹2,695. From this, it is evident that there is no additional profit or loss, if the production is reduced to 29 items per day since the total profit remains unchanged.

(b) It is given that the factory works effectively 7 hours (420 minutes) a day. Time required by each operator for producing each of the product is also given. Based on this information, following production and profit matrices are prepared:

Production Matrix (units)				
Operators	Products			
	A	B	C	D
P	$420/6 = 70$	$420/10 = 42$	$420/14 = 30$	$420/12 = 35$
Q	$420/7 = 60$	$420/5 = 84$	$420/3 = 140$	$420/4 = 105$
R	$420/6 = 70$	$420/7 = 60$	$420/10 = 42$	$420/10 = 42$
S	$420/20 = 21$	$420/10 = 42$	$420/15 = 28$	$420/15 = 28$

Profit Matrix (in ₹)				
Operators	Products			
	A	B	C	D
P	$70 \times 3 = 210$	$42 \times 2 = 84$	$30 \times 4 = 120$	$35 \times 1 = 35$
Q	$60 \times 3 = 180$	$84 \times 2 = 168$	$140 \times 4 = 560$	$105 \times 1 = 105$
R	$70 \times 3 = 210$	$60 \times 2 = 120$	$42 \times 4 = 168$	$42 \times 1 = 42$
S	$21 \times 3 = 63$	$42 \times 2 = 84$	$28 \times 4 = 112$	$28 \times 1 = 28$

In order to apply assignment algorithm for minimizing losses, let us convert this profit matrix to a loss matrix by subtracting all elements of the given matrix from its highest element which is equal to 560. The matrix so obtained is given below:

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Operators	Products			
	A	B	C	D
P	350	476	440	525
Q	380	392	0	455
R	350	440	392	518
S	497	476	448	532

Now we apply the assignment algorithm to the above loss matrix, subtracting the minimum element of each row from all elements of that row, we get the following matrix:

Operators	Products			
	A	B	C	D
P	0	126	90	175
Q	380	392	0	455
R	0	90	42	168
S	49	28	0	84

Now subtract the minimum element of each column from all elements of that column to get the following matrix:

Operators	Products			
	A	B	C	D
P	0	98	90	91
Q	380	364	0	371
R	0	62	42	84
S	49	0	0	0

Draw the minimum number of lines to cover all zeros. The number of lines to cover all zeros is 3, which is one less than the order of matrix (i.e., 4). Thus, the above matrix will not give optimal solution. Subtract the minimum uncovered element (i.e., 62) from all the uncovered elements and add it to the elements lying on the intersection of two lines, we get the following matrix:

Operators	Products			
	A	B	C	D
P	0	36	90	29
Q	380	302	0	309
R	0	0	42	22
S	111	0	42	0

The minimum number of lines which cover all zeros is 4, which is the order of the matrix. Hence, the above matrix will give the optimal solution. Specific assignments in this case are given below:

Operators	Products			
	A	B	C	D

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P		0		36		90		29
Q		380		302		0		309
R		8		0		42		22
S		111		8		62		0

Statement showing the assignment of operators to products and maximum profit:

Operators	Products	Profit (₹)
P	A	210
Q	C	560
R	B	120
S	D	28
Total		918

7. (a) A project schedule has the following characteristics:

Activity	Time	Activity	Time
1-2	4	5-6	4
1-3	1	5-7	8
2-4	1	6-8	1
3-4	1	7-8	2
3-5	6	8-10	5
4-9	5	9-10	7

(i) Construct a PERT network,

(ii) Compute Earliest Time and Latest Time for each event,

(iii) Find the critical path,

(iv) Also obtain the Total and Free Floats of each activity.

[8]

(b) Laxmi Chemical Company operates a small plant for the manufacture of two joint chemical products X and Y. the production of these chemicals require two raw materials, A and B, which cost ₹5 and ₹8 per litre respectively. The maximum available supply per week is 2,700 litres of A and 2,000 litres of B.

The plant can operate using either of two processes, which have different operating costs and raw materials requirements for the production of X and Y, as follows:

Process	Raw materials consumed		Output		Operating cost (₹ per hour)
	(litres per processing hours)		(litres per hour)		
	A	B	X	Y	
1	20	10	15	20	500
2	30	20	20	10	230

The plant can run for 120 hours per week in total, but for safety reasons, process 2 cannot be operated for more than 80 hours per week.

The selling prices of output are:

X ₹18 per litre

Y ₹24 per litre

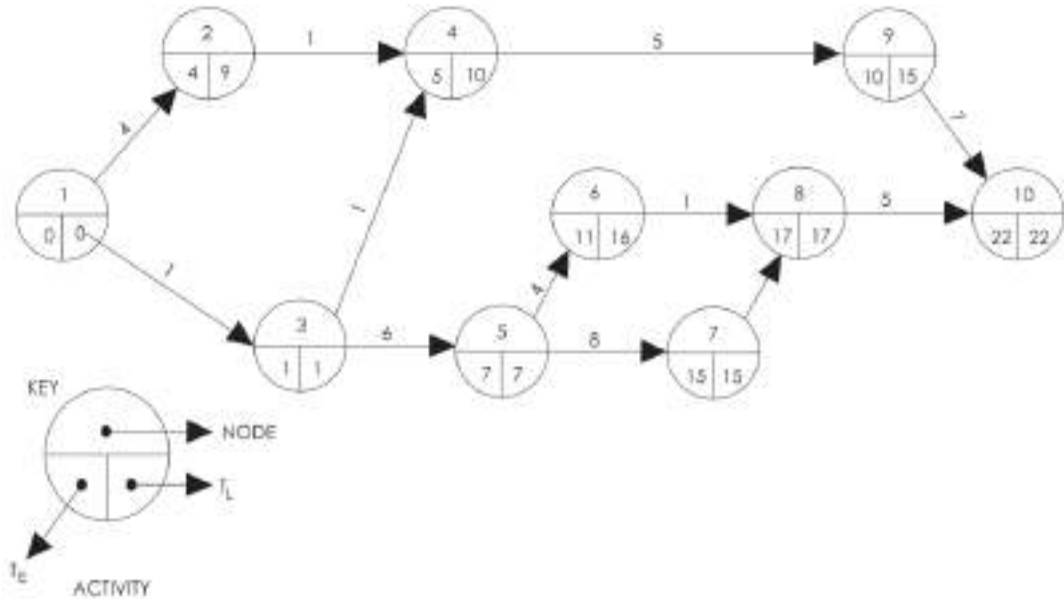
Required: Formulate a Linear Programming model.

[8]

Answer:

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7. (a) (i) Based on the above details relating activities, precedence and expected time (t_e), a network diagram can be drawn as follows:



(ii) Critical path is: 1-3-5-7-8-10

Project duration is 22 units of time.

(iii) Statement showing the total float and free float

Activity	Duration	Earliest Time		Latest Time		Slack Time at		Total Float	Free Float
		EST	EFT (2+3)	LST (6-2)	LFT	Starting event	Ending event		
1	2	3	4	5	6	7	8	9	10
1-2	4	0	4	5	9	0	5	5	0
1-3	1	0	1	0	1	0	0	0	0
2-4	1	4	5	9	10	5	5	5	0
3-4	1	1	2	9	10	1	5	8	3
3-5	6	1	7	1	7	1	0	0	0
4-9	5	5	10	10	15	5	5	5	0
5-6	4	7	11	12	16	0	5	5	0
5-7	8	7	15	7	15	0	0	0	0
6-8	1	11	12	16	17	5	0	5	5
7-8	2	15	17	15	17	0	0	0	0
8-10	5	17	22	17	22	0	0	0	0
9-10	7	10	17	15	22	5	0	5	5

(b)1. Identifying the decision variables

(i) There are two decision variables in this problem, i.e., quantity of X and the quantity of Y to make each week. Therefore, one may start by letting these be x and y respectively. For this purpose objective function will have to be expressed in terms of X and Y. It is not possible because cost of X and Y is not given directly.

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(ii) The operating costs are given in terms of processing hours:

	Process I		Process II	
	₹ per hour	₹ per hour	₹ per hour	₹ per hour
Costs:				
Material A		100		150
Material B		80		160
Operating cost		500		230
Total costs		680		540
Revenue:				
A	15 x 18 = 270		20 x 18 = 360	
B	20 x 24 = 480	750	10 x 24 = 240	600
Contribution		70		60

Therefore, decision variables should be processing hours in each process rather than litre of X and Y.

Therefore,

Let P_1 = hours in Process 1

Let P_2 = hours in Process 2

2. Objective function

Maximise contribution = $70 P_1 + 60 P_2$

Subject to:

$$20 P_1 + 30 P_2 \leq 2,700$$

$$10 P_1 + 20 P_2 \leq 2,000$$

$$P_2 \leq 80$$

$$P_1 + P_2 \leq 120$$

$$P_1 \geq 0$$

$$P_2 \geq 0$$

8. Write short notes on any four of the following:

4×4=16

- (a) Advantages of Target Costing
- (b) Enterprise Resource Planning
- (c) Difference between Bench Trending and Bench Marking
- (d) Limitations of Activity Based Costing
- (e) Difference between PERT & CPM

Answer:

8. (a) Advantages of Target Costing are:

1. Innovation – It reinforces top-to-bottom commitment to process and product innovation, and is aimed at identifying issues to be resolved.

2. Competitive Advantage – It enables a firm to achieve competitive advantage over other firms in the industry. The firm which achieves cost reduction targets realistically stands to gain in the long run.
 3. Market driven management – It helps to create a Company's competitive future with market-driven management for designing and manufacturing products that meet the price required for market success.
 4. Real Cost Reduction – It uses management control systems to support and reinforce manufacturing strategies, and to identify market opportunities that can be converted into real savings to achieve the best value rather than simply the lower cost.
- (b)** Enterprise Resource Planning – ERP attempts to integrate all departments and functions across a company into a single computer system that can serve all those different department particular needs. In fact ERP combines all computerized departments together with the help of a single integrate software program that runs off as single database so that various departments can more easily share information and commission with each other. ERP perform core activities and increases customer service, thereby augmenting the corporate image. It bridges the information gap across organizations, provides complete integration of system not only across departments but also across companies under the same management. ERP is the solution for better project management. ERP not only addresses the current requirement of the company but also provide the opportunity of continually improving and refining business processes.
- (c)** Bench Trending: Continuous monitoring of specific process performance with a selected group. It is a systematic and continuous measurement process of comparing through measuring an organization business processes against business leaders anywhere in the world, to gain information that will help organization take action to improve its performance. The continuous process of enlisting the best practices in the world for the processes, goals and objectives leading to world class levels of achievement.

Bench Marking: It is the process of comparing the cost, time or quality of what one organization does against what another organization does. The result is often a business case for making changes in order to make improvements. It is a continuous process of enlisting the best practices in the world for the process, goals and objectives leading to world-class levels of achievements. It is a powerful management tool because it overcomes "paradigm blindness".

(d) Limitations of Activity Based Costing are as follows:

- More time consuming to collect data.
- Cost of buying, implementing and maintain activity based system.
- In some cases, the establishment of cause and effect relationship between cost driver and costs is not a simple affair.

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- ABC does not conform to generally accepted accounting principles in some areas.

(e)

PERT	CPM
It is an Event oriented system.	It is an Activity oriented system.
It is a technique for planning, scheduling & controlling of projects whose activities are subject to uncertainty in the performance time.	It is a technique for planning, scheduling & controlling of projects whose activities are not subjected to any uncertainty and the performance times are fixed.
It is a probabilistic model.	It is a deterministic model.
Basically does not differentiate critical and non-critical activities.	Differentiates clearly the critical activities from the other activities.

Paper 15- Strategic Cost Management- Decision Making

Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

Paper-15: Strategic Cost Management- Decision Making

Full Marks: 100

Time Allowed: 3 Hours

This paper contains two sections **A** and **B**. **Section A** is compulsory and contains question No.1 for 20 marks. **Section B** contains question Nos. 2 to 8, each carrying 16 marks. Answer any five questions from **Section B**.

Section – A [20 Marks]

1. Choose the most appropriate answer to the following questions giving justification

[10x2=20]

(i) 120 units of semi-conductors are required to be sold to earn a profit of ₹1,00,000 in a monopoly market. The fixed cost for the period is ₹80,000. The contribution in the monopoly market is as high as 3/4th of its variable cost. Determine the target selling price per unit.

- (a) ₹4500
- (b) ₹3250
- (c) ₹4000
- (d) ₹3500

(ii) Abhishek Ltd. operates Throughput Accounting System. The details of product A per unit are as under:

Particulars	Details
Selling Price	₹150
Material Cost	₹60
Conversion Cost	₹40
Time to Bottleneck Resources	10 minutes

The return per hour for product A is

- (a) ₹540
- (b) ₹300
- (c) ₹240
- (d) ₹180

(iii) Sara Ltd. is to market a new product. It can produce up to 3,00,000 units of this product. The following are the estimated cost data:

Particulars	Fixed Cost	Variable Cost
For Production up to 1,50,000 units	₹16,00,000	60%
Exceeding 1,50,000 units	₹24,00,000	50%

Sale price is expected to be ₹25 per unit.

How many units must the company sell to break even?

- (a) 1,00,000 units
- (b) 1,11,000 units
- (c) 1,27,000 units
- (d) 75,000 units

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- (iv) Sarathi Ltd. makes components and sells internally to its subsidiary and also to external market. The external market price is ₹48 per component, which gives a contribution of 40% of sales. For external sales, variable costs include ₹3 per unit for distribution costs. This is, however not incurred in internal sales. There are no capacity constraints. To maximize company profit, the transfer price to subsidiary should be:
- (a) ₹19.20
 (b) ₹25.80
 (c) ₹28.80
 (d) None of these

- (v) A manufacturing company uses two types of materials- A and B, for manufacture of a standard product. The following information is given:

	Standard Mix		Actual mix		
Materials A	240 Kg	@ ₹5 = ₹1200		224 Kg	@ ₹5 = ₹1120
Materials B	160 Kg	@ ₹10 = ₹1600		176 Kg	@ ₹10 = ₹1760
	400 Kg	₹2800		400 Kg	₹2880
30% loss	120 Kg		25% loss	100 Kg	
	280 Kg	₹2800		300 Kg	₹2880

Direct Materials Mix Variance is:

- (a) ₹ 80 (fav.)
 (b) ₹ 80 (unfav.)
 (c) ₹ 160 (fav.)
 (d) ₹ 160 (unfav.)
- (vi) Which of the following is/are scope of Uniform Costing:
- (a) In a single enterprise having a number of branches or units, each of which may be a separate manufacturing unit
 (b) In a number of concerns in the same industry bound together through a trade association or otherwise
 (c) In industries which are diverse in nature
 (d) Both (a) and (b)
- (vii) Which of the following is not a Limitation of Inter-Firm Comparison:
- (a) Information about the organisation is made available freely with the fear of disclosure of confidential data to outside market or public
 (b) Non-availability of a suitable base for comparison
 (c) Absence of a proper system of Cost Accounting so that the costing figures supplied may not be relied upon for comparison purposes
 (d) The top management may not be convinced of the utility of inter-firm comparison
- (viii) Rudra Ltd. manufactures a product whose time for the first unit is 10000 hours. It experiences a learning curve of 80%, What will be the total time taken in hours for unit 5 to 8?

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- (a) 40960 hours
- (b) 32000 hours
- (c) 15360 hours
- (d) 20000 hours

(ix) Which of the following is a valid constraint for a linear programming problem?

- (a) $6x^2 + 8x + 2 = 0$
- (b) $10x_1 + 4x_2 \leq 20$
- (c) $8x_x + 6x_2 > 14$
- (d) $(24x_1 + 8x_2)/6x_2 \leq 16x_1$

(x) Which of the following is/are the method/s of solving an assignment problem:

- (a) Complete Enumeration Method
- (b) Transportation Method
- (c) Both (a) and (b)
- (d) Simplified Method

Answer:

1. (i) (d) ₹3,500

Contribution = ₹(1,00,000 + 80,000) = ₹1,80,000

Contribution/Unit = ₹(180000 ÷ 120) = ₹1500

Variable cost/unit = $1500 \div \frac{3}{4} = ₹2000$

Selling price = ₹1,500 + ₹2,000 = ₹3,500

(ii) (a) ₹540

(Selling Price – Material Cost) ÷ Time on bottleneck resources

= [(₹150 – ₹60) ÷ 10 minutes] × 60 = ₹540

(iii) (b) 2,22,000 units

At a production of 1,50,000 units or less the fixed costs amount to ₹16 lakhs. Contribution is ₹10 per unit (₹25 – 60% of ₹25).

Production will however, be more than this level. Total fixed cost is then ₹24 lakhs.

Contribution for first 1,50,000 units = ₹15,00,000.

Hence, to meet ₹24 lakh fixed cost, further ₹9,00,000 of contribution is required.

Contribution beyond 1,50,000 units is ₹12.5 (₹25 – 50% of ₹25).

Additional units to be sold = (₹9,00,000 ÷ ₹12.5) + 1,50,000 = (72,000 + 1,50,000) units = 2,22,000 units

(iv) (b) ₹25.80

= ₹48 × 60% – ₹3 = ₹25.80

(v) (b) ₹80 (unfav.)

Revised Standard Quantity:

A	B
$\frac{240}{400} \times 400$	$\frac{160}{400} \times 400$
240 Kg	160 Kg

Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

Direct Materials Mix Variance:

SP (RSQ – AQ)

A ₹5 (240 – 224) = ₹80 (fav.)

B ₹10 (160 – 176) = ₹160 (unfav.)
= ₹80 (unfav.)

(vi) (d) Both (a) and (b)

Uniform Costing methods may be advantageously applied:

- (a) In a single enterprise having a number of branches or units, each of which may be a separate manufacturing unit.
- (b) In a number of concerns in the same industry bound together through a trade association or otherwise, and
- (c) In industries which are similar in nature such as gas and electricity, various types of transport, and cotton, jute and woollen textiles.

(vii) (a) Information about the organisation is made available freely with the fear of disclosure of confidential data to outside market or public

The practical difficulties that are likely to arise in the implementation of a scheme of inter-firm comparison are:

- (a) The top management may not be convinced of the utility of inter-firm comparison.
- (b) Reluctance to disclose data which a concern considers to be confidential.
- (c) A sense of complacency on the part of the management who may be satisfied with the present level of profits.
- (d) Absence of a proper system of Cost Accounting so that the costing figures supplied may not be relied upon for comparison purposes.
- (e) Non-availability of a suitable base for comparison.

(viii) (c) 15360 hours

As per the data:

At 80% Learning Curve, the total time for 8 units will be $8 \times (0.8)^3 \times 10000$

40960 hours and for 4 units it is $4 \times (0.8)^2 \times 10000$ i.e. 25600 hours. Hence the time taken for units 5 to 8 will be 15360 hours i.e. (40960 – 25600).

(ix) (b) $10x_1 + 4x_2 \leq 20$

Other options do not conform to linearity or fundamental of constraints.

(x) (c) Both (a) and (b)

There are four methods of solving an assignment problem and they are:

- (1) Complete Enumeration Method
- (2) Simplex Method
- (3) Transportation Method and
- (4) Hungarian Method

Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

Section – B

Answer any five questions.

[16×5= 80]

2. (a) Sweet Ltd. has sales of 4,00,000 units at a price of ₹100.00 per unit and profit of ₹140.00 Lakhs in the current year. Due to stiff competition, next year the Company has to reduce its price of product @ 3% to achieve same target volume of sales. The cost structure and profit for the current year is given as below:

Particulars	(₹ Lakhs)
Direct Material	100.00
Direct Wages	80.00
Variable Factory Overheads	30.00
Fixed Overheads including Sales & Admin Expenses	50.00
Total Cost	260.00

To achieve the Target Cost to maintain the same profit, the Company is evaluating the proposal to reduce Labour Cost and Fixed Factory Overheads. A Vendor supplying the Machine suitable for the Company's operations has offered an advanced technology Semi-Automatic Machine of ₹20 Lakhs as replacement of Old Machine worth ₹6 Lakhs. The Vendor is agreeable to take back the Old Machine at ₹2 Lakhs only. The Company's policy is to charge depreciation at 15% on WDV. The Maintenance Charge of the Existing Machine is ₹2 Lakh per annum whereas there will be warranty of services free of cost for the New Machine first two years. There are 7 Supervisors whose Salary is ₹3 Lakhs per annum. The New Machine having Conveyor Belt is expected to help in cost cutting measures in the following ways -

- (1) Improve Productivity of workers by 10%
- (2) Cut-down Material Wastage by 5%
- (3) Elimination of services of Supervisors because of automatic facilities of the machine
- (4) Saving in Packaging Cost by ₹2 Lakhs.

Assuming Cost of Capital to be 15%, calculate how many Supervisors should be removed from the production activities to achieve the Target Cost. [6]

2. (b) The accountant of XYZ Ltd. has prepared the following estimate on the basis of which he has advised that a contract should not be accepted at the price offered. The estimate (₹) was as follows:

Material X in stock at original cost	1,50,000
Material Y on order at contract price	1,80,000
Material Z to be ordered at current price	3,00,000
Skilled Labour	5,40,000
Unskilled Labour	3,00,000
Supervisory Cost	1,00,000
General Overheads	1,80,000
Total Cost	17,50,000
Price offered	14,00,000
Net Loss (Price offered – Total Cost)	3,50,000

The following details are available about the cost components listed above.

Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

- a. Material X is an obsolete material. It can be used on another product W, the material for which is available at ₹1,35,000 (Material X requires some adaptation to be used which costs ₹15,000). It may take some time before W's order is confirmed. Until then storage will cost ₹12,000.
- b. Material Y is ordered for some other product which is no longer required. It now has a residual value of ₹1,55,000.
- c. Skilled labour can work on other contracts which are presently operated by semi-skilled labour at a cost of ₹4,00,000
- d. Unskilled labour are specifically employed for this contract.
- e. Supervisory staff will remain whether or not the contract is accepted. Only two of them can replace other positions where the salary is ₹50,000.
- f. Overheads are charged at 33 $\frac{1}{3}$ % of skilled labour. Only ₹1,25,000 would be avoidable.

You are required to answer the following questions using relevant cost approach:

(i) Relevant costs of material X, Y and Z

(ii) Relevant cost of labour-skilled and unskilled

(iii) Relevant cost of Supervisory cost and General overheads

(iv) If the contract is accepted, what would be the resulting financial impact on XYZ's profit. [10]

Answer:

(a) A. Targeted Cost Reduction

Targeted price Reduction = 3% of 400 lakhs = ₹12 lakhs
∴ Targeted Cost Reduction = ₹12 lakhs

B. Net Savings on account of New Machine

1. Savings on account of the New Machine
 - a. Reduction in wages due to Improving Productivity of workers by 10%
= {80 lakhs - [(80 lakhs ÷ 110) × 100]} = (80.00 - 72.72) = ₹7.28 lakhs
 - b. Cut-down Material Wastage by 5% = 5% of 100 lakhs = ₹5.00 lakhs
 - c. Saving in Packaging Cost = ₹2.00 lakhs
 - d. Saving in Maintenance Cost = ₹2.00 lakhs
 - e. Total Savings = 7.28 + 5.00 + 2.00 + 2.00 = ₹16.28 lakhs
2. Additional Costs on account of the New Machine
 - a. Loss in Disposal of Old Machine = (₹6 lakhs - ₹2 lakhs) = ₹4.00 lakhs
 - b. Difference in Depreciation = (₹20 lakhs - ₹6 lakhs) × 15% = ₹2.10 lakhs
 - c. Cost of Capital Investment = (₹20 lakhs × 15%) = ₹3.00 lakhs
 - d. Total Additional Costs = (4.00 + 2.10 + 3.00) = ₹9.10 lakhs
3. Net Savings = (16.28 - 9.10) = ₹7.18 lakhs

C. Supervisors to be Removed

Shortfall = (A - B) = (12.00 - 7.18) = ₹4.82 lakhs

∴ Number of Supervisors to be removed

= (4.82 lakhs ÷ 3 lakhs per supervisors) = 1.61

i.e. say 2 Supervisors.

Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

(b) (i) Relevant costs of material X, Y and Z

Material X (Obsolete)

Material X in stock at original cost = ₹1,50,000

Reuse Value = ₹1,35,000

Adaptation Cost = ₹15,000

Storage Cost = ₹12,000

Relevant Cost of Material X = ₹(1,35,000 – 15,000 – 12,000) = ₹1,08,000

Material Y (No longer required)

Material Y on order at contract price = ₹1,50,000

Residual Value = ₹1,55,000

Relevant Cost of Material Y = ₹1,55,000

Material Z (To be ordered)

Material Z to be ordered at current price = ₹3,00,000

Relevant Cost of Material Z = ₹3,00,000

Material X is an obsolete material but can be used as substitute of some other material available at ₹1,35,000 after incurring an adaptation cost of ₹15,000 and Storage cost of ₹12,000. While using Material 'X' for current work, these costs can be saved, so relevant cost = ₹(1,35,000 – 15,000 – 12,000) = ₹1,08,000

(ii) Relevant cost of labour-skilled and unskilled

Skilled Labour (Can replace unskilled labour)

Cost of skilled labour = ₹5,40,000

Replacement Cost (in place of unskilled labour) = ₹4,00,000

Relevant Cost of Skilled Labour = ₹4,00,000 [Lower of the Above]

Unskilled Labour (Specifically Employed)

Cost of unskilled labour = ₹3,00,000

Relevant Cost of Unskilled Labour = ₹3,00,000

(iii) Relevant cost of Supervisory cost and General overheads

Supervisory cost = ₹1,00,000

Replacement Value for others = ₹50,000

Relevant Supervisory Cost = ₹50,000

Avoidable General Overheads = ₹1,25,000

Relevant Costs of General Overheads = ₹1,25,000

(iv) Computation of Financial Impact

Serial	Element	Amount (₹)
A	Price Offered	14,00,000
B	Relevant Costs	
	1. Material X	1,08,000
	2. Material Y	1,55,000
	3. Material Z	3,00,000
	4. Skilled Labour	4,00,000
	5. Unskilled Labour	3,00,000

Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

	6. Supervisory Cost	50,000
	7. General Overheads	1,25,000
	8. Total (1 to 7)	14,38,000
C	Financial Impact (A – B)	(38,000)

Observation: The loss is much less than what the accountant has worked out. However, if the contract is accepted, XYZ's profit will be reduced by ₹38,000.

3. An agro-based farm is planning its production for next year. The following is relating to the current year:

Product/Crop	M	N	O	P
Area Occupied (Acres)	125	100	150	125
Yield per acre (ton)	50	40	45	60
Selling Price per ton (₹)	100	125	150	135
Variable Cost per acre (₹)				
Seeds	150	125	225	200
Pesticides	75	100	150	125
Fertilizers	62.50	37.50	50	62.50
Cultivation	62.50	37.50	50	62.50
Direct Wages	2000	2250	2500	2850

Fixed overhead per annum ₹13,44,000. The land that is being used for the production of O and P can be used for either crop. But not for M and N; the land that is being used for the production of M and N can be used for either crop, but not for O and P. In order to provide adequate market service, the company must produce each year at least 1,000 tons of each of M and N and 900 tons each of O and P.

Required:

- (i) Determine the profit for the production mix fulfilling market commitment.
- (ii) Assuming the land could be cultivated to produce any of the four products and there was no market commitment, calculate the profit amount of most profitable crop and break-even point of most profitable crop in terms of acres and sales value. [16]

Answer:

3. (i) Determination of Profit for Production Mix fulfilling the market commitment:

a. Statement of Recommended Product Mix

Sl. No.	Product	M	N	O	P
1	Yield per acre (ton)	50	40	45	60
2	Selling Price per ton (₹)	100	125	150	135
3	Sales Revenue per acre (₹)	5000	5000	6750	8100
4	Variable Cost per acre (₹):				
	a. Seeds	150	125	225	200
	b. Pesticides	75	100	150	125
	c. Fertilizers	62.50	37.50	50	62.50
	d. Cultivation	62.50	37.50	50	62.50

Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

	e. Direct Wages	2000	2250	2500	2850
	f. Sub Total (a. to e.)	2350	2550	2975	3300
5	Contribution per acre (₹)	2650	2450	3775	4800
6	Rank	III	IV	II	I
7	Minimum Sales per annum (tons) (Minimum Market Commitment)	1000	1000	900	900
8	Minimum Area (acres) [7 ÷ 1]	(1000 ÷ 50) = 20	(1000 ÷ 40) = 25	(900 ÷ 45) = 20	(900 ÷ 60) = 15
9	Occupied Area (acres)**	125	100	150	125
10	Recommended Mix as per Rank in 6 (acres)	{(125+100) – 25} = 200	25 (Minimum)	20 (Minimum)	{(150+125) – 20} = 255

**Area of M&N can be interchanged and area of O&P can be interchanged.

b. Statement of Profit

Serial	Particulars	Workings	Rupees
1	Contribution for the recommended product Mix		
	M	(200 × 2650) = 5,30,000	5,30,000
	N	(25 × 2450) = 61,250	61,250
	O	(20 × 3775) = 75,500	75,500
	P	(255 × 4800) = 12,24,000	12,24,000
	Sub Total		18,90,750
2	Fixed Cost		13,44,000
3	Profit (1–2)		5,46,750

(ii) Most profitable crop

Product P gives highest contribution of ₹4,800 per acre and hence is the most profitable crop.

Statement of Profit if complete land is used for P:

Contribution = (500 × 4800) = ₹24,00,000

Fixed cost = ₹13,44,000

Profit = ₹10,56,000

Break-even point in acres for P = 13,44,000 ÷ 4,800 = 280 acres

Break-even point in sales value = 280 × 135 × 60 = ₹22,68,000.

4. (a) The following is a flexible budget of FB Co. Ltd. for a production department:

Particulars	Level of Activity		
	4000	5000	6000
Direct Labour Hours	4000	5000	6000
Number of Units	8000	10000	12000
Fixed Overhead (₹)	5000	5000	5000
Variable Overhead (₹)	800	1000	1200
Total Overheads (₹)	5800	6000	6200

Normal Level of activity was 5000 direct labour hours.

Actual Results were:

Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

Direct Labour hours – 4800

Variable Overhead – ₹900

Output in Units – 10400

Fixed Overhead – ₹5100

Compute Fixed overhead cost variance, Fixed overhead volume variance, Fixed overhead expenditure variance, Variable overhead cost variance, Variable overhead efficiency variance, Variable overhead expenditure variance and Efficiency, Capacity and Activity ratios. [10]

4. (b) State any six limitations of standard costing. [6]

Answer:

4. (a) Step 1: Initial Workings

Normal level of activity has been expressed in terms of direct labour hours. Accordingly:

Standard Labour Hours per unit of Output = $(10,000 \div 5,000) = 2$ hours per unit
Standard Labour Hours for Actual Output = $(10,400 \div 2) = 5,200$ hours

Standard Rate of Recovery for FOH = $(5,000 \div 5,000) = ₹1$ per labour hour

Standard Rate of Recovery for VOH = $(1,000 \div 5,000) = ₹0.20$ per labour hour

Step 2: FOH Variances

Description	Formula	Workings	Variance
FOH Cost Variance	SRSH – AOH	$(1 \times 5200) - 5100 = 100$ (F)	₹100 (F)
FOH Volume Variance	SR (SH – BH)	$1 \times (5200 - 5000) = 200$ (F)	₹200 (F)
FOH Expenditure Variance	SRBH – AOH	$(1 \times 5000) - 5100 = 100$ (A)	₹100 (A)

Step 3: VOH Variances

Description	Formula	Workings	Variance
VOH Cost Variance	SRSH – AOH	$(0.2 \times 5200) - 900 = 140$ (F)	₹140 (F)
VOH Efficiency Variance	SR (SH – AH)	$0.2 \times (5200 - 4800) = 80$ (F)	₹80 (F)
VOH Expenditure Variance	SRAH – AOH	$(0.2 \times 4800) - 900 = 60$ (F)	₹60 (F)

Step 4: Ratios

Description	Formula	Workings	Ratio
Efficiency Ratio	SH ÷ AH	$5200 \div 4800$	108.33%
Capacity Ratio	AH ÷ BH	$4800 \div 5000$	96 %
Activity Ratio	SH ÷ BH	$5200 \div 5000$	104%

Answer:

4. (b) Limitations of standard costing:

1. Establishment of standard costs is difficult in practice.
2. In course of time, sometimes even in a short period the standards become rigid.
3. Inaccurate, unreliable and out of date standards do more harm than benefit.
4. Sometimes, standards create adverse psychological effects. If the standard is set at high level, its non-achievement would result in frustration and build-up of resistance.

Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

5. Due to the play of random factors, variances cannot sometimes be properly explained, and it is difficult to distinguish between controllable and non-controllable expenses.
6. Standard costing may not sometimes be suitable for some small concerns. Where production cannot be carefully scheduled, frequent changes in production conditions result in variances. Detailed analysis of all of which would be meaningless, superfluous and costly.

5. (a) A company is organized on decentralized lines, with each manufacturing division operating as a separate profit centre. Each division has full authority to decide on sale of the division's output to outsiders and to other divisions.

Division C has always purchased its requirements of a component from Division A but when informed that Division A was increasing its selling price to ₹150, the manager of Division C decided to look at outside suppliers. Division C can buy the components from an outside supplier for ₹135. But Division A refuses to lower its price in view of its need to maintain its return on the investment. The top management has the following information:

C's annual purchase of the component: 1,000 units

A's variable costs per unit: ₹120

A's fixed cost per unit: ₹20

Required:

- (i) Will the company as a whole benefit, if Division C buys the component at ₹135 from an outside supplier?**
- (ii) If Division A did not produce the material for Division C, it could use the facilities for other activities resulting in a cash operating savings of ₹18,000. Should Division C then purchase from outside sources?**
- (iii) Suppose there is no alternative use of Division A's facilities and the market price per unit for the component drops by ₹20. Should Division C now buy from outside?**

[3+4+3]

5. (b) Describe the Pre-requisites of Benchmarking.

[6]

Answer:

5. (a) (i) Division C buying the component at ₹135 from an outside supplier

Purchase cost (from outside supplier) (1,000 units × ₹135 p.u.)	1,35,000
Less: Saving in variable cost of Division A by reducing division's output (1,000 units × ₹120 p.u.)	1,20,000
Net loss	15,000

Observation: The company as a whole will incur a loss of ₹15,000 if Division C buys the component from an outside supplier at ₹135 p.u.

(ii) Division C buying the component at ₹135 from an outside supplier and Division A saving ₹18,000

Purchase cost (from outside supplier) (1,000 units × ₹135 p.u.)		1,35,000
Less:		
a. Saving in variable cost of Division A by reducing division's output (1,000 units × ₹120 p.u.)	1,20,000	

Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

b. Operating savings by using facilities for other activities	18,000	
c. Total Savings		1,38,000
Net Gain		3,000

Observation: The company as a whole will benefit by ₹3,000 if Division C buys the component from an outside supplier at ₹135 p.u. and Division A's facilities are used for other activities.

(iii) There is no alternative use of Division A's facilities and the market price per unit for the component drops by ₹20

Purchase cost (from outside supplier) (1,000 units × ₹115 p.u.)	1,15,000	
Less: Saving in variable cost of Division A by reducing division's output (1,000 units × ₹120 p.u.)		1,20,000
Net Gain		5,000

Observation: The company as a whole will benefit by ₹5,000 if Division C buys the component from an outside supplier at ₹115 p.u.

Answer:

5. (b) The following are the Pre-requisites of Benchmarking:

- 1. Commitment:** Senior Managers should support benchmarking fully and must be omitted to continuous improvements.
- 2. Clarity of Objectives:** The objectives should be clearly defined at the preliminary stage. Benchmarking teams have a clear picture of their Firm's performance before approaching others for comparisons.
- 3. Appropriate Scope:** The scope of the work should be appropriate in the light of the objectives, resources, time available and the experience level of those involved.
- 4. Resources:** Sufficient resources must be available to complete projects within the required time scale.
- 5. Skills:** Benchmarking teams should have appropriate skills and competencies.
- 6. Communication:** Stakeholders, and also staff and their representatives, are to be kept informed of the reasons for benchmarking.

6. (a) Mr. Partha, a businessman, is considering taking over a certain new business. Based on past information and his own knowledge of the business, he works out the probability distributions of the daily costs and sales revenue, as given here:

Cost (in ₹)	Probability	Sales (in ₹)	Probability
85000	0.10	95000	0.10
90000	0.10	100000	0.10
95000	0.40	105000	0.20
100000	0.20	110000	0.40
105000	0.20	115000	0.15
		120000	0.05

Use the following sequences of random numbers to be used for estimating costs and revenues. Obtain the probability distribution of the daily net revenue.

Sequence 1: 81, 83, 27, 81, 35, 91, 72, 90 62, 28, 26, 25, 91, 62, 82, 02, 12, 38, 10, 18.

Sequence 2: 38, 71, 37, 28, 70, 82, 18, 71, 91, 58, 48, 38, 71, 93, 02, 91, 73, 17, 09, 04.

[10]

6. (b) A computer centre has got three expert programmers. The centre needs three expert programmers. The centre needs three application programmes to be

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developed. The Head of the computer centre, after studying carefully the programmes to be developed, estimated the computer time in minutes required by the experts to the application programmes as follows:

Programmers		Programmes		
		A	B	C
	1	1200	1000	800
	2	800	900	1100
	3	1100	1400	1200

Assign the programmers to the programmes in such a way that the total computer time is least. [6]

Answer:

6. (a) Step 1: Random numbers 00 – 99 are allocated in proportion to the probabilities associated with each event as given below:

Cost	Prob.	Cum. Prob.	Random Number Interval	Revenue	Prob.	Cum. Prob.	Random Number Interval
85000	0.10	0.10	00 – 09	95000	0.10	0.10	00 – 09
90000	0.10	0.20	10 – 19	100000	0.10	0.20	10 – 19
95000	0.40	0.60	20 – 59	105000	0.20	0.40	20 – 39
100000	0.20	0.80	60 – 79	110000	0.40	0.80	40 – 79
105000	0.20	1.00	80 – 99	115000	0.15	0.95	80 – 94
				120000	0.05	1.00	95 – 99

Step 2: Simulate cost and revenue data using given random numbers we get:

Random Number	Cost (in '000 ₹)	Random Number	Revenue (in '000 ₹)	Net revenue (in '000 ₹)
81	105	38	105	0
83	105	71	110	5
27	95	37	105	10
81	105	28	105	0
35	95	70	110	15
91	105	82	115	10
72	100	18	100	0
90	105	71	110	5
62	100	91	115	15
28	95	58	110	15
26	95	48	110	15
25	95	38	105	10
91	105	71	110	5
62	100	93	115	15
82	105	02	95	-10
02	85	91	115	30
12	90	73	110	20
38	95	17	100	5
10	90	09	95	5

Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

18	90	04	95	5
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Step 3: Frequency distribution of net revenue and probabilities by expressing frequencies in relative form are as under:

Net revenue (in ₹)	Frequency	Probability
-10000	1	0.05
-5000	0	0.00
0	3	0.15
5000	6	0.30
10000	3	0.15
15000	5	0.25
20000	1	0.05
25000	0	0.00
30000	1	0.05
Total	20	1

Answer:

6. (b) Using the Hungarian Assignment Method, we subtract the smallest element of each row to get the following table:

Programmers	Programmes		
	A	B	C
1	400	200	0
2	0	100	300
3	0	300	100

Now from all the elements of a column, subtract the minimum element of that column. Repeat this operation with all the columns to get the following table:

Programmers	Programmes		
	A	B	C
1	400	100	0
2	0	0	300
3	0	200	100

The minimum number of lines to cover all the zeros is 3, which is equal to the order of the matrix (3). Hence the above table will give the optimum assignment. The assignments are as follows:

Programmers	Programmes		
	A	B	C
1	400	100	0
2	✗	0	300
3	0	200	100

Each row and each column has one and only one assignment, an optimal assignment has been made.

Thus the optimal solution is:

Assign 1 to C, 2 to B and 3 to A.

Total minimum computer time will be 800 + 900 + 1100, i.e., 2800 minutes.

Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

7. (a) A project schedule consists of the following activities with the time estimates noted against each activity:

Activity	Time	Activity	Time
1-2	4	5-6	4
1-3	1	5-7	8
2-4	1	6-8	1
3-4	1	7-8	2
3-5	6	8-10	5
4-9	5	9-10	7

- (i) Construct a PERT network and compute T_E T_L and for each event, (ii) Find the critical path, (iii) Obtain the total and free floats of each activity. [8]

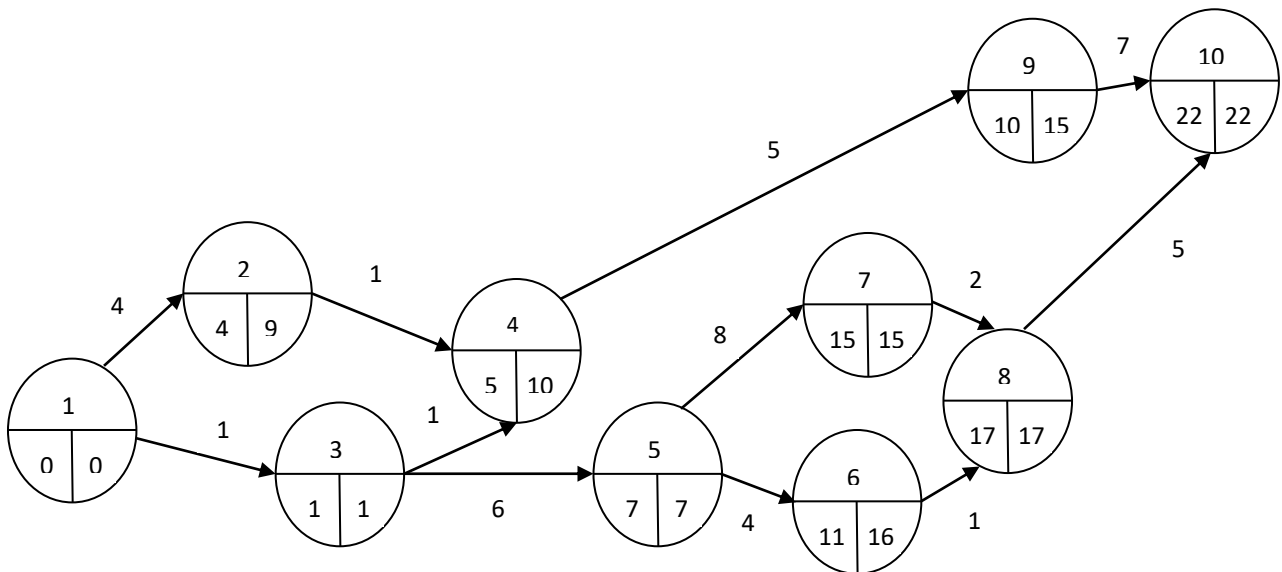
7. (b) Mr. Ashis, a dealer of cement has two warehouses M and N with stocks of 30000 and 20000 bags of cement respectively. Three customers A, B and C have placed order on the dealer for 15000, 20000 and 15000 bags respectively. Costs of transportation per 1000 bags of cement from different warehouses to different customers are given below:

To	Transportation Cost (₹ '00) per 1000 bags		
	A	B	C
From			
M	40	20	20
N	20	60	40

- The dealer wants to find how to fulfill the orders so that the transportation cost is minimum. Formulate the problem. [8]

Answer:

7. (a) (i) Based on the above details relating activities, precedence and expected time (t_e), a network diagram with T_E and T_L for each event can be drawn as follows:



Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

(ii) Critical path is:

1-3-5-7-8-10

Project duration is 22 units of time.

(iii) **Statement showing the Total Float and Free Float**

Activity	Working	Total Float $T_L - T_E - t_e$	Working $E_F - T_E - t_e$	Free Float
1-2	9-0-4	5	4-0-4	0
1-3	1-0-1	0	1-0-1	0
2-4	10-4-1	5	5-4-1	0
3-4	10-1-1	8	5-1-1	3
3-5	7-1-6	0	7-6-1	0
4-9	15-5-5	5	10-5-5	0
5-6	16-7-4	5	11-7-4	0
5-7	15-7-8	0	15-7-8	0
6-8	17-11-1	5	17-11-1	5
7-8	17-15-2	0	17-15-2	0
8-10	22-17-5	0	22-17-5	0
9-10	22-10-7	5	22-10-7	5

Answer:

7. (b) As transportation costs are given per 1000 bags, we assume 1 unit = 1000 bags

Let Warehouse M supplies x_1 units to A and x_2 units to B. As the stock of M is 30000 bags or 30 units, so C gets $(30 - x_1 - x_2)$ units from M.

Total requirement of A is 15000 bags or 15 units. Of this x_1 is supplied from M. Thus remaining $(15 - x_1)$ units is to be supplied from N.

Similarly, B gets $(20 - x_2)$ units from N and C gets $[15 - (30 - x_1 - x_2)] = x_1 + x_2 - 15$ units from N.

Using the supplied values of Transportation Cost per unit we express Total Transportation Cost as –

$$Z = 4000x_1 + 2000x_2 + 2000(30 - x_1 - x_2) + 2000(15 - x_1) + 6000(20 - x_2) + 4000(x_1 + x_2 - 15)$$

$$\text{Or, } Z = 4000x_1 - 2000x_2 + 150000$$

As the problem deals with units of cement bags, each of the units mentioned above should be non-negative.

Hence the constraints are –

$$x_1 \geq 0, x_2 \geq 0,$$

$$30 - x_1 - x_2 \geq 0 \text{ Or, } x_1 + x_2 \leq 30,$$

$$15 - x_1 \geq 0 \text{ Or, } x_1 \leq 15,$$

$$20 - x_2 \geq 0 \text{ Or, } x_2 \leq 20$$

$$x_1 + x_2 - 15 \geq 0 \text{ Or, } x_1 + x_2 \geq 15$$

Thus the mathematical formulation of the given LPP is –

Minimize $Z = 4000x_1 - 2000x_2 + 150000$ Subject to the constraints

$$x_1 + x_2 \leq 30$$

$$x_1 + x_2 \geq 15$$

$$x_1 \leq 15$$

$$x_2 \leq 20$$

$$x_1 \geq 0, x_2 \geq 0$$

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8. Write short notes on any four of the following:

4×4=16

- (a) Explain the limitations of Backflush accounting.
- (b) State the Characteristics of Re-engineering Process and Seven Principles of BPR.
- (c) Differentiate between Lean Accounting and Traditional Standard Costing.
- (d) Explain the 4P's of TQM.
- (e) Describe the usefulness of Pareto Analysis.

Answer:

8. (a) Backflushing is a theoretically elegant solution to the complexities of assigning costs to products and relieving inventory, but it is difficult to implement. Backflush accounting is subject to the following problems:

- **Requires an accurate production count-** The number of finished goods produced is the multiplier in the backflush equation, so an incorrect count will relieve an incorrect amount of components and raw materials from stock.
- **Requires an accurate bill of materials-** The bill of materials contains a complete itemization of the components and raw materials used to construct a product. If the items in the bill are inaccurate, the backflush equation will relieve an incorrect amount of components and raw materials from stock.
- **Requires excellent scrap reporting-** There will inevitably be unusual amounts of scrap or rework in a production process that are not anticipated in a bill of materials. If you do not separately delete these items from inventory, they will remain in the inventory records, since the backflush equation does not account for them.
- **Requires a fast production cycle time-** Backflushing does not remove items from inventory until after a product has been completed, so the inventory records will remain incomplete until such time as the backflushing occurs. Thus, a very rapid production cycle time is the best way to keep this interval as short as possible. Under a backflushing system, there is no recorded amount of work-in-process inventory.

Backflushing is not suitable for long production processes, since it takes too long for the inventory records to be reduced after the eventual completion of products. It is also not suitable for the production of customized products, since this would require the creation of a unique bill of materials for each item produced.

Answer:

8. (b) **Characteristics of Re-engineering Process:**

- (i) Several jobs are combined into one
- (ii) Often workers make decisions
- (iii) The steps in the process are performed in a logical order
- (iv) Work is performed, where it makes most sense
- (v) Quality is built in.
- (vi) Manager provides a single point of contact
- (vii) Centralized and decentralized operations are combined.

Seven Principles of BPR:

- (a) Processes should be designed to achieve a desired outcome rather than focusing on existing tasks.
- (b) Personnel who use the output from a process should perform the process
- (c) Information processing should be included in the work, which produces the information

Answer to MTP_Final_Syllabus 2016_Jun2023_Set1

- (d) Geographically dispersed resources should be treated, as if they are centralized
- (e) Parallel activities should be linked rather than integrated
- (f) Doers should be allowed to be self-managing
- (g) Information should be captured once at source.

Answer:

- 8. (c)** The following are the contrasting features of Lean Accounting and Traditional Standard Costing:

Lean Accounting	Traditional Standard Costing
Quick, simple, and timely	Complex and wasteful processes
Clear and easy to understand	Difficult for people to understand
Provides information for effective decisions	Leads to bad decisions
Supports value stream measurements and box scores	Supports measurements that undermine Lean endeavours
Supports a value stream (total process) approach	Supports a departmental view of production
Enables value stream financial control and improvement	Narrows the focus of financial control and improvement
Enables inventory valuation	Enables inventory valuation
Enables value based pricing	Enables Cost + Pricing

Answer:

- 8. (d)** It is possible that the organisation is led to Total Quality Paralysis, instead of improvement, by improper implementation of TQM. To avoid such disruption and paralysis the following principles (called the four P's) of TQM should be followed:

The 4P's	
People	To avoid misdirection, TQM teams should consist of team spirited individuals who have a flair for accepting and meeting challenges. Individuals who are not ideally suited to the participatory process of TQM, should not be involved at all, e.g. lack of enthusiasm, non-attendance at TQM meetings, failure to complete delegated work, remaining a "Mute Spectator" at TQM meetings, etc.
Process	It is essential to approach problem-solving practically and to regard the formal process as a system designed to prevent participants from jumping to conclusions. As such, it will provide a means to facilitate the generation of alternatives while ensuring that important discussion stages are not omitted.
Problem	Problems need to be approached in a systematic manner, with teams tackling solvable problems with a direct economic impact, allowing for immediate feedback together with recognition of the contribution made by individual participants.
Preparation	Additional training on creative thinking and statistical processes are

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	needed in order to give participants a greater appreciation of the diversity of the process. This training must quickly be extended beyond the immediate accounting circle to include employees at supervisory levels and also who are involved at the data input stage.
--	--

Answer:

8. (e) Usefulness of Pareto Analysis: It provides the mechanism to control and direct effort by fact, not by emotions. It helps to clearly establish top priorities and to identify both profitable and unprofitable targets. Pareto analysis is useful to:

- (i) Prioritize problems, goals, and objectives to Identify root causes.
- (ii) Select and define key quality improvement programs.
- (iii) Select key customer relations and service programs.
- (iv) Select key employee relations improvement programs.
- (v) Select and define key performance improvement programs.
- (vi) Maximize research and product development time.
- (vii) Verify operating procedures and manufacturing processes.
- (viii) Product or services sales and distribution.
- (ix) Allocate physical, financial and human resources.



PAPER - 16
STRATEGIC COST MANAGEMENT

Time Allowed: 3 Hours

Full Marks: 100

The figures in the margin on the right side indicate full marks.
Where considered necessary, suitable assumptions may be made and
clearly indicated in the answer.

SECTION – A : STRATEGIC COST MANAGEMENT FOR DECISION MAKING

Answer to Question No. 1 & 6 in Section A, are compulsory.

Further, answer **any 3** from Question nos. 2, 3, 4 & 5.

1. (a) Choose the most appropriate answer to the following questions with justification. 1 mark will be awarded for correct answer and 1 mark for justification.: [8 × 2 = 16]

- (i) The cost incurred to ensure that failures do not happen is known as _____. Provide a justification for your answer.
- External failure cost
 - Internal failure cost
 - Prevention cost
 - None of the above
- (ii) Which of the following is not the quality parameter for service organizations and why?
- Consistency
 - Friendliness
 - Durability
 - Promptness
- (iii) Which one of the following is not a standard definition of 'Quality' and why?
- Conformance to Specifications
 - Fitness for Use
 - Psychological Criteria
 - Physiological Criteria
- (iv) Prevention costs are all costs incurred in the process of preventing poor quality from occurring. Which one of the following is not included in Prevention cost? Provide a justification.
- Cost of creating and maintaining quality circles
 - Cost related to statistical process control activities
 - Costs related to System Development for prevention
 - WIP testing and inspecting



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SET 1
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- (v) The best way to define the principles that guide Lean Accounting and form the foundation for all of accounting's work and interaction with the organization are _____. Provide a justification for your answer.
- Customer value:
 - Continuous improvement:
 - Respect for people:
 - All of the above.
- (vi) A company is considering to accept a one-year contract which will require four skilled employees. The four skilled employees could be recruited on a one-year contract at a cost of ₹ 40,000 per employee. The employees would be supervised by an existing manager who earns ₹ 60,000 per annum. It is expected that supervision of the contract would take 10% of the manager's time.
- Instead of recruiting new employees, the company could retrain some existing staff who currently earns ₹30,000 per year. The training would cost ₹15,000 in total but if those employees were used they would need to be replaced at a total cost of ₹100,000. The relevant labour cost of the contract is _____.
- ₹ 1,15,000
 - ₹1,00,000
 - ₹ 85,000
 - ₹ 1,10,000
- (vii) A firm has some material which originally cost ₹ 45,000. It has a scrap value of ₹12,500 but if reworked at a cost of ₹ 7,500 it could be sold for ₹17,500. What would be the incremental effect of reworking and selling the material?
- A Loss of ₹ 27,500
 - B Loss of ₹2,500
 - C Profit of ₹ 5,000
 - D Profit of ₹10,000
- (viii) The product of XYZ Company is sold at a fixed price of ₹1,500 per unit. As per company's estimate, 500 units of the product are expected to be sold in the coming year. If the value of investments of the company is ₹15 lakhs and it has a target ROI of 15%, the target cost would be _____.
- ₹ 930
 - ₹ 950
 - ₹ 1,050
 - ₹ 1,130



2. (a) Answer both the questions
- (i) ‘Value chain is a powerful tool for disaggregating a company into its strategically relevant activities’ - explain the elements of the value chain.
- (ii) “Value chain analysis help an organization in gaining competitive advantage” – Explain the validity of the above statement in a dynamic business world.
[4+2=6]
- (b) Answer both the questions
- (i) “A traditional approach to quality management is that there is an optimal level of quality effort, that minimizes total quality costs, and there is a point beyond which spending more on quality yields a benefit that is less than the additional cost incurred”.
- Describe the principles of Total Quality Management (TQM) in the above context? Distinguish those from the traditional approach to quality management?
- (ii) Explain the notion of continuous improvement. What is the cornerstone of continuous improvement?
[3+3=6]
3. (a) A Company manufacturing a highly successful line of cosmetics intends to diversify the product line to achieve fuller utilization of its plant capacity. As a result of considerable research made the company has been able to develop a new product called ‘EMO’. EMO is packed in tubes of 50 grams capacity and is sold to the wholesalers in cartons of 24 tubes at ₹ 240 per carton. Since the company uses its spare capacity for the manufacture of EMO, no additional fixed expenses will be incurred. However, the cost accountant has allocated a share of ₹ 4,50,000 per month as fixed expenses to be absorbed by EMO as a fair share of the company’s present fixed costs to the new production for costing purposes. The company estimated the production and sale of EMO at 3,00,000 tubes per month and on this basis the following cost estimates have been developed

	₹ per carton
Direct Materials	108
Direct Wages	72
All overheads	54
Total costs	234

After a detailed market survey, the company is confident that the production and sales of EMO can be increased to 3,50,000 tubes and the cost of empty tubes, purchased from outside will result in a saving of 20% in material and 10% in direct



FINAL EXAMINATION
MODEL QUESTION PAPER
PAPER - 16

SET 1
TERM – JUNE 2023

STRATEGIC COST MANAGEMENT

wages and variable overhead costs of EMO. The price at which the outside firm is willing to supply the empty tubes is ₹1.35 per empty tube. If the company desires to manufacture empty tubes in excess of 3,00,000 tubes, new machine involving an additional fixed overheads ₹ 30,000 per month will have to be installed.

Required:

- (i) Discuss with reasons as the Cost Accountant of the company whether it should make or buy the empty tubes at each of the three volumes of production of EMO namely 3,00,000; 3,50,000 and 4,50,000 tubes.
- (ii) At what volume of sales will it be economical for the company to install the additional equipment for the manufacture of empty tubes?
- (iii) Determine the profitability on the sale of EMO at each, of the aforesaid three levels of output based on your decision and showing the cost of empty tubes as a separate element of cost. **[3+2+3=8]**

- (b) A company makes three products X, Y and Z. All three products use the same type of labour which is limited to 1,000 hours per month. Individual details are as follows;

Product	X	Y	Z
Contribution/unit	₹ 25	₹ 40	₹32
Labour hours/unit	5	6	8
Maximum demand	50	100	400

Suggest the management on the optimal product mix. **[4]**

4. (a) Mr Belle has recently developed a new improved video cassette and shown below is a summary of a report by a firm of management consultants on the sales potential and production costs of the new cassette. Sales potential: The sales volume is difficult to predict and will vary with the price, but it is reasonable to assume that at a selling price of ₹10 per cassette, sales would be between 7,500 and 10,000 units per month. Alternatively, if the selling price was reduced to ₹9 per cassette, sales would be between 12,000 and 18,000 units per month. Production costs: If production is maintained at or below 10,000 units per month, then variable manufacturing costs would be approximately ₹8.25 per cassette and fixed costs ₹12,125 per month. However, if production is planned to exceed 10,000 units per month, then variable costs would be reduced to ₹7.75 per cassette, but the fixed costs would increase to ₹16,125 per month. Mr. Belle has been charged ₹2,000 for the report by the management consultants and, in addition, he has incurred ₹3,000



development costs on the new cassette. If Mr. Belle decides to produce and sell the new cassette it will be necessary for him to use factory premises which he owns, but are leased to a colleague for a rental of ₹400 per month. Also he will resign from his current post in an electronics firm where he is earning a salary of ₹1,000 per month.

Required:

- a) Draw inference from the information given above and identify the following
 - (i) an opportunity cost,
 - (ii) a sunk cost.
- b) Making whatever calculations you consider appropriate, analyze the report from the consultants and advise Mr. Belle of the potential profitability of the alternatives shown in the report.
- c) You are required to analyze the basis on which the above decisions are applied and state the assumptions considered necessary or matters which may require further investigation or comment should be clearly stated.

[2+4+2=8]

- (b) Company X is forced to choose between two machines A and B. The two machines are designed differently but have identical capacity and do exactly the same job. Machine A costs ₹1,50,000 and will last for 3 years. It costs ₹40,000 per year to run. Machine B is an 'economy' model costing only ₹1,00,000, but will last only for 2 years, and costs ₹60,000 per year to run. These are real cash flows. The costs are forecasted in rupees of constant purchasing power. Ignore tax. Opportunity cost of capital is 10%. Suggest the management as to which machine it should buy. [4]

5. (a) You have been provided with the following data for S plc for September:

Accounting method: Variances	Absorption (₹)	Marginal (₹)
Selling Price	1,900 (A)	1,900 (A)
Sales Volume	4,500 (A)	7,500 (A)
Fixed overhead expenditure	2,500 (F)	2,500 (F)
Fixed overhead volume	1,800 (A)	n/a

During September production and sales volumes were as follows:



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STRATEGIC COST MANAGEMENT

	Sales	Production
Budget	10000	10000
Actual	9500	9700

Required:

- a) Calculate:
- the standard contribution per unit;
 - the standard profit per unit;
 - the actual fixed overhead cost total.
- b) Using the information presented above, analyze how different variances are calculated on the basis of the choice of marginal or absorption costing.

[6 + 2=8]

- (b) From past experience a company operating a standard cost system has accumulated the following information in relation to variances in its monthly management accounts:

Percentage of total number of variances

1. Its variances fall into two categories:

Category 1: those that are not worth investigating	64%
Category 2: those that are worth investigating	36%
	100%

2. Of Category 2, corrective action has eliminated 70 per cent of the variances, but the remainder have continued.
3. The cost of investigation averages ₹350 and that of correcting variances averages ₹550.
4. The average size of any variance not corrected is ₹525 per month and the company's policy is to assess the present value of such costs at 2% per month for a period of five months.

You are required to prepare two decision trees, to represent the position if an investigation is

- carried out;
- not carried out.

[2+2=4]

6. SBA is a company that produces televisions and components for televisions. The company has two divisions, Division S and Division B. Division S manufactures



components for televisions. Division S sells components to Division B and to external customers. Division B uses five of the components in each of the televisions that it manufactures, and sells televisions directly to external customers.

Division S

Budgeted Variable manufacturing cost per component	₹
Direct Material	14
Direct Labour	18
Variable Overhead	12

The following information relating to next year is also available

Fixed Cost	₹5,60,000
Production Capacity	175000 components
External demand	150000 components
Potential demand from Division B	80000 components
The anticipated external market price for a component is	₹ 50

Division B

Sales Price	₹ 450
Budgeted variable manufacturing cost per television	
Direct Material	₹ 40
Direct Labour	₹ 62
Variable overhead	₹16

In addition to the variable costs above, each television produced needs five components. Fixed costs are budgeted to be ₹14,60,000 for next year. Annual sales of televisions are expected to be 16,000 units.

Transfer pricing policy

Transfer prices are set at opportunity cost.

Division S must satisfy the demand of Division B before selling components externally.

Division B is allowed to purchase components from Division S or from external suppliers.



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Required:

1. Assuming that Division B buys all the components it requires from Division S: Produce a profit statement for each division detailing sales and costs, showing external sales and internal company transfers separately where appropriate.
2. A specialist external supplier has approached Division B and offered to supply 80,000 components at a price of ₹42 each. The components fulfill the same function as those manufactured by Division S. The manager of Division B has accepted the offer and has agreed to buy all the components it requires from this supplier.
 - Develop and submit a revised profit statement for each division and for the total SBA company
3. Discuss the potential implications for SBA of outsourcing the production of one type of component that it manufactures [8]

SECTION – B : QUANTITATIVE TECHNIQUES IN DECISION MAKING

Answer to Question No. 7 & 11 in Section B, are compulsory.

Further, answer **any 2** from Question nos. 8, 9 & 10.

7. **Choose the most appropriate answer to the following questions giving justification.** [2 + 2 = 4]
 - (i) Optimistic time and pessimistic time of an activity are respectively 4 days and 16 days. Variance of duration of the activity will be –
 - a. 4 days
 - b. 2 days
 - c. 3 days
 - d. None of the above.
 - (ii) Dummy row or column is added in an assignment problem –
 - a. To prevent a solution to become degenerate.
 - b. To reduce the total cost of assignment.
 - c. To increase the profit function.
 - d. To balance total activities and total resources.
8. (a) An animal feed company must produce 200 kg. of a mixture consisting of ingredients X_1 and X_2 . The ingredient X_1 cost ₹3 per kg. and X_2 cost ₹5 per kg. Not



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more than 80 kg. of X_1 can be used and at least 60 kg. of X_2 must be used. Find the minimum cost mixture, using LP technique. [6]

- (b) Consider a problem of assigning four officers to four tasks. The time (hours) required to complete the tasks is given below:

	Tasks			
Officer	A	B	C	D
Officer 1	4	7	5	6
Officer 2	-	8	7	4
Officer 3	3	-	5	3
Officer 4	6	6	4	2

Officer 2 cannot be assigned to task A and officer 3 cannot be assigned to task B. Find all the optimal assignment schedules. [8]

9. (a) Infer the optimum solution of the Game using Dominance Principle

$$\begin{bmatrix} 15 & 2 & 3 \\ 6 & 5 & 7 \\ -7 & 4 & 0 \end{bmatrix}$$

[8]

- (b) (i) What do you mean by Data Mining
(ii) Discuss briefly applications of R Programming in the real world. [3+3=6]

10. (a) Z.P.L.C experience difficulty in its budgeting process because it finds it necessary to quantify the learning effect as new products are introduced.

Substantial product changes occur and result in the need for retraining.

An order for 30 units of a new product has been received by Z.P.L.C so far, 14 have been completed; the first unit required 40 direct labour hours and a total of 240 direct labour has been recorded for the 14 units. The production manager expects an 80% learning effect for this type of work.

The company uses standard absorption costing. The costs attributed to the centre in which the unit is manufactured are as follows:

Head	Cost (₹)
Direct Material	₹ 30.00 per unit
Direct Labour	₹ 6.00 per unit
Variable Overhead	₹ 0.50 per direct labour hour
Fixed Overhead	₹ 6,000 per 4 week operating period.



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There are ten direct employees working a five-day week, eight hours per day. Personal and other downtime allowances account for 25% of total available time. The company usually quotes a four-week delivery period for orders. You are required to:

Determine whether the assumption of an 80% learning effect is a reasonable one in this case, by using the standard formula $Y = ax^b$

Where Y = the cumulative average direct labour time per unit (productivity).

a = the average labour time per unit for the first batch.

x = the cumulative number of batches produced.

b = the index of learning.

- (i) Calculate the number of direct labour hours likely to be required for an expected second order of 20 units.
- (ii) Use the cost data given to produce an estimated product cost for the initial order, examine the problems.

Use logarithmic tables to find the values of Logarithm and Anti-Logarithm.

[4+4=8]

- (b) Assume the Cost in Rupee term for manufacturing x number of a product per day is $C(x) = 14400 + 550x + 0.01x^2$. Suggest the no. of units of the product that should be manufactured per day so that the Average Cost is minimum. Also find the Average Cost and the total cost at this level of production. **[6]**

Case study

11. Problems of Linear Programming with objective of minimizing Total Cost of transportation of a particular commodity from different Sources to various Destinations is solved using the methodology of Transportation technique. Traditionally such problems involve one Objective function. But in real life, problems involve more than one Objective function. An example of such type, is transportation of perishable items or deteriorating items. For these items minimization of deterioration is equally important along with that of cost of transportation.

Egg is a commodity which comes under the category of deterioration in the form of its breakage. Any broken egg is of zero value to the manufacturing firms. Thus minimization



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of breakage of eggs during transportation is one of the most important objectives of the egg transportation problem. At the same time there are the other important objectives too, like minimization of distance travelled to supply, optimization of time taken to supply etc. In fact, these factors are all related to the minimization of deterioration. As eggs are traditionally transported through roads in our country, which are not of best possible quality as far as smoothness is concerned, chances of breakage increase with increased distance travelled. Similarly, optimization of time taken to reach the Destination (which has a relationship with the speed of the transporting vehicle) is important because more the speed of the vehicle less is the time taken to reach but with a higher chance of breakage of eggs. So it is quite clear that logistics and supply chain for eggs is a multi-objective problem of transportation.

Help of software is needed to find solution of such problems without any hassle. In fact, the solutions obtained are heuristic type where some compromise among the optimum values of the individual functions is done to reach the ultimate goal.

A problem of transportation of eggs is given as follows –

Suppose there are three sources A, B & C with capacities (in lakhs of eggs) 8, 5 & 3 respectively to supply eggs to three destinations I, II & III having respective demands (in lakhs of eggs) of 5, 3 and 2. The distance in kilometres between the sources and destinations are given in the following matrix.

From Source	To Destination		
	I	II	III
A	551	314	280
B	521	267	341
C	396	142	193

Software provided the following optimal allocation of eggs to the different cells of the matrix while going for distance minimization: - A – III = 2, B – I = 2, B – II = 3 and C – I = 3

Based on the above, the minimum distance to be travelled is given to be 1464 Kms. which has the break-up of (280 + 521 + 267 + 396).

The objective of minimization of Percentage Breakage of eggs is taken care of based on the following data



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From Source	To Destination @ 30 Kmph			To Destination @ 35 Kmph			To Destination @ 40 Kmph		
	I	II	III	I	II	III	I	II	III
A	5.00	2.85	2.54	5.50	3.13	2.80	6.00	3.42	3.05
B	4.77	2.42	3.10	5.20	2.66	3.40	5.67	2.91	3.71
C	3.61	1.29	1.75	3.95	1.42	1.93	4.13	1.55	2.00

Optimal allocations for different Speeds of vehicles as provided by the software are given in the tables below.

From Source	To Destination @ 30 Kmph			To Destination @ 35 Kmph			To Destination @ 40 Kmph			Supply in Lakhs
	I	II	III	I	II	III	I	II	III	
A			2			2			2	8
B	2	3		2	3		2	3		5
C	3			3			3			3
Demand in Lakhs	5	3	2	5	3	2	5	3	2	

Using the methodology similar to that of Distance minimization, the total breakage percentage for a speed of 30 Kmph is found to be 13.34 and the average breakage percentage is 3.335.

Total Transportation cost is found to be ₹ 2,80,000/-

Based on the above information answer the following questions –

1. Instead of using the software if the problem is to be solved manually then formulate the first step.
2. Is the figure of average breakage percentage correct for a speed of 30 Kmph? Justify.
3. What is the Transportation Cost of an egg per kilometre of distance travelled?
4. Formulate a matrix for minimizing the time taken to supply when the vehicle speed is 35 Kmph.

[8]



Time Allowed: 3 Hours

Full Marks: 100

The figures in the margin on the right side indicate full marks.

Where considered necessary, suitable assumptions may be made and clearly indicated in the answer.

SECTION – A : STRATEGIC COST MANAGEMENT FOR DECISION MAKING

Answer to Question No. 1 & 6 in Section A, are compulsory.

Further, answer **any 3** from Question nos. 2, 3, 4 & 5.

1. (a)

Sl. No.	Answer	Justification
(i)	c	Cost to ensure that failure does not happen is for ensuring that in future failure is prevented.
(ii)	c	Service organizations produce a product that is intangible. Usually, the complete product cannot be seen or touched. Rather, it is experienced. Examples include delivery of health care, experience of staying at a vacation resort, and learning at a university. Thus durability cannot be a parameter of quality of Service organization.
(iii)	d	(i) Today, there is no single universal definition of quality. Some people view quality as “performance to standards.” Others view it as “meeting the customer’s needs” or “satisfying the customer.” Some of the more common definitions of quality are; a. Conformance to Specifications: b. Fitness for Use c. Value for Price Paid d. Support Services e. Psychological Criteria Thus Physiological Criteria is certainly not one of the standard definitions of Quality.
(iv)	d	The first category of quality cost consists of costs necessary for achieving high quality, which are also called quality control costs. These are either prevention cost or appraisal cost. While prevention costs are all costs incurred in the process of preventing poor quality from occurring appraisal costs are incurred in the process of uncovering defects. They include the cost of quality inspections,



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		product testing, and performing audits to make sure that quality standards are being met. Thus it is quite evident that WIP testing and inspecting is appraisal cost and not prevention cost.						
(v)	d	<p>(i) Three principles guide Lean Accounting and form the foundation for all of accounting's work and interaction with the organization:</p> <p>a. Customer value: Delivering the relevant and reliable information in a timely manner to all users of the information inside the organization.</p> <p>b. Continuous improvement: Improving accounting processes, cross-functional business processes and the information used inside the business for analysis and decision making.</p> <p>c. Respect for people: Adopting a learning attitude by seeking to understand root causes of business problems and issues in a cross-functional, collaborative manner.</p> <p>Thus the best way of defining the principles of Lean Accounting are all of the above.</p>						
(vi)	a	<p>(i) The relevant cost in this example is the lower of the relevant cost for each option</p> <p><u>Recruitment</u> Four employees @ ₹ 40,000 each = ₹160,000 (Super vision is sunk as it is already incurred)</p> <p><u>Retrain and replace</u></p> <table><tr><td>Training</td><td>₹ 15,000</td></tr><tr><td>Replacement</td><td>₹1,00,000</td></tr><tr><td></td><td>₹ 1,15,000</td></tr></table> <p>So answer is ₹ 1,15,000</p>	Training	₹ 15,000	Replacement	₹1,00,000		₹ 1,15,000
Training	₹ 15,000							
Replacement	₹1,00,000							
	₹ 1,15,000							
(vii)	b	<p>B (incremental approach)</p> <p><u>Option 1</u> Sell for scrap ₹ 12,500</p> <p><u>Option 2</u></p> <table><tr><td>Extra cost</td><td>7,500</td></tr><tr><td>Extra revenue</td><td>5,000</td></tr><tr><td>Loss</td><td>2,500</td></tr></table>	Extra cost	7,500	Extra revenue	5,000	Loss	2,500
Extra cost	7,500							
Extra revenue	5,000							
Loss	2,500							



(viii)	c	Target ROI at 15% of total investment of ₹ 15 lakhs $= ₹ 15,00,000 \times 0.15$ $= ₹ 2,25,000$ Expected output = 500 units Target Profit per unit of output = $₹ 2,25,000 \div 500$ $= ₹ 450$ per unit Target cost per unit = Selling Price – Profit per unit $= ₹ 1,500 - ₹ 450$ $= ₹ 1,050$ per unit
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2. (a) (i) Developed by Michael Porter in 1985 and used throughout the world, the value chain is a powerful tool for disaggregating a company into its strategically relevant activities in order to focus on the sources of competitive advantage, that is, the specific activities that result in lower costs or higher prices. A company's value chain is typically part of a larger value system that includes companies either upstream (suppliers) or downstream (distribution channels), or both. This perspective about how value is created forces managers to consider and see each activity not just as a cost, but as a step that has to add some increment of value to the finished product or service. Manufacturing companies create value by acquiring raw materials and using them to produce something useful. Retailers bring together a range of products and present them in a way that is convenient to customers, sometimes supported by services such as trial rooms or personal shopper advice and insurance companies offer policies to customers that are underwritten by larger re-insurance policies. Here, they are packaging these larger policies in a customer-friendly way, and distributing them to a mass audience. In other words, the value that is created and captured by a company as reduced by the costs incurred is the profit margin. Expressed as a formula the equation would read as:

$$\text{Value Created and Captured} - \text{Cost of Creating that Value} = \text{Profit Margin}$$

The more value an organisation creates, the more profitable it is likely to be. As more and more value is provided to the customers, competitive advantage creeps in. Understanding how a company creates value, and looking for ways to add more value, are critical elements in developing a competitive strategy. Thus, the value chain is a set of activities that an organisation carries out to create value for its customers. Porter proposed a general-purpose value chain that companies can use to examine all of their activities, and see how they are connected. The way in which value chain activities are performed determines costs and affects profits.

*Elements in Porter's Value Chain*

Rather than looking at departments or accounting cost types, Porter's Value Chain focuses on systems, and how inputs are changed into the outputs purchased by consumers. Using this viewpoint, Porter described a chain of activities common to all businesses, and he divided them into primary and support activities, as shown below.

Primary Activities: Primary activities relate directly to the physical creation, sale, maintenance and support of a product or service. They consist of the following:

- **Inbound Logistics:** These are all the processes related to receiving, storing, and distributing the inputs internally. The supplier relationships are a key factor in creating value here.
- **Operations:** These are the transformation activities that change inputs into outputs that are sold to customers. Here, operational systems create value.
- **Outbound Logistics:** These activities deliver the product or service to the customer. These are the things like collection, storage, and distributing the outputs. They may be internal or external to the organisation.
- **Marketing and Sales:** These are the processes that are used to persuade clients to purchase from the firm instead of its competitors. The benefits being offered, and how well they are communicated to the customers, are sources of value here.
- **Service:** These are the activities related to maintaining the value of the product or service to customers, once it has been purchased.

Support Activities:

Support activities support the primary functions stated above. Each support, or secondary, activity can play a role in each primary activity. For example, procurement supports operations with certain activities, but it also supports marketing and sales with other activities.

- **Procurement (Purchasing):** This is what the organisation does to get the resources it needs to operate. This includes finding vendors and negotiating best prices.
- **Human Resource Management:** This is how well a company recruits, hires, trains, motivates, rewards, and retains its workers. People are a significant source of value, so businesses can create a clear advantage with good HR practices.
- **Technological Development:** These activities relate to managing and processing information, as well as protecting a company's knowledge base. Minimizing information technology costs, staying current with



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technological advances, and maintaining technical excellence are sources of value creation.

- Infrastructure: These are a company's support systems, and the functions that allow it to maintain daily operations. Accounting, legal, administrative, and general management are examples of necessary infrastructure that businesses can use to their advantage

(ii) Value chain analysis (VCA) is a process where a firm identifies its primary and support activities that add value to its final product and then analyse these activities to reduce costs or increase differentiation. Value chain analysis relies on the basic economic principle of advantage - companies are best served by operating in sectors where they have a relative productive advantage compared to their competitors. Simultaneously, companies should ask themselves where they can deliver the best value to their customers. Conducting a value chain analysis prompts a firm to consider how each step adds or subtracts value from its final product or service. This, in turn, can help it realize some form of competitive advantage, such as:

- Cost reduction, by making each activity in the value chain more efficient and, therefore, less expensive
- Product differentiation, by investing more time and resources into activities like research and development, design, or marketing that can help the product stand out

Typically, increasing the performance of one of the four secondary activities can benefit at least one of the primary activities.

There are as such five steps in developing the value chain analysis

Step 1: Identify all value chain activities

Step 2: Calculate the cost of each activity

Step 3: Look at what your customers perceive as value

Step 4: Look at your competitors' value chains

Step 5: Decide on a competitive advantage

- (b) (i) In order to identify how and to what extent TQM differs from the traditional model of quality management, the philosophy behind the TQM is to be identified, which are;
- a) Failure and poor quality are unacceptable. It is inappropriate to think of an optimal level of quality at which some failures will occur, and the inevitability of errors is not something that an organisation should accept. The target should be zero defects.



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- b) Quality costs are difficult to measure, and failure costs in particular are often seriously underestimated. The real costs of failure include not just the cost of scrapped items and reworking faulty items, but also the management time spent sorting out problems and the loss of confidence between different parts of the organisation whenever faults occur.
- c) A TQM approach does not accept that the prevention costs of achieving zero defects becomes unacceptably high as the quality standard improves and goes above a certain level. In other words, diminishing returns do not necessarily set in. If everyone in the organisation is involved in improving quality, the cost of continuous improvement need not be high.
- d) If an organisation accepts an optimal quality level that it believes will minimize total quality costs, there will be no further challenge to management to improve quality further.
- (ii) According to Colin Drury Continuous Improvement (CI) is an ‘ongoing process that involves a continuous search to reduce costs, eliminate waste, and improve the quality and performance of activities that increase customer value or satisfaction’.

The implementation of continuous improvement does not necessarily call for significant investment, but it does require a great deal of commitment and continuous effort. Continuous improvement is often associated with incremental changes in the day-to-day process of work suggested by employees themselves. This is not to say that continuous improvement organisations do not engage in radical change. Quantum leaps in performance can occur when cumulative improvements synergize, the sum of a number of small improvements causing a profound net effect greater than the sum of all the small improvements. The process must be ongoing, and sustained success is more likely in organisations that regularly review their business methods and processes in the drive for improvement.

Cornerstones of continuous improvement (CI)

- Quality – the creation of key performance indicators (KPIs) with a focus on meeting customer needs was an important step in improving these processes. Previous measures had focused on output.
- Process improvements – a process of benchmarking its KPIs means that Tata is always reviewing its activities, and by sharing relevant information within Tata, it maintains the drive necessary to keep the system working.



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- Teamwork – CI requires everyone to work differently. Every employee needs to feel that they can and should spot areas of weakness and make suggestions about how to make improvements. To help employees make this shift in attitude, a phased approach was used whereby initially CI coaches were responsible for CI, then CI champions, managers, team leaders and finally the team.

3. (a) (i) Make or Buy

Total Cost per tube of EMO:

		Per Tube
Direct Material	= (108 ÷ 24)	= ₹ 4.50
Direct Wages	= (72 ÷ 24)	= ₹ 3.00
Variable Overheads	= {(54 ÷ 24) – (4,50,000 ÷ 3,00,000)}	= ₹ 0.75

Particulars	Total Cost (₹)	Tube Cost (₹)	Product Cost (₹)
Material	4.50	20% of total cost = 0.90	3.60
Wages	3.00	10% of total cost = 0.30	2.70
Variable Overhead	0.75	10% of total cost = 0.075	0.675
Total	8.25	1.275	6.975

Cost of Making = (3,00,000 × 1.275) = ₹ 3,82,500

Cost of Buying = (3,00,000 × 1.35) = ₹ 4,05,000

Therefore, it is better to make the tubes at 3,00,000 level of output, as it is cheaper than Buying.

Computation of Cost for additional tubes at the level of 3,50,000 and 4,50,000:

Particulars	3,50,000	4,50,000
Additional tubes needed over 3,00,000	50,000	1,50,000
Cost of Making (₹)	93,750 [(50,000 × 1.275) + 30,000]	2,21,750 [(1,50,000 × 1.275) + 30,000]
Cost of Buying (₹)	67,500 (50,000 × 1.35)	2,02,500 (1,50,000 × 1.35)

From the above, it is better to Buy the empty tubes at the level of 3,50,000 and 4,50,000, as it is deeper than making at both levels.

(ii) The level at which it is beneficial to make the tubes over and above 300000 units

Additional Fixed Overheads = ₹ 30,000



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Excess of buying cost over variable cost = $(1.35 - 1.275) = ₹ 0.075$

Indifference Point = $(\text{Additional Fixed Overheads} \div \text{Excess Buying Cost})$
 $= 30,000 \div 0.075$
 $= 4,00,000$ units

Therefore, the Company will be justified to install the additional Equipment for the manufacture of Empty tubes at a sales volume of 400000 units.

(iii) Evaluation of Profitability at the three levels of output

Sl. No.	Particulars	3,00,000	3,50,000	4,00,000
(i)	Sales @ ₹ 10 p.u.	30,00,000	35,00,000	45,00,000
(ii)	Product Cost @ ₹ 6.975 p.u.	20,92,500 (3,00,000×6.975)	24,41,250 (3,50,000×6.975)	31,38,750 (4,50,000×6.975)
(iii)	Tube Cost (₹) [As per (i)]	3,82,500 (3,00,000×1.275)	4,72,500 (3,50,000 × 1.35)	6,07,500 (4,50,000×1.35)
(iv)	Fixed cost (₹)	4,50,000	4,50,000	4,50,000
(v)	Total Cost (₹)	29,25,000	33,63,750	41,96,250
(vi)	Profit (I–V) (₹)	75,000	1,36,250	3,03,750

(b) Contribution per labour hour of X = $₹ 25 \div 5 = ₹ 5$ (2nd)

Contribution per labour hour of Y = $₹ 40 \div 6 = ₹ 6.67$ (1st)

Contribution per labour hour of Z = $₹ 32 \div 8 = ₹ 4$ (3rd)

Quantities produced

	Hours
100 units of Y	600
50 units of X	250
18.75 unit of Z	150 (balance)
	<hr/> 1,000

Since it would not be practical to produce 0.75 of a unit, we would produce 18 units of product Z with 6 spare hours.

4. (a) (i) The opportunity costs of producing cassettes are the salary forgone of ₹ 1,000 per month and the rental forgone of ₹ 400 per month.

(ii) The consultant's fees and development costs represent sunk costs.



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(b) The following information can be obtained from the report.

	₹ Selling price	₹ 9 selling price
Sales quantity	7500 – 10000 units	12000 – 18000 units
Fixed costs ^a	₹ 13,525	₹ 17,525
Profit at maximum sales ^b	₹ 3,975	₹ 4,975
Profit/(Loss) at minimum sales ^c	(₹ 400)	(₹ 2,525)
Break-even point ^d	7729 units	14020 units
Margin of safety:		
Below maximum	2271 units	3,980 units
Above minimum	229 units	2020 units

Notes:

^a Fixed production cost + ₹ 1,400 opportunity cost

^b (10000 units × ₹ 1.75 contribution) – ₹ 13,525 fixed costs = ₹ 3,975 profit
(18000 units × ₹ 1.25 contribution) – ₹ 17,525 fixed costs = ₹ 4,975 profit

^c (7500 units × ₹ 1.75 contribution) – ₹ 13,525 fixed costs = ₹ 400 loss
(12000 units × ₹ 1.25 contribution) – ₹ 17,525 fixed costs = ₹ 2,525 loss

^d Fixed costs / contribution per unit

Conclusions

- The ₹ 10 selling price is less risky than the ₹ 9 selling price. With the ₹ 10 selling price, the maximum loss is lower and the break-even point is only 3% above minimum sales (compared with 17% for a ₹ 9 selling price).
- The ₹ 9 selling price will yield the higher profits if maximum sales quantity is achieved.
- In order to earn ₹ 3975 profits at a ₹ 9 selling price, we must sell 17,200 units (required contribution of 17,525 fixed costs plus ₹ 3,975 divided by a contribution per unit of ₹ 1.25).

Additional information required: These are the assumptions

- Details of capital employed for each selling price.
- Details of additional finance required to finance the working capital and the relevant interest cost so as to determine the cost of financing the working capital.
- Estimated probability of units sold at different selling prices.
- How long will the project remain viable?
- Details of range of possible costs. Are the cost figures given in the question certain?



(b)

Compounded present value of 3 years @ 10%		2.486
P.V. of Annual running cost of Machine A for 3 years	₹40,000×2.486	₹ 99,440
Compounded present value of 2 years @ 10%		1.735
P.V. of annual running cost of Machine B for 2 years	₹60,000×1.735	₹ 1,04,100

Statement Showing Evaluation of machine A and B

Particulars	Machine A	Machine B
Cost of purchase	1,50,000	1,00,000
Add: P.V. of running cost	99,440	1,04,100
P.V. of Cash outflow	2,49,440	2,04,100
Equivalent present value of annual cash outflow/EAC	$2,49,440 \div 2,486 = 1,00,338$	$2,04,100 \div 1,735 = 1,17,637$

Suggestion: Since the annual cash outflow of Machine B is higher, purchase of Machine A is recommended.

5. (a) a. (i) **Sales margin variance (Marginal costing):**

$(\text{Actual Volume} - \text{Budgeted Volume}) \times \text{Standard Contribution Margin}$
 $= (9500 - 10000) \times \text{Standard Contribution Margin (SCM)} = ₹7,500 \text{ (A)}$
 $500 \text{ SCM} = 1500$

Therefore, SCM (Standard Contribution Margin) = ₹ 15

(ii) **Sales margin volume variance (Absorption Costing)**

$(\text{Actual Volume} - \text{Budgeted Volume}) \times \text{Standard profit margin per unit}$
 $= (9500 - 10000) \times \text{Standard Profit Margin (SPM)} = ₹ 4,500 \text{ (A)}$
 $500 \text{ SPM} = ₹4,500 \text{ (A)}$

SPM (Standard Profit Margin) = ₹ 9

(iii) **Fixed Overhead Volume Variance**

$(\text{Actual Production} - \text{Budgeted Production}) \times \text{Standard Rate}$
 $= (9700 - 10000) \times \text{Standard Rate} = ₹ 1,800 \text{ (A)}$

Standard Fixed Overhead rate per unit = ₹ 6

Budgeted Fixed Overheads = 10000 units × ₹ 6 = ₹ 60,000

Fixed Overhead expenditure variance = ₹ 2,500 (F)

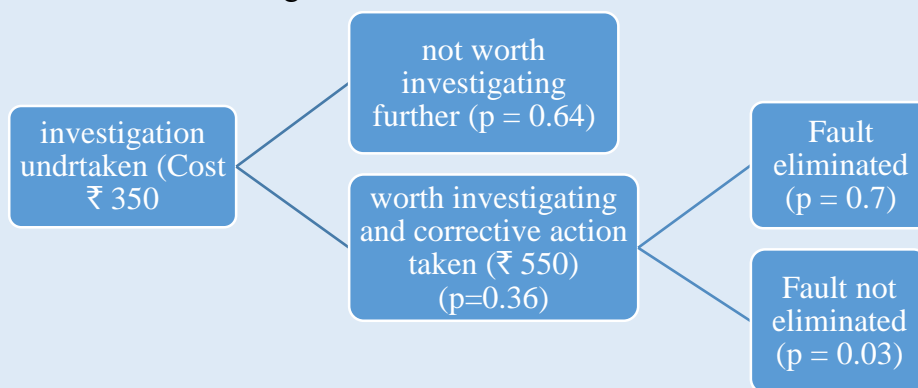
Actual Fixed Overheads (₹ 60,000 – ₹ 2,500) = ₹ 57,500.



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- b. Absorption costing unitises fixed overheads and treats them as product costs whereas marginal costing does not charge fixed overheads to products. Instead, the total amount of fixed overheads is charged as an expense (period cost) for the period. A fixed overhead volume variance only occurs with an absorption costing system. Because marginal costing does not unitise fixed costs product margins are expressed as contribution margins whereas absorption costing expresses margins as profit margins.

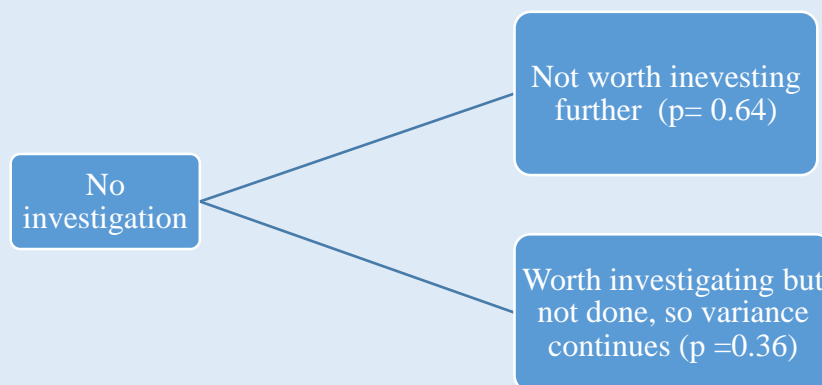
(b) Decision Tree if an investigation is carried out



It is assumed that the ₹ 550 correction cost applies to all variances that the initial investigation indicates are worthy of further investigation. The expected cost if the investigation is carried out is

$₹350 + ₹550$ (corrective action) $+ 0.36 \times 0.3 \times ₹246$ (continuing variance) $= ₹815$
[note: ₹ 246 represents the PV of ₹ 525 for 5 month at 2% ($₹ 525 \times 4.7135$) for variances that are not eliminated]

Decision Tree if an investigation is not carried out



The expected cost if no investigation is undertaken is
 $0.36 \times ₹ 525 \times 4.7135 = ₹ 891$.



STRATEGIC COST MANAGEMENT

6. (1) If Division B buys all of its components from division S (80000) then division S will sell its remaining capacity (95000) on the external market. This will result in unfulfilled demand of 55000 components (total demand of 150000 295000) in the external market. In terms of the transfer price 55000 of the components transferred will have an opportunity cost equal to the lost sales revenue of ₹ 50. This could be restated as variable cost (₹ 44) + lost contribution (₹ 6) giving a transfer price of ₹ 50. The remaining 25 000 units transferred to division B do not have an opportunity cost so the relevant cost is the marginal cost of ₹ 44. The profit statements will be as follows:

	S (₹)	B (₹)	Working
Sales			
Internal	38,50,000		1
External	47,50,000	72,00,000	2
	86,00,000	72,00,000	
Variable costs			
Components			
Internal	0		3
External	77,00,000		4
Other Variable	0	18,88,000	5
Fixed Costs	5,60,000	14,60,000	
Profit	3,40,000	2,000	

Workings:

¹ $(55,000 \times ₹ 50) + (25,000 \times ₹ 44) = ₹ 38,50,000$

² $95,000 \times ₹ 50 + ₹ 47,50,000$ Division S, $16,000 \times ₹ 450 = ₹ 72,00,000$

³ Same as division S internal sales revenue

⁴ $1,75,000 \times ₹ 44 = ₹ 77,00,000$

⁵ $16,000 \times ₹ 118 = ₹ 18,88,000$

(2)

	S (₹)	B (₹)	SBA (₹)	Working
Sales				
Internal	0	0	0	
External	75,00,000	72,00,000	1,47,00,000	1
	75,00,000	72,00,000	1,47,00,000	
Variable costs				
Components				
Internal	0	0	0	



STRATEGIC COST MANAGEMENT

External	66,00,000	33,60,000	99,60,000	2
Other Variable	0	18,88,000	18,88,000	3
Fixed Costs	5,60,000	14,60,000	20,20,000	
Profit	3,40,000	4,92,000	8,32,000	

Workings:

- ¹ Division S = 1,50,000 maximum external demand × ₹ 50; division B = 16,000 × ₹ 450 = ₹ 72,00,000
- ² Division S = 1,50,000 × ₹ 44 variable cost = ₹ 66,00,000, division B = 80,000 × ₹ 42 = ₹ 33,60,000
- ³ 16,000 × ₹ 118 = ₹ 18,88,000.

- (3) The motivation for outsourcing is that the external supplier may be able provides the component at a lower cost than SBA is currently incurring internally. Specialist component manufacturers may be more efficient arising from utilizing the latest manufacturing technology. The major disadvantage of outsourcing is that there is a potential loss of control and a danger that SBA will be at the mercy of the supplier when negotiating a new contract. This danger will be minimized if there are many other suppliers that can provide the component at a competitive price. A close relationship will be required between the two organizations requiring knowledge of lead times and the demand cycle at SBA. Outsourcing the manufacture of components may also result in spare capacity at SBA. Can this be utilized or can cost savings be achieved from reducing capacity?

	S (₹)	B (₹)	SBA (₹)	Working
Sales				
Internal	0	0	0	
External	75,00,000	72,00,000	1,47,00,000	1
	75,00,000	72,00,000	1,47,00,000	
Variable costs				
Components				
Internal	0	0	0	
External	66,00,000	33,60,000	99,60,000	2
Other Variable	0	18,88,000	18,88,000	3
Fixed Costs	5,60,000	14,60,000	20,20,000	
Profit	3,40,000	4,92,000	8,32,000	

**SECTION – B : QUANTITATIVE TECHNIQUES IN DECISION MAKING**

Answer to Question No. 7 & 11 in Section B, are compulsory.

Further, answer **any 2** from Question nos. 8, 9 & 10.

7.

Sl. No.	Answer	Justification
(i)	a	Optimistic time (t_o) and Pessimistic (t_p) time – 4 days 16 days. Variance of duration = $\left(\frac{t_p - t_o}{6}\right)^2 = \left(\frac{16 - 4}{6}\right)^2 = \left(\frac{12}{6}\right)^2 = (2)^2 = 4.$
(ii)	d	The purpose of dummy row or column in an assignment problem is to obtain balance between total number of activities and total number of resources. Dummy row (or columns) are added in the matrix so as to complete it to perform a square matrix. The dummy rows or columns will contain all costs elements as zeroes.

8. (a) The appropriate mathematical formulation of the given problem as LP model is as follows:

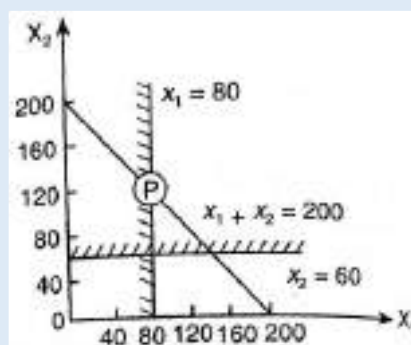
$$\text{Minimize (total cost)} = 3x_1 + 5x_2$$

Subject to the constraints

$$x_1 + x_2 = 200, x_1 \leq 80, x_2 \geq 60,$$

$$x_1 \geq 0 \text{ and } x_2 \geq 0$$

Drawing the lines $x_1 + x_2 = 200$, $x_1 = 80$ and $x_2 = 60$ on a graph sheet, we get the adjoining figure.



It may be observed from the adjoining figure that the given problem has no feasible solution space (shaded area) but has only one feasible point with its co-ordinates $x_1 = 80$ and $x_2 = 120$.

Hence the optimum solution is to mix 80 kgs. of ingredients X_1 and 120 kgs. of ingredients X_2 to have a minimum cost of ₹ 840.



STRATEGIC COST MANAGEMENT

(b) Step 1: Assign a high cost, denoted by M, to the pair (A, 2) and (B, 3).

ROW SUBTRACTION

Task \ Officer	A	B	C	D
1	0	3	1	2
2	M	4	3	0
3	0	M	2	0
4	4	4	2	0

COLUMN SUBTRACTION

Task \ Officer	A	B	C	D
1	0	0	0	2
2	M	1	2	0
3	0	M	1	0
4	4	1	1	0

Step 2 : Draw minimum number of straight lines to cover all zeros.

Task \ Officer	A	B	C	D
1	0	0	0	2
2	M	1	2	0
3	0	M	1	0
4	4	1	1	0

The table shows a horizontal line drawn through the zeros in row 1, and two vertical lines drawn through the zeros in column 1 and column 4. Arrows indicate the direction of the lines.

Step 3 : Smallest uncovered number subtracted from uncovered numbers, added to numbers at intersection of two lines.



STRATEGIC COST MANAGEMENT

Task Officer	A	B	C	D
1	1	0	0	3
2	M	0	1	0
3	0	M	0	0
4	4	0	0	0

Step 4 : Return to step 2. Cover all zeros. Since the number of lines is 4, the optimum solution is reached

Task Officer	A	B	C	D
1	1	0	∅	3
2	M	∅	1	0
3	0	M	∅	∅
4	4	∅	0	∅

Assign:

Officer		Job	Time
1	to	B	7 hrs
2	to	D	4 hrs
3	to	A	3 hrs
4	to	C	4 hrs
		Total	18 hrs

9. (a) Let the given Game is played by the players A and B with A (the maximizing player) having strategies A₁, A₂ and A₃, represented along the rows and B (the minimizing player) having strategies B₁, B₂ and B₃ represented along the columns. So the given payoff Matrix can be written as follows –

	Strategies of B		
Strategies of A	B ₁	B ₂	B ₃
A ₁	15	2	3
A ₂	6	5	7
A ₃	-7	4	0



STRATEGIC COST MANAGEMENT

All the elements of Row A_3 are less than the corresponding elements of Row A_2 . So A_3 is dominated by A_2 . Hence it is ignored and deleted. The new matrix is given below.

Strategies of A	Strategies of B		
	B ₁	B ₂	B ₃
A ₁	15	2	3
A ₂	6	5	7

Here all the elements of B_3 are more than the corresponding elements of B_2 . Hence B_3 is dominated by B_2 and ignored to get the new matrix below.

Strategies of A	Strategies of B		Row Min.
	B ₁	B ₂	
A ₁	15	2	2
A ₂	6	5	5
Column Max.	15	5	

Maximum among the Row minimums = 5 = Maximin value and Minimum among the Column maximums = 5

= Minimax value. As, Maximin and Minimax values are equal, there exists a Saddle Point. It occurs at the cell A_2B_2 .

Hence optimal strategies of A and B are respectively A_2 and B_2 . Also value of the Game = 5

(b) (i) Data Mining

This is the activity of “Data Discovery” because here the patterns and inconsistencies of data unveiled through automated or semi-automated data analysis. Common correlations drawn from Data Mining include grouping specific sets of data, finding outliers in data and drawing connections and dependencies from disparate datasets.

Data Mining often uncovers the patterns used in more complex analyses, like Predictive modelling which makes it an essential part of the BI Process whose growth is correlated directly with the rise of Big Data in businesses of all sizes.

Of the standard processes performed by Data Mining, association rule learning presents the greatest benefit. By examining data to draw dependencies and construct correlations, the association rule can help



businesses better understand the way customers interact with their website or even what factors influence their purchasing behavior.

Association rule learning was originally introduced to uncover connections between purchase data recorded in point of sale systems at supermarkets. For example, if a customer purchased Tomato Sauce and Cheese, the association rules would likely uncover that the customer purchased Hamburger Meat as well. Though this is a very simple example but it works well to understand the type of analysis that now connects incredibly complex chains of events in all sorts of industries and helps users find correlations that would have remained hidden otherwise.

(ii) Applications of R Programming in the real world

1. **Data Science** – With the advent of “Internet of things” (IoT) devices creating terabytes and terabytes of data that can be used to make better decisions, Data Science is a field that has no other way but to go up. Simply explained, a data scientist is a statistician with an extra asset – computer programming skills. Programming languages like R give a data scientist superpowers that allow them to collect data in real time, perform statistical and predictive analysis, create visualisation and communicate actionable results to the stakeholders.
2. **Statistical Computing** – R is the most popular programming language among statisticians. In fact, it was initially built by statisticians for carry work related to statistical data. It has a rich package repository with over 9000 packages having every statistical function one can think of. R’s expressive syntax allows researchers – even those from non-computer science backgrounds to quickly import, clean and analyse data from various data sources. R also has charting capabilities which means one can plot the data and create interesting visualisations from any dataset.
3. **Machine Learning** – R has found a lot of use in predictive analytics and machine learning. It has various packages for common ML tasks like linear and nonlinear regression, decision trees, linear and non-linear classification and many more. Everyone from machine learning enthusiasts to researchers use R to implement machine learning algorithms in fields like finance, genetics research, retail, marketing and health care.



10. (a) Total time taken to produce 14 units

$$Y = ax^b$$

$$Y = 40 (14)^{-0.322}$$

$$\log Y = \log 40 - (0.322) \log 14$$

$$= 1.60221 - (0.322) \times 1.1461$$

$$= 1.60221 - 0.3690 = 1.233$$

$$Y = \text{Antilog } (1.233) = 17.14$$

$$\text{Total time} = 17.14 \times 14 = 239.96$$

$$= 240 \text{ hours (which is same as the hours recorded)}$$

So the assumption that learning ratio 80% is reasonable.

(i) 30 units

$$Y = 40 (30)^{-0.322} = 13.380 \text{ hours (Average time)}$$

50 units

$$Y = 40 (50)^{-0.322} = 11.35 \text{ hours (Average time)}$$

$$\text{Total time for 30 units} = 13.38 \times 30 = 401.4 \text{ hours}$$

$$\text{Total time for 50 units} = 11.35 \times 50 = 567.5 \text{ hours}$$

$$\text{Time taken for 20 units from 31 to 50 units } (567.5 - 401.4) = 166.1 \text{ hours}$$

(ii) Man hours = $10 \times 8 \times 5 \times 4 = 1600$

(–) down time ($25\% \times 1600$) = 400

1200

Fixed Cost per hour = $6000/1200 = ₹ 5$

Computation of total cost for the initial order

Material (30×30) = ₹ 900.0

Labour (401.4×6) = ₹ 2408.4

Variable Overheads (0.5×401.4) = ₹ 200.7

Fixed Overheads (5×401.4) = ₹ 2007.0

Total Cost = ₹ 5516.1



(b) Cost function is given to be $C(x) = 14400 + 550x + 0.01x^2$

So Average Cost function = $C(x) / x$

Or, $AC(x) = (14400 + 550x + 0.01x^2) / x$

Or, $AC(x) = 14400/x + 550 + 0.01x$

This is the Objective function which has to be minimized.

Differentiating both sides of the above function with respect to 'x' we get

$$\frac{d}{dx} [AC(x)] = 14400/x^2 + 0.01 \text{ ----- (i)}$$

As per the necessary condition of optimization, $\frac{d}{dx} [AC(x)] = 0$

$$\text{or, } -14400/x^2 + 0.01$$

$$\text{or, } 0.01x^2 = 14400$$

$$\text{or, } x^2 = 14400 / 0.01$$

$$\text{Or, } x = \pm \sqrt{1440000}$$

$$\text{Or, } x = \pm 1200$$

But x being the quantity cannot be negative. Hence $x = 1200$

To ascertain whether this value of x corresponds to minima, we have to take help of the sufficient condition mentioned above.

Again differentiating both sides of 9i) with respect to 'x' we get, $\frac{d^2}{dx^2} [AC(x)]$
 $= 28800/x^3$

For $x = 1200$, the value of 2nd order Derivative is $\frac{d^2}{dx^2} [AC(1200)] = 28800/(1200)^3$
 $= 1.67 \times 10^{-5} > 0$

So there exist a Minima to the Objective Function at $x = 1200$

Hence 1200 units should be produced per day to minimize the Average Cost.

At this level of production,

$$\begin{aligned} \text{Average Cost} &= [AC(X)]_{\text{at } x = 1200} \\ &= 14400/1200 + 550 + 0.01 \times 1200 \\ &= ₹574 \text{ per unit} \end{aligned}$$

Also at this level of production,

$$\begin{aligned} \text{Total Cost} &= [C(x)]_{\text{at } x = 1200} \\ &= 14400 + 550 \times 1200 + 0.01 \times 1200^2 \\ &= ₹ 6,88,800/- \end{aligned}$$

**Case study**

11. (1) As per the given information, Total demand of eggs = 10 Lakh pieces and Total supply is 16 Lakh pieces. Thus the problem is unbalanced one with Supply > Demand

So, the very first step should be to make it balanced by introducing a DUMMY destination having a demand of $16 - 10 = 6$ Lakh pieces.

- (2) When the vehicle speed is 30 Kmph then the total percentage of broken eggs is $(2.54+4.77+2.42+3.61) = 13.34$.

So, the average percentage of broken eggs = $13.34 \div 4 = 3.335$.

Hence the figure of average breakage percentage for a speed of 30 Kmph is correct.

- (3) Total Cost of transportation = ₹ 280000/-,

Total No. of eggs to be supplied = 1000000

Minimum total distance to be travelled = 1464 Kms.

So, Cost of Transportation per egg per Km = $280000 \div (1000000 \times 1464) = ₹ 0.00019$.

- (4) Time (Hours) Matrix for Vehicle Speed 35 Kmph

From Source	To Destination		
	I	II	III
A	15.74	8.97	8.00
B	14.89	7.63	9.74
C	11.31	4.06	5.51

Note:- Time in hours = Distance in Km \div Speed in Kmph.



FINAL EXAMINATION
MODEL QUESTION PAPER
PAPER - 16

SET 2

STRATEGIC COST MANAGEMENT

Time Allowed: 3 Hours

Full Marks: 100

The figures in the margin on the right side indicate full marks.
Where considered necessary, suitable assumptions may be made and
clearly indicated in the answer.

SECTION – A : STRATEGIC COST MANAGEMENT FOR DECISION MAKING

Answer to Question No. 1 & 6 in Section A, are compulsory.

Further, answer **any 3** from Question nos. 2, 3, 4 & 5.

1. (a) Choose the most appropriate answer to the following questions with justification. 1 mark will be awarded for correct answer and 1 mark for justification.: [8 × 2 = 16]

- (i) Which one of the following is not true for a Blue Ocean Strategy?
- Create uncontested market space
 - Make the competition irrelevant
 - Exploit existing demand
 - Create and capture new demand
- Briefly state a reason supporting your selection.
- (ii) One of the following is not an advantages of cost control are mainly as:
- Achieving the expected return on capital employed by maximizing or optimizing profit.
 - Increasing the productivity of the available resources.
 - Delivering the product or service to the customers at a reasonable price.
 - It is a corrective function, thus corrects an existing situation.
- Briefly justify your answer.
- (iii) The rules governing the application of the Value Analysis (VA) approach are
- No cost can be removed if it compromises the quality of the product or its reliability.
 - Marketability is another issue that cannot be compromised.
 - Any activity that reduces the maintainability of the product increases the cost of ownership to the customer and can lower the value attached to the product.
 - None of the above
- Briefly state a reason in support of your selection.



FINAL EXAMINATION
MODEL QUESTION PAPER
PAPER - 16

SET 2

STRATEGIC COST MANAGEMENT

- (iv) Which of the following is not a term normally used in value analysis and why?
- Exchange value
 - Use value
 - Esteem value
 - Cost value
- (v) Which of the three principles guide Lean Accounting and form the foundation for all of accountants' work and interaction with the organization and why?
- Customer value, quality circle, respect for people
 - Supplier value, quality circle, respect for people
 - Customer value, continuous improvement, respect for people
 - Supplier value, continuous improvement, suggestion box
- (vi) The standard variable production overhead cost of product B is as follows.
4 hours at ₹ 1.70 per hour = ₹ 6.80 per unit
During period 3 the production of B amounted to 400 units. The labour force worked 1,690 hours, of which 30 hours were recorded as idle time. The variable overhead cost incurred was ₹ 2,950. The variable production overhead efficiency variance for period 3 is
- ₹ 102 (F)
 - ₹ 102 (A)
 - ₹ 105 (A)
 - ₹ 153 (A)
- (vii) M Co sells product L. An extract from its budget for the four-week period ended 28 October 2022 shows that it planned to sell 500 units at a unit price of ₹ 300, which would give a C/S ratio of 30%. Annual sales were 521 units at an average selling price of ₹ 287. The actual C/S ratio averaged 26%. The sales volume contribution variance (to the nearest ₹ 1) was
- ₹ 1,890 (F)
 - ₹ 1,808 (F)
 - ₹ 1,638 (F)
 - ₹ 1,567 (F)
- (viii) A technical writer is to set up her own business. She anticipates working a 40-hour week and taking four weeks' holiday per year. General expenses of the business are expected to be ₹ 10,000 per year, and she has set herself a target of ₹ 40,000 a year salary. Assuming that only 90% of her time worked will be chargeable to customers, her charge for each hour of writing (to the nearest cent) should be
- ₹ 26.04
 - ₹ 30.94
 - ₹ 28.94
 - ₹ 29.84



FINAL EXAMINATION
MODEL QUESTION PAPER
PAPER - 16

SET 2

STRATEGIC COST MANAGEMENT

2. (a) 'Lean evolved from the manufacturing philosophy of the Toyota Production System' – explain the evolution process. In this context explain Lean Accounting and its three principles. [6]
- (b) Explain the principles of Total Quality Management (TQM). Also describe the essential requirements for the implementation of Total Quality Management (TQM)? [6]
3. (a) Rags Ltd. manufactures and sells premium quality of sports shoes in India. Noted sports clubs and its members are the main customers. Finished products show some rectifiable defects. These problems can be detected and rectified during internal inspection. Inspection cost is ₹30 per unit. Rectification cost is ₹18 per unit. During 2022, 60000 pairs of shoes were manufactured and sold. After inspection defect was detected in respect of 5% of output. Inspection cost is ₹ 30 per pair. After sales, customers reported defects in respect of 6% of output. These shoes were received back from customers at a transportation cost of ₹ 10 per pair. Due to negative publicity arising out of sale of defective materials, loss in sales is expected in next year to the extent of 5% of external failures.
Required:
- a. Calculate the cost of quality showing the elements separately.
- b. If the selling price per pair of shoes is ₹ 600 and variable cost is 60% of sales, fixed cost is ₹ 5,50,000 p.a., prepare the profitability statement for the product during 2022. [2 + 3 = 5]
- (b) ASA LLP has been approached by a customer who would like a special job to be done for him and is willing to pay ₹ 22,000 for it. The job would require materials A, B, C and D. the details of the material are given below;

Materials	Total units required	Units already in inventory	Book Value of units in stock (₹ per unit)	Realisable Value (₹ per unit)	Replacement Cost (₹ per unit)
A	1000	0	-	-	6
B	1000	600	2	2.5	5
C	1000	700	3	2.5	4
D	200	200	4	6	9

The following information are also furnished.

- (i) Material B is used regularly by X Ltd. and if stocks were required for this job, they would need to be replaced to meet other production demand.



FINAL EXAMINATION
MODEL QUESTION PAPER
PAPER - 16

SET 2

STRATEGIC COST MANAGEMENT

- (ii) Materials C and D are in stock as the result of previous excess purchase and they have a restricted use. No other use could be found for material C but material D could be used in another job as substitute for 300 units of material which currently costs ₹ 5 per unit (of which the company has no units in stock at the moment.)
- (iii) Assume all other expenses on this contract to be specially incurred besides the relevant cost of material is ₹ 550.

Analyze the relevant costs of material, in deciding whether or not to accept the contract? [7]

4. (a) Kobe Co manufactures electronic mobility scooters. The company is split into two divisions: the scooter division (Division S) and the motor division (Division M). Division M supplies electronic motors to both Division S and to external customers. The two divisions run as autonomously as possible, subject to the group's current policy that Division M must make internal sales first before selling outside the group; and that Division S must always buy its motors from Division M. However, this company policy, together with the transfer price which Division M charges Division S, is currently under review.

Details of the two divisions are given below.

Division S

Division S's budget for the coming year shows that 35 000 electronic motors will be needed. An external supplier could supply these to Division S for ₹ 800 each.

Division M

Division M has the capacity to produce a total of 60 000 electronic motors per year. Details of Division M's budget, which has just been prepared for the forthcoming year, are as follows:

Budgeted sales volume (units)	60 000
Selling price per unit for external sales of motors	₹ 850
Variable costs per unit for external sales of motors	₹ 770

Maximum external demand for the motors is 30 000 units per year.

Required:

Assuming that the group's current policy could be changed, determine, using suitable calculations, the number of motors which Division M should supply to Division S in order to maximize group profits. Calculate the transfer price or prices at which these internal sales should take place. Note: All relevant workings must be shown

The variable cost per unit for motors sold to Division S is ₹ 30 per unit lower due to cost savings on distribution and packaging. [4]



FINAL EXAMINATION
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SET 2

STRATEGIC COST MANAGEMENT

- (b) AB Ltd. Has two divisions Alfa & Beta. Alfa produces components, two units of which are required for one unit of final product produced by Beta. Alfa has a capacity to produce 20000 units and entire quantity is supplied to Beta @ ₹ 200 per unit. Variable cost component at Alfa is ₹ 190 & fixed cost ₹ 20 per unit. For final product of Beta, per unit variable cost excluding component is ₹ 700, fixed cost ₹ 200 and selling price is ₹ 1500.

Alfa has placed a proposal for increasing the transfer price to ₹ 220 i.e. the market price. Facility at Alfa can be rented out @ ₹ 3.00 Lacs p.a. Manager at Alfa wants to opt for this alternative

- Beta can buy this component from outside market @ ₹ 210
- If capacity of Alfa is augmented to 40000 units with an additional investment of ₹ 15 lacs, it can sell 20000 units to external market and balance to Beta @ ₹ 210 per unit. Fixed cost for Alfa will be up by ₹ 1.00 lac.

Evaluate and give your opinion under the following decision options.

- a. Facility of Alfa is rented out and Beta buys from market @ ₹ 210 per unit
- b. Alfa sells to outside market @ ₹ 220 and Beta buys @ 210 per unit from market
- c. Capacity enhancement with cost of capital @ 12 % [8]

5. (a) The summarized results of a company for the two years ended 31st December 2021 and 2022 are given below:

	2021 (₹ in Lakhs)	2022 (₹ in Lakhs)
Direct Materials	324	300
Sales	770	600
Direct Wages	137	120
Variable Overheads	69	60
Fixed Overheads	150	80
Profit	90	40

As a result of re-organization of production methods and extensive advertisement campaign, the company was able to secure an increase in the selling prices by 10% during the year 2022 as compared to the previous year.

In the year 2022, the company consumed 1,20,000 Kgs. of raw materials and used 24,00,000 hours of direct labour. In the year 2023, the corresponding figures were 1,35,000 kgs of raw materials and 26,00,000 hours of direct labour.

You are required to:



FINAL EXAMINATION
MODEL QUESTION PAPER
PAPER - 16

SET 2

STRATEGIC COST MANAGEMENT

Use information given for the year 2022 as the base year information to analyze the results of the year 2023 and to show in a form suitable to the management the amount each factor has contributed by way of price, usage and volume to the change in profit in 2023. **[8]**

- (b) At the beginning of 2023, ASA Inc. set a standard marginal cost for its major product of ₹ 25 per unit. The standard cost is recalculated once each year. Actual production costs during August 2023 were ₹ 3,04,000, when 8,000 units were made. With the benefit of hindsight, the management of ASA Inc. realizes that a more realistic standard cost for current conditions would be ₹ 40 per unit. The planned standard cost of ₹ 25 is unrealistically low.

Required

- (i) Calculate the planning and operational variances.
(ii) What is the implication of planning and operational variances against traditional variance? State your answer in particular reference to the information given in the above situation. **[4]**

6. E Ltd manufactures a metal trimming device which has been sold at ₹ 16 per unit for a number of years. The selling price is to be reviewed and the following information is available on costs and likely demand. The standard variable cost of manufacture is ₹ 10 per unit and an analysis of the cost variances for the past 20 months show the following pattern which the production manager expects to continue in the future. Adverse variances of +10% of standard variable cost occurred in ten of the months. Nil variances occurred in six of the months. Favourable variances of -5% of standard variable cost occurred in four of the months. Monthly data Fixed costs have been ₹ 4 per unit on an average sales level of 20 000 units but these costs are expected to rise in the future and the following estimates have been made for the total fixed cost:

Monthly data Fixed costs have been ₹ 4 per unit on an average sales level of 20 000 units but these costs are expected to rise in the future and the following estimates have been made for the total fixed cost:

	₹
Optimistic estimate (Probability 0.3)	82,000
Most likely estimate (Probability 0.5)	85,000
Pessimistic estimate (Probability 0.2)	90,000



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The demand estimates at the two new selling prices being considered are as follows:

If the selling price/unit is demand would be:	₹ 17	₹ 18
Optimistic estimate (Probability 0.2)	21 000 units	19 000 units
Most likely estimate (Probability 0.5)	19 000 units	17 500 units
Pessimistic estimate (Probability 0.3)	16 500 units	15 500 units

It can be assumed that all estimates and probabilities are independent. You are required to

- Advise management, based only on the information given above, whether they should alter the selling price and, if so, the price you would recommend;
- Calculate the expected profit at the price you recommend and the resulting margin of safety, expressed as a percentage of expected sales;
- Criticize the method of analysis you have used to deal with the probabilities given in the question;
- Describe briefly how computer assistance might improve the analysis. **[8]**

SECTION – B : QUANTITATIVE TECHNIQUES IN DECISION MAKING

Answer to Question No. 7 & 11 in Section B, are compulsory.

Further, answer **any 2** from Question nos. 8, 9 & 10.

7. Choose the most appropriate answer to the following questions giving justification.

[2 + 2 = 4]

- (i) For a Cost Function $TC = 3Q^2 + 7Q + 12$, MC is –
- a. 6Q
 - b. $6Q + 7$
 - c. $3Q + 12$
 - d. None of the above
- (ii) Which of the following is related to Financial Data Analytics and why?
- a. Value driver analytics
 - b. Financial ratio analytics
 - c. Predictive sales analysis
 - d. All the above

8. (a) Write the dual of the following linear programming problem:

$$\text{Minimize } Z = 5x_1 - 6x_2 + 4x_3$$

Subject to the constraints



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$$3x_1 + 4x_2 + 6x_3 \geq 9$$

$$x_1 + 3x_2 + 2x_3 \geq 5$$

$$7x_1 - 2x_2 - x_3 \leq 10$$

$$x_1 - 2x_2 + 4x_3 \geq 4$$

$$2x_1 + 5x_2 - 3x_3 = 3$$

$$x_1 \geq 0, x_2 \geq 0, x_3 \geq 0.$$

[7]

- (b) A multi-plant company has three manufacturing plants, A, B and C. It sells products in two markets X and Y. Production cost at A, B and C is ₹ 1,500; 1,600; and 1,700 per piece respectively. Selling prices in X and Y are ₹ 4,400 and ₹ 4,700 respectively. Demands in X and Y are 3,500 and 3,600 piece respectively. Production capacities at A, B and C are 2,000; 3,000 and 4,000 pieces respectively. Transportation costs are as shown in the table below. Build a mathematical model.

Plant	Market	
	X	Y
A	1,000	1,500
B	2,000	3,000
C	1,500	2,500

[7]

9. (a) At a service station a study was made over a period of 50 days to determine both the number of automobiles being brought in for service and the number of automobiles serviced. The results are given in the adjoining table:

No. of automobiles arriving for service or completing services/day	Frequency of arrival	Frequency of daily serviced
0	4	6
1	8	4
2	20	24
3	10	6
4	6	8
5	2	2

Simulate the arrival service pattern for a ten-day period and estimate the mean number of automobiles that remain in service for more than a day.

Use the following series of random numbers:

For arrivals	09	54	42	01	80	06	06	26	57	79
For Service	49	16	36	76	68	91	97	85	56	84

[8]



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- (b) The following table gives data on normal time & cost. You need to develop the Network diagram and briefly discuss with reason the Critical Path. Also find out the Normal duration of the project and analyse the corresponding Total Cost associated with it.

. Activity	Normal	
	Time (days)	Cost (₹)
1 – 2	6	600
1 – 3	4	600
2 – 4	5	500
2 – 5	3	450
3 – 4	6	900
4 – 6	8	800
5 – 6	4	400
6 – 7	3	450

[6]

10. (a) From the following past data of Sales (in lakhs rupees) of a company estimate the same for the year 2025.

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Sales	15.3	14.6	16.8	17.3	17.2	20.9	22.3	20	23.1	24.5

Assume the trend line to be linear. What is the monthly rate of increase of sales.

[7]

- (b) A company produces two products x and y. The total Profit (in ₹ '000) earned by the company is expressed algebraically by the function $\Pi = 100x - x^2 - 2xy + 200y - 3y^2$. Critically assess the Profit maximizing quantities of the products. Also determine the maximum profit with justification in support of your determined value.

[7]

Case Study

11. Human performance of activities typically shows improvement when the activities are done on a repetitive basis. The time required to perform a task decreases with increasing repetitions. The degree of improvement and the number of repetitions needed to realize the major portion of the improvement is a function of the task being done. If the task is short and somewhat routine, only a modest amount of improvement is likely to occur and it generally occurs during the first few repetitions. If the task is fairly complex and has a longer duration, improvements will occur over a large number of repetitions.



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Any kind of surgery comes under the category of fairly complex or complex task. Surgeons require large number of repetitions of a particular type of surgery to master it. This is due to the fact that random complications may arise due to the patients' conditions. Hence it is important to know the number of repetitions required for a surgeon to stabilize the operating times and the complication rates.

Dr. X of ABC Hospital reported the results of 100 consecutive operations for laparoscopic hernia repair on 98 patients. Approximately two thirds of the surgeries were unilateral (left / right) and the remaining one third were bilateral involving contra lateral defects, many unsuspected before surgery. The average surgery time (from skin incision to skin closure) was 46 minutes for unilateral and 62 minutes for bilateral. Surgery times for the unilateral procedure began to level off after 50 operations. The average surgery times (in minutes) reported by the doctor for each quartile of the 100 operations, classified by the type of operation are as provided in the table below

Type of Surgery	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Unilateral	59	45	38	37
Bilateral	69	67	58	52

At the end of the study the times had levelled off at 58 minutes (operating time) including 37 minutes of surgical time for Unilateral type which are considered to be the historical times for open repair. Complication rates were also reduced in an approximately exponential manner, beginning to level off at 50 operations and becoming stable after 75. It is also reported that the 1st to 4th quartile of the Unilateral type surgery are represented by the 8th, 24th, 40th and 58th observations respectively and those of Bilateral are 4th, 12th, 20th and 28th observations respectively.

- (1) Analyse the incidence described above and formulate a set of brief explanations to ascertain which particular phenomenon of human behaviour the above incidence refers to?
- (2) How you can decide which one of the two types of surgeries was grasped faster by the surgeon? Explain.
- (3) What type of relationship exists between the Average time required to complete a particular operation with the number of operations done by the surgeon?
- (4) Design with brief reasons the procedure to determine the time required by the surgeon to complete 59th Unilateral type surgery and 27th Bilateral type surgery.

[8]



Time Allowed: 3 Hours

Full Marks: 100

The figures in the margin on the right side indicate full marks.

Where considered necessary, suitable assumptions may be made and clearly indicated in the answer.

SECTION – A : STRATEGIC COST MANAGEMENT FOR DECISION MAKING

Answer to Question No. 1 & 6 in Section A, are compulsory.

Further, answer **any 3** from Question nos. 2, 3, 4 & 5.

1. (a)

Sl. No.	Answer	Justification
(i)	(c)	Blue ocean strategists recognize that market boundaries exist only in managers' minds, and they do not let existing market structures limit their thinking. To them, extra demand is out there, largely untapped. Thus exploiting existing markets [C] cannot be an option.
(ii)	(d)	The advantages of cost control are <ul style="list-style-type: none">• The advantages of cost control are mainly as follows:• Achieving the expected return on capital employed by maximizing or optimizing profit.• Increasing the productivity of the available resources.• Delivering the product or service to the customers at a reasonable price.• Continued employment and job opportunity for the workers• Economic use of limited resources of production• Increased credit worthiness• Prosperity and economic stability of the industry Thus it is clear that cost control is not a corrective function. Point D is the answer
(iii)	(d)	The key focus of the Value Analysis (VA) approach is the management of 'functionality' to yield value for the customer. If a company seeks to reduce the costs of producing a product, then it must seek out costs that are unnecessary or items of the product that provide no functional value to the customer. In this case the first three (No cost can be removed if it compromises the quality of the product or its reliability, marketability is another issue that cannot be compromised and any activity that reduces the maintainability of the product increases the cost of ownership to the customer and can lower the value attached to the product) are issues of adding functionality to



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		add value for the customer. Thus Point D is the odd answer and all other three are issues of VA.
(iv)	(a)	Value Analysis is a process of improving value for money in a product, service or company. It is a systematic approach to analyze, identify and reduce costs and/or improve performance. The focus of Value Analysis is to optimize value by eliminating or reducing unnecessary costs and improving effectiveness of resources. This is done by examining the functions that are performed, the processes and materials used, the costs associated and the overall performance of the system. <i>Exchange value is the amount of money that can be exchanged for a given item or service and is not a part of Value Analysis.</i> Thus A is the answer.
(v)	(c)	
(vi)	(b)	<p><u>Justification</u></p> <p>400 Units of Product B should take ($\times 4$ hours) = 1600 hours But did take (active hours) = 1660 hours Efficiency variance in hours = 60 hours \times standard rate per hour $\times 1.70$ 102 (A)</p>
(vii)	(a)	<p>Budgeted C/S ration = 30%</p> <p>Therefore, Budgeted Contribution = 30% \times budgeted selling price = 30% \times ₹ 300 = ₹ 90</p> <p>Sales Volume should have been = 500 units But was = 521 units Sales volume variance in units = 21 units (F) \times Standard contribution per unit = \times ₹ 90 Sales volume contribution variance = ₹ 1,890 (F)</p>
(viii)	(c)	<p>Weeks worked per year = 52 – 4 = 48 Hours worked per year = 48 \times 40 hours = 1920 hours Hours chargeable to clients = 1920 \times 90% = 1728 Total expenses = ₹ 10,000 + ₹ 40,000 = ₹ 50,000 Hourly rate = $\frac{50000}{1728}$ = ₹ 28.94</p>



2. (a) Taiichi Ohno (1912-1990) is more a symbol of Japan's manufacturing resurgence after the Second World War. Born in Dalian, in eastern China, he joined Toyota Automatic Loom Works between the wars. Ohno felt that there was no reason other than inefficiency and wastefulness why Toyota's productivity should be any lower than that of Detroit. Hence, he set out to eradicate inefficiency and eliminate waste in that part of the production process that he was responsible for. This became the core of the so-called Toyota Production System (TPS) that he and others subsequently developed between the mid-1940s and the mid-1970s. Several elements of this system have become familiar in the West; for example, muda (the elimination of waste), jidoka (the injection of quality) and kanban (the tags used as part of a system of just-in-time stock control). Lean was evolved from the manufacturing philosophy of the Toyota Production System. The cornerstone of lean is the elimination of waste from processes with a mindset of continuous improvement. In its most basic form, Lean Manufacturing is the systematic elimination of waste by focusing on production costs, product quality and delivery, and worker involvement. It is said that the famed Toyota Production system was inspired by what the Toyota executives learned during their visits to the Ford Motor Company in the 1920s and developed by Toyota leaders such as Taiichi Ohno and consultant Shigeo Shingo after World War II. Broadly speaking, Lean Manufacturing represents a fundamental paradigm shift from traditional "batch and queue" mass production to production systems based on product aligned "single-piece flow, pull production." Whereas "batch and queue" involves mass-production of large inventories of products in advance based on potential or predicted customer demands, a "single-piece flow" system rearranges production activities in a way that processing steps of different types are conducted immediately adjacent to each other in a continuous and single piece flow. If implemented properly, a shift in demand can be accommodated immediately, without the loss of inventory stockpiles associated with traditional batch-and-queue manufacturing.

Lean Accounting is the application of lean thinking to all accounting and finance processes and systems. It is an essential component of a successful lean transformation for any organization. Lean accounting uses a method that categorizes costs by value stream rather than by department. This approach "provides the basis for sound management decisions". The researchers define value stream accounting as "tracking revenue and the associated variable costs required to generate those sales." It is experienced that value stream costing includes a simpler cost collection method and reduces the number of cost centers. They also list features of value stream accounting as:

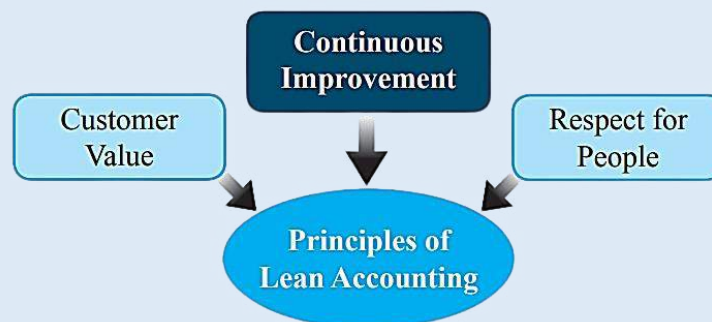
- Costs calculated weekly

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- No distinction made between direct or indirect costs – all costs of the value stream are considered direct costs
- Value stream costs include labour, materials, production support, machines and equipment, operation support, facilities and maintenance
- Value stream costing provides a more accurate picture by elimination of unnecessary costs outside control of value stream managers

Lean accounting groups together costs that fall outside of the value stream as “business sustaining costs” that do not get included in value stream costs. This, in turn, helps the businesses to find better price points for products and do further research into high-cost areas. The bottom line is that Lean accounting can help business leaders quickly know if they are heading in the right direction or need to make a change. Three principles guide Lean Accounting and form the foundation for all of accounting’s work and interaction with the organization:

- i. Customer value: Delivering the relevant and reliable information in a timely manner to all users of the information inside the organization.
- ii. Continuous improvement: Improving accounting processes, cross-functional business processes and the information used inside the business for analysis and decision making.
- iii. Respect for people: Adopting a learning attitude by seeking to understand root causes of business problems and issues in a cross-functional, collaborative manner.



- (b) TQM is a vision based, customer focused, prevention oriented, Customer Focus Total Employee Commitment Process Approach Integrated System Strategic and Systematic Approach Continual Improvement Fact-based Decision-making Communications Principles of TQM continuous improvement strategy based on scientific approach adopted by cost conscious people committed to satisfy the customers first time every time. It aims at Managing an organization so that it excels in areas important to the customer. Principles of TQM are

- Customer Focus: The first of the Total Quality Management principles puts the focus back on the people buying your product or service. Your customers determine



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the quality of your product. If your product fulfills a need and lasts as long or longer than expected, customers know that they have spent their money on a quality product. When you understand what your customer wants or needs, you have a better chance of figuring out how to get the right materials, people, and processes in place to meet and exceed their expectations.

- **Total Employee Commitment:** You can't increase productivity, processes, or sales without the total commitment of all employees. They need to understand the vision and goals that have been communicated. They must be sufficiently trained and given the proper resources to complete tasks in order to be committed to reaching goals on time.
- **Process Approach:** Adhering to processes is critical in quality management. Processes ensure that the proper steps are taken at the right time to ensure consistency and speed up production.
- **Integrated System:** Typically, a business has many different departments, each with their own specific functions and purposes. These departments and functions should be interconnected with horizontal processes that should be the focus of Total Quality Management. But sometimes these departments and functions operate in isolated silos. In an integrated system, everybody in every department should have a thorough understanding of policies, standards, objectives, and processes. Integrated systems help the company to look for continual improvement in order to achieve an edge over the competition.
- **Strategic and Systematic Approach:** The International Organization for Standardization (ISO) describes this principle as: "Identifying, understanding and managing interrelated processes as a system contributes to the organization's effectiveness and efficiency in achieving its objectives." Multiple processes within a development or production cycle are managed as a system of processes in an effort to increase efficiency.
- **Continual Improvement:** Optimal efficiency and complete customer satisfaction do not happen in a day— your business should continually find ways to improve processes and adapt your products and services as customer needs shift.
- **Fact-based Decision-making:** Analysis and data gathering lead to better decisions based on the available information. Making informed decisions leads to a better understanding of customers and your market.
- **Communications:** Everybody in your organization needs to be aware of plans, strategies and methods that will be used to achieve goals. There is a greater risk of failure if you don't have a good communication plan.



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The essential requirements for successful implementation are described as the **six C's** of TQM as tabulated below

- **Commitment** - If a TQM culture is to be developed, total commitment must come from top management. It is not sufficient to delegate 'quality' issues to a single person. Quality expectations must be made clear by the top management, together with the support and training required for its achievement.
- **Culture** - Training lies at the centre of effecting a change in culture and attitudes. Negative perceptions must be changed to encourage individual contributions and to make 'quality' a normal part of everyone's job.
- **Continuous Improvement** - TQM should be recognised as a 'continuous process'. It is not a 'one-time programme'. There will always be room for improvement, however small it may be.
- **Co-operation** - TQM visualises Total Employee Involvement (TEI). Employee involvement and cooperation should be sought in the development of improvement strategies and associated performance measures.
- **Customer Focus** - The needs of external customers (in receipt of the final product or service) and also the internal customers (colleagues who receive and supply goods, services or information), should be the prime focus.
- **Control** Documentation, procedures and awareness of current best practice are essential if TQM implementations are to function appropriately. Unless control procedures are in place, improvements cannot be monitored and measured nor deficiencies corrected.

3. (a) (a) Statement of Costs of Quality

		₹
(a)	Inspection or Appraisal Cost (30 x 60,000 shoes)	18,00,000
(b)	Internal failure (re-work) cost (5% x 60,000 × ₹ 18)	54,000
(c)	External failure cost (i.e., transportation + re-work cost) [6% x 60,000 x (₹ 10 + 18)]	1,00,800
(d)	Opportunity cost (i.e., loss of contribution) [5% x (6% x 60,000) x (₹ 600 x 40%)]	43,200
	Total Quality Cost	19,98,000



(b) Profitability Statement

	₹
Sales (60,000 x ₹ 600)	3,60,00,000
Less: Variable Cost (60%)	2,16,00,000
Contribution	1,44,00,000
Less: Quality Cost (as above)	19,98,000
Contribution, net of quality costs	1,24,02,000
Less: Fixed Cost	5,50,000
Net Profit	1,18,52,000

(b) Computation of relevant costs of Material

Material	Relevant Cost	Workings	Amount (₹)
A	Replacement Cost	(1000 × 6)	6,000.00
B	Replacement Cost	(1000 × 5)	5,000.00
C	Realisable Value for 700 units and Replacement Cost for 300 units	[(700 × 2.5) + 300 × 4]	2,950.00
D	Substitution Cost	(300 × 5)	1,500.00
	Sub Total		15,450.00
	Add: Other expenses		550.00
	Total		16,000.00

As the revenue from the order, is more than the relevant costs of ₹ 16,000 the order should be accepted.

Justification of the solution for each material is given as under

- **Material A:** Since it is not in stock, needs to be purchased from market at replacement cost, hence it is Relevant
- **Material B:** It is in stock and is being regularly used for other production demand. So it needs to be purchased from market at replacement cost, hence it is Relevant
- **Material C:** partly available Ex stock, so realisable value is relevant and balance needs to be purchased from market at replacement cost, hence it is Relevant
- **Material D:** available ex stock but it can be used for other job where replacement cost is 300 units @ ₹ 5 each so $300 \times 5 = 1500$ is relevant cost

4. (a) Division M generates a contribution to profit of ₹ 80 (₹ 850 – ₹ 770) for the group as a whole for every motor sold externally. The incremental cost for every motor which Division S has to buy from outside of the group is ₹ 60 per unit (₹ 800 – [₹ 770 – ₹ 30]). Therefore, from the group's perspective as many external sales as possible should be made before any internal transfers are made. Division M's total capacity is 60000 units so 30000 units should be sold externally and the remaining 30000 units transferred to Division S. From the group's perspective, the cost of supplying these internally is ₹ 60



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per unit (₹ 800 – ₹ 740) cheaper than buying externally. Division S's remaining demand of 5000 units should be bought from the external supplier at ₹ 800 per unit. Therefore, the group's current policy will need to be changed. In order to determine the transfer price which should be set for the internal sales of 30000 motors, the perspective of both divisions should be considered. Division M can only sell the motors to Division S and the lowest price it would be prepared to charge is the marginal cost of ₹ 740 of making these units but it will also wish to make a profit on each unit transferred. From Division S's perspective it can buy as many external motors as it needs from between ₹ 740 and ₹ 800. The total group profit will be the same irrespective of where in this range the transfer price is set outside the group at a price of ₹ 800 per unit so this will be the maximum price which it is prepared to pay. Therefore, the transfer price should be set somewhere between ₹ 740 and ₹ 800. The total group profit will be the same irrespective of where in this range the transfer price is set.

(b) Present position on transfer of component @ ₹ 200:

Particulars	Division Alfa	Division Beta
Units Sold	20000	10000
Selling Price/unit	₹ 200	₹ 1,500
Variable Cost/unit	₹ 190	₹ 1,100
Contribution /unit	₹ 10	₹ 400
Fixed Cost/unit	₹ 20	₹ 200
Profit /unit	₹ -10	₹ 200
Total Profit/Loss	₹ -2,00,000	₹ 20,00,000

Overall profit for the Company is ₹18,00,000.

a. Facility of Alfa is rented out and beta buys from market @ ₹210 per unit

Particulars	Division Alfa	Division Beta
Units Sold		10000
Selling Price/unit		₹ 1,500
Variable Cost/unit		₹ 1,120
Contribution /unit		₹ 380
Total Contribution		₹ 38,00,000
Fixed Cost		₹ 20,00,000
Rental Income	₹ 3,00,000	
Total Profit	₹ 3,00,000	₹ 18,00,000

Overall Profit for the Company is ₹ 21,00,000



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- b. Alfa sells to outside market @ ₹ 220 and Beta buys @ ₹210 per unit from market.

Particulars	Division Alfa	Division Beta
Units Sold	20000	10000
Selling Price/unit	₹ 220	₹ 1,500
Variable Cost/unit	₹ 190	₹ 1,120
Contribution /unit	₹ 30	₹ 380
Total Contribution	₹ 6,00,000	₹ 38,00,000
Fixed Cost	₹ 4,00,000	₹ 20,00,000
Total Profit	₹ 3,00,000	₹ 18,00,000

Overall Profit for the Company is ₹20,00,000

- c. Capacity enhancement at the Cost of Capital @ 12 %

Particulars	Division Alfa (Sales)	Division Alfa (transfer)	Division Beta
Units Sold	20000	20000	10000
Selling Price/unit	₹220	₹ 220	₹ 1,500
Variable Cost/unit	₹190	₹ 190	₹ 1,120
Contribution /unit	₹30	₹ 20	₹ 380
Total Contribution	₹ 6,00,000	₹ 4,00,000	₹ 38,00,000
Fixed Cost	₹ 4,00,000	₹ 1,00,000	₹ 20,00,000
Cost of Capital		₹ 1,80,000	
Total Profit	₹2,00,000	₹ 1,20,000	₹ 18,00,000

Overall profit for the Company is ₹ 21,20,000.

Since overall profit is the highest in Option “C”, it can be adopted.

5. (a) A. Sales Variance

1. sales price variance = ₹ 770 – (₹770 × 100/110) - ₹600 = ₹ 70 (F)

2. Sales Volume Variance = ₹(770 × 100/110) - ₹ 600 = ₹ 100 (F)

% increase in volume = (100/600) × 100 = ₹ 16.67%

3. Sales value variance = ₹ 770 - ₹ 600 = ₹ 170 (F)

- B. Material Variance

Material price = (300,00,000)/120000 = ₹ 250/-

Material expected to be used = (120000/600) × 700 = 140000kgs

Standard Material Cost = 140000 × ₹ 250 = ₹ 350 lacs

4. Material Cost variance = ₹(350- 324) = ₹ 26

5. Material volume variance = 300 × 1/6 = ₹ 50 (A)

6. Material usage variance = 5000 × ₹ 250 = ₹ 12,50,000(F)

7. Material price variance = ₹(250 – 240) × 135000 = ₹ 13,50,000 (F)



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C. Labour Variance

Labour hours expected to be used = $(24,00,000/600) \times 700 = 28,00,000$

Labour rate = $(120,00,000)/24,00,000 = ₹ 5$

Standard labour cost = $28,00,000 \times ₹ 5 = ₹ 140$ lacs

8. Labour cost variance = $₹ 140 - ₹ 137 = ₹ 3$ (F)

9. Labour volume variance = $120/6 = ₹ 20$ (A)

10. Labour efficiency variance = $2 \times ₹ 5 = ₹ 10$ (F)

11. Labour rate variance = $₹ (20-3-10) = ₹ 7$ (A)

D. Overhead Variance

Standard variance overheads = $₹ 60 + (₹ 60 \times 16.67\%) = ₹ 70$

Standard variable overhead rate per hour = $₹ 60/24 = ₹ 2.5$

12. VOH Cost variance = $₹ (70-69) = ₹ 1$ (F)

13. VOH volume variance = $₹ 60/6 = ₹ 10$ (A)

14. VOH efficiency variance = $(2800000 - 2600000) \times ₹ 2.5 = ₹ 5$ (F)

15. VOH expenditure variance = $₹ (10-1-5) = ₹ 4$ (A)

16. FOH cost variance = $₹ 70$ (A)

Profit Reconciliation Statement:

Particulars	₹ in lakhs	₹ in lakhs
Profit for 2022		40
(+) sales variance :		
Price	70	
Volume	100	
Material Variance :		
Usage	12.50	
Price	13.50	
Labour variance – efficiency	10	
VOH efficiency variance	5	211
		251
(-) material volume variance	50	
Labour Variance :		
Volume	20	
Rate	7	
VOH Variances:		
Volume	10	
Expenditure	4	
FOH cost variance	70	161
Profit for 2023		90



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- (b) (i) With the benefit of hindsight, the realistic standard should have been ₹ 40. The variance caused by favourable or adverse operating performance should be calculated by comparing actual results against this realistic standard.

	₹
Revised standard cost of actual production (8,000 × ₹ 40)	3,20,000
Actual cost	3,04,000
Total operational variance	16,000 (F)

The variance is favourable because the actual cost was lower than would have been expected using the revised basis. The planning variance reveals the extent to which the original standard was at fault.

		₹
Revised standard cost	8,000 units × ₹ 40 per unit	320,000
Original standard cost	8,000 units × ₹ 25 per unit	200,000
Planning variance		120,000 (A)

It is an adverse variance because the original standard was too optimistic, overestimating the expected profits by understating the standard cost. More simply, it is adverse because the revised cost is much higher than the original cost.

	₹
Planning variance	120,000 (A)
Operational variance	16,000 (F)
Total	104,000 (A)

- (ii) If traditional variance analysis had been used, the total cost variance would have been the same, but all the *blame* would appear to lie on actual results and operating inefficiencies (rather than some being due to faulty planning).

	₹
Standard cost of 8000 units × ₹ 25 per unit	2,00,000
Actual cost of 8000 units	3,04,000
Total cost variance	1,04,000 (A)

6. (a) For each of selling price there are three possible outcomes for sales demand, unit variable cost and fixed costs. Consequently, there are 27 possible outcomes. In order to present probability distributions for the two possible selling prices, it would be necessary to compute profits for 54 outcomes. Clearly, there would be insufficient time to perform these calculations within the examination time that can be calculations to be based on an expected value approach.



STRATEGIC COST MANAGEMENT

The expected value calculations are as follows:

(i) Variable cost

	₹
$\text{₹}(10+\text{₹}10\times 10\%)\times 10/20$	5.50
$\text{₹} 10\times 6/20$	3.00
$\text{₹} (10-10\times 5\%)\times 4/20$	1.90
	10.40

(ii) Fixed cost

	₹
$\text{₹} 82,000 \times 0.3$	24,600
$\text{₹} 85,000 \times 0.5$	42,500
$\text{₹} 90,000\times 0.2$	18,000
	85,100

(iii) ₹ 17 selling price

Particulars	Unit
21000 units \times 0.2	4,200
19000 units \times 0.5	9,500
16500 units \times 0.3	4,950
	18,650

(iv) ₹ 18 selling price

Particulars	Unit
19000 units \times 0.2	3,800
17500 units \times 0.5	8,750
15500 units \times 0.3	4,650
	17,200

Expected contribution:

Selling price ₹17 = $(\text{₹} 17.00 - \text{₹} 10.40) \times 18,650 = \text{₹} 1,23,090$

Selling price ₹ 18 = $(\text{₹} 18 - \text{₹} 10.40) \times 17,200 = \text{₹} 1,30,720$

The existing selling price is ₹ 16, and if demand continues at 20,000 units per annum then the total contribution will be 1120 [₹ (16 – 10.40) \times 20,000 units]

using the expected value approach, a selling price of ₹ 18 is recommended.

(b) Expected profit = ₹ 1,30,720 - ₹ 85,100 = ₹ 45,620 (fixed cost)

Break Even Point = Fixed cost /Contribution per unit

$\text{₹} 85,100 / \text{₹} 7.60 = 11,197$ units



Margin of safety = expected demand (17,200 units) - 11,197 units = 6003 units

% margin of safety = $6003/17,200 = 34.9\%$ of sales

Note that the most pessimistic estimate is above the break - even point.

- (c) An Expected Value approach has been used. The answer should draw attention to the limitations of basing the decision solely on expected values. In particular, it should be stressed that risk is ignored and the range of possible outcomes is not considered. The decision ought to be based on a comparison of the probability distributions for the proposed selling prices.
- (d) Computer assistance would enable a more complex analysis to be undertaken. In particular, different scenarios could be considered, based on different combinations of assumption regarding variable cost, fixed cost, selling prices and demand. Using computers would also enable the Monte Carlo simulation to be used for more complex decisions.

SECTION – B : QUANTITATIVE TECHNIQUES IN DECISION MAKING

Answer to Question No. 7 & 11 in Section B, are compulsory.

Further, answer **any 2** from Question nos. 8, 9 & 10.

7.

Sl. No.	Answer	Justification
(i)	b	$6Q + 7$ $TC = 3Q^2 + 7Q + 12$ $MC = \frac{dTC}{dQ} = 6Q + 7$
(ii)	d	All the above (Financial analytics can provide business leader a better understanding of business processes and drivers. Value driver analytics, Financial ratio analytics and Predictive Sales Analysis are three types of financial Analytics.

8. (a) First, we convert the equality constraint in terms of two inequalities, one involving ‘ \leq ’ by (-1). Then the primal problem can be written as follows:

$$\text{Minimize } Z_x = 5x_1 - 6x_2 + 4x_3$$

Subject to the constraints

$$3x_1 + 4x_2 + 6x_3 \geq 9$$

$$x_1 + 3x_2 + 2x_3 \geq 5$$



STRATEGIC COST MANAGEMENT

$$-7x_1 + 2x_2 + x_3 \geq -10$$

$$x_1 - 2x_2 + 4x_3 \geq 4$$

$$2x_1 + 5x_2 + 3x_3 \geq 3$$

$$-2x_1 - 5x_2 + 3x_3 \geq -3$$

$$x_1, x_2, x_3 \geq 0$$

Let y_1, y_2, y_3, y_4, y_5 and y_6 be the dual variables corresponding to the six constraints in given order, then the dual of the given primal problem can be formulated as follows:

$$\text{Maximize } Z_y = 9y_1 + 5y_2 - 10y_3 + 4y_4 + 3y_5 - 3y_6$$

Subject to the constraints

$$3y_1 + y_2 - 7y_3 + y_4 + 2y_5 - 2y_6 \leq 5$$

$$4y_1 + 3y_2 + 2y_3 - 2y_4 + 5y_5 - 5y_6 \leq -6$$

$$6y_1 + 2y_2 + y_3 + 4y_4 - 3y_5 + 3y_6 \leq 4$$

$$y_1, y_2, y_3, y_4, y_5, y_6 \geq 0$$

Let $y_7 = y_5 - y_6$, then the above dual problem reduces to the form:

$$\text{Maximize } Z_y = 9y_1 + 5y_2 - 10y_3 + 4y_4 + 3y_7$$

Subject to the constraints

$$3y_1 + y_2 - 7y_3 + y_4 + 2y_7 \leq 5$$

$$-4y_1 - 3y_2 - 2y_3 + 2y_4 - 5y_7 \geq 6$$

$$6y_1 + 2y_2 + y_3 + 4y_4 - 3y_7 \leq 4$$

$$y_1, y_2, y_3, y_4 \geq 0 \text{ and } y_7 \text{ is unrestricted in sign.}$$

- (b) Here three plants differ in production cost. Therefore, our problem is to determine the schedule of production which may result in the maximum profit. The various profits per item are as shown in the adjacent table.

Plant	Market	
	X	Y
A	1,900	1,700
B	800	100
C	1,200	500

The profit (selling price - production cost - transportation cost) data from plants to markets are shown below:

from A to X: $4400 - 1500 - 1000 = 1900$; from A to Y: $4700 - 1500 - 1500 = 1700$; From B to X: $4400 - 1600 - 2000 = 800$; and so on.



STRATEGIC COST MANAGEMENT

Further, total production at A, B and C plants is $2,000 + 3,000 + 4,000 = 9,000$ units while total requirement at X and T is $3,500 + 3,600 = 7,100$ units. Hence this is an unbalanced transportation problem. By introducing a dummy market Z to receive an excess production of $9,000 - 7,100 = 1,900$ units, the complete relevant information is summarized in the following table:

Plant	Market			Supply
	X	Y	Dummy	
A	1900 x_{11}	1700 x_{12}	0 x_{13}	2000
B	800 x_{21}	100 x_{22}	0 x_{23}	3000
C	1200 x_{31}	500 x_{32}	0 x_{33}	4000
Demand	3500	3600	1900	9000

Let x_{ij} be quantity to be transported from plant i , ($i = 1, 2, 3$) to market j , ($j = 1, 2, 3$). Now the LP model based on the given data can be formulated as follows:

Maximize (total profit) $Z = 1900x_{11} + 1700x_{12} + 800x_{21} + 100x_{22} + 1200x_{31} + 500x_{32}$

Subject to the constraints

$$\begin{array}{l}
 x_{11} + x_{12} + x_{13} = 2,000 \\
 x_{21} + x_{22} + x_{23} = 3,000 \\
 x_{31} + x_{32} + x_{33} = 4,000
 \end{array}
 \left. \vphantom{\begin{array}{l} x_{11} + x_{12} + x_{13} = 2,000 \\ x_{21} + x_{22} + x_{23} = 3,000 \\ x_{31} + x_{32} + x_{33} = 4,000 \end{array}} \right\} \text{supply constraints}$$

$$\begin{array}{l}
 x_{11} + x_{21} + x_{31} = 3,500 \\
 x_{12} + x_{22} + x_{32} = 7,600 \\
 x_{13} + x_{23} + x_{33} = 1,900
 \end{array}
 \left. \vphantom{\begin{array}{l} x_{11} + x_{21} + x_{31} = 3,500 \\ x_{12} + x_{22} + x_{32} = 7,600 \\ x_{13} + x_{23} + x_{33} = 1,900 \end{array}} \right\} \text{demand constraints}$$

$x_{ij} \geq 0$ for all i and j



9. (a) The cumulative probability distributions and random number intervals both for inter arrival time and service time are shown in table below:

Determination of Random Number Internal

No. of arrivals / services / day	Arriving pattern				Servicing pattern			
	Frequency	Probability	Cum. Prob	RN Internal	Frequency	Probability	Cum. Prob	RN Internal
0	4	4/50	0.08	00-07	6	6/50	0.12	00-11
1	8	8/50	0.24	08-23	4	4/50	0.20	12-19
2	20	20/50	0.64	24-63	24	24/50	0.68	20-67
3	10	10/50	0.84	64-83	6	12/50	0.80	68-79
4	6	6/50	0.86	84-95	8	8/50	0.96	80-95
5	2	2/50	1.00	96-99	2	2/50	1.00	96-99

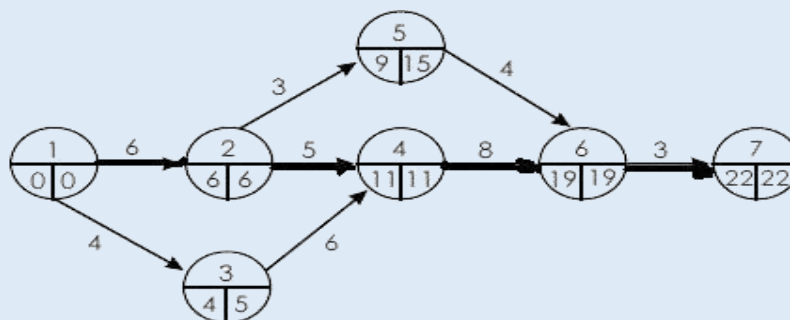
The simulation worksheet developed to the problem is shown in table below:

Simulation Experiments Worksheet

Day	Arrivals		Services		Total no. held from previous day	Total waiting for services	Number services	Held for Next Day
	Random number	Simulated arrival	Random number	Simulated services				
1	09	01	49	02	00	01	02	-
2	54	02	16	01	00	02	01	01
3	42	02	36	02	01	03	02	01
4	01	00	76	03	01	01	03	-
5	80	03	68	03	00	03	03	-
6	06	00	91	04	00	00	04	00
7	06	00	97	05	00	00	05	00
8	26	02	85	04	00	02	04	-
9	57	03	56	02	00	03	02	01
10	79	03	84	04	04	04	04	-

Average number of automobiles remaining in service for more than one day = 3/10.

- (b) The network for normal activity times indicates project duration of 22 days with critical path 1-2-4-6-7. It is shown below.



Total Cost = (600 + 600 + 500 + 450 + 900 + 800 + 400 + 450) = ₹4,700



STRATEGIC COST MANAGEMENT

10. (a) Let the best fit Linear Trend line to the given data be $y = a + bx$
(origin at the middle of the year 2014 & 2015 and x unit = 6 months)

Normal equation are $\Sigma y = a.n + b.\Sigma x$ (1) where n = No, of years = 10 (here)

$$\Sigma xy = a.\Sigma x + b.\Sigma x^2$$
 (2)

Using the values (from calculations below) of Σy , Σx and n is equation (1) we get,

$$192 = a.10 + b.0$$

$$\text{Or, } a = 19.2$$

Also using the values (from calculations below) of Σxy , Σx and Σx^2 and putting in the equation (2) we get,

$$177 = a.0 + b.330$$

$$\text{Or, } b = 0.536$$

Calculations for fitting Straight Line Trend

Year	Sales (y in ₹ Millions)	x	x ²	xy
2010	15.3	-9	81	-137.7
2011	14.6	-7	49	-102.2
2012	16.8	-5	25	-84
2013	17.3	-3	9	-51.9
2014	17.2	-1	1	-17.2
2015	20.9	1	1	20.9
2016	22.3	3	9	66.9
2017	20	5	25	100
2018	23.1	7	49	161.7
2019	24.5	9	81	220.5
Total	192	0	330	177

So the required equation of Straight Line Trend is $y = 19.2 + 0.536x$

(Origin = At the middle of 2014 & 2015, x unit = 6 months)

For the year 2025, $x = 21$. So the **estimated sales for the year 2025** = $19.2 + 0.536 \times 21$
= **30.456 Million ₹**

Yearly rate of increase in Sales = $b = 0.536$. so **monthly rate of increase in Sales** = $b/12$
= **0.0467 Million ₹**



STRATEGIC COST MANAGEMENT

(b) Profit function is given as: $\Pi = 100x - x^2 - 2xy + 200y - 3y^2$

Differentiating the function partially with respect to x we get,

$$\Pi_x = 100 - 2x - 2y \text{ ----- (I)}$$

Also differentiating the function partially with respect to y we get

$$\Pi_y = -2x + 200 - 6y \text{ ----- (II)}$$

To determine the Critical Point, we have $\Pi_x = 0$ and $\Pi_y = 0$

$$\text{So, } 100 - 2x - 2y = 0 \text{ Or. } x + y = 50 \text{ ---(1) and } -2x + 200 - 6y = 0 \text{ or, } x + 3y = 100 \text{ ---- (2)}$$

$$(2) - (1) \text{ gives, } 2y = 50 \text{ or, } y = 25$$

Putting $y = 25$ in (1) we get $x = 25$

Thus Critical Point is (25, 25)

To check whether this point is a local Maxima, we have to find out the values of the 2nd Order Partial Derivatives at this point.

Again differentiating (I) partially with respect to x we get $\Pi_{xx} = -2$ Or, $A = -2$ (Let) Or, $A < 0$

Similarly differentiating (II) partially with respect to y we get $\Pi_{yy} = -6$ Or, $C = -6$ (Let) or, $C < 0$

Also differentiating (I) partially with respect to y we get $\Pi_{xy} = -2$ Or, $B = -2$ (Let)

$$\text{So } D = AC - B^2 = (-2) \times (-6) - (-2)^2 = 8 > 0$$

Hence $D > 0$ and $A, C < 0$

Thus there is a local Maxima at the already determined Critical Point (25, 25)

Required Profit maximizing quantities of the products are $x = 25$ units and $y = 25$ units.

$$\begin{aligned} \text{Also Maximum profit} &= \text{Value of the function } \Pi \text{ at } x = 25 \text{ \& } y = 25 = 100 \times 25 - 25^2 - 2 \\ &\times 25 \times 25 + 200 \times 25 - 3 \times 25^2 \\ &= ₹3,750 \text{ (₹000)} \end{aligned}$$



11. (1) The described information refers to the LEARNING phenomenon of human beings. The data provided show a continuous reduction of Operating time for both types of surgeries. In other words, there is a continuous improvement in the performance of a human being (the Surgeon) with repetition of the task. This happens only due the Learning effect.
- (2) To understand the grasping rate of the surgeon for any type of surgery one has to find out his LEARNING PERCENTAGE for that type of surgery from the supplied data. Higher is the numerical value of the Learning Percentage for a particular type, faster is said to be the grasping rate for that.
- (3) If T_N be the Average time required to complete the nth operation and T_1 be that of the first one then the relation between T_N and N (the number of operations done) is given as follows -
 $T_N = T_1.N^b$ where $b = \text{Learning Index} = \log(\text{Learning Percentage}/100) \div \log 2$
Thus an Exponential relation exists between the Average time required to complete an operation and the number of operations done by the surgeon.
- (4) From the basic concept of Learning we can say –
Time required to complete the Nth operation (t_N) = Difference between the total time required for N operations and $(N - 1)$ operations

Now total time required for N operations = $N.T_N$ where T_N represents the Average time per operation when N operations are done.

Thus $t_N = N.T_N - (N - 1).T_{(N-1)}$

So for the Unilateral type, $t_{59} = 59.T_{59} - 58.T_{58}$ where the values of T_{59} and T_{58} are to be computed from the supplied data for Unilateral type.

Similarly for Bilateral type, $t_{27} = 27.T_{27} - 26.T_{26}$

**PAPER 15 - STRATEGIC COST MANAGEMENT
AND DECISION MAKING**

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PAPER 15 - STRATEGIC COST MANAGEMENT AND DECISION MAKING

Full Marks: 100

Time allowed: 3 hours

Section – A

1. Answer the following and each question carries 2 marks. [10×2= 20]
- (i) If the first time you perform a job takes 60 minutes, how long will the eighth job take if you are on an 80% learning curve?
- 48 minutes
 - 30.72 minutes
 - 31 minutes
 - None of the above
- (ii) A company has 2,000 units of an obsolete item which are carried in inventory at the original purchase price of ₹30,000. If these items are reworked for ₹10,000, they can be sold for ₹18,000. Alternatively, they can be sold as scrap for ₹3,000 in the market. In a decision model used to analyze the reworking proposal, the opportunity cost should be taken as:
- ₹8,000
 - ₹12,000
 - ₹3,000
 - ₹10,000
- (iii) The single price of the selling product manufactured by a company is fixed at ₹1,500 per unit. In the coming year, 500 units of the product are likely to be sold. If the total value of investments of the company is ₹15 lakhs and it has a target ROI of 15%, the target cost would be:
- ₹9.30
 - ₹9.50
 - ₹1050
 - None of these
- (iv) If the direct labour cost is reduced by 20% with every doubling of output, what will be the cost of labour for the sixteenth unit produced as an approximate percentage of the cost of the first unit produced?
- 51.2%
 - 40.96%
 - 62%
 - None of these

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- (v) A company determines its selling price by making up variable costs 60%. In addition, the company uses frequent selling price mark down to stimulate sales. If the mark down average 10%, what is the company's contribution margin ratio?
- (a) 30.6%
(b) 44%
(c) 86.4%
(d) None of these
- (vi) Back flush costing is most likely to be used when:
- (a) Management desires sequential tracking of costs
(b) A Just-in-Time inventory philosophy has been adopted
(c) The company carries significant amount of inventory
(d) Actual production costs are debited to work-in-progress.
- (vii) A company produces two joint products, P and V. In a year, further processing costs beyond split-off point spent were ₹8,000 and ₹12,000 for 800 units of P and 400 units of V respectively. P sells at ₹25 and V sells at ₹50 per unit. A sum of ₹9,000 of joint cost were allocated to product P based on the net realization method. What were the total joint cost in the year?
- (a) ₹ 20,000
(b) ₹ 10,000
(c) ₹15,000
(d) None of these
- (viii) When allocation service department cost to production departments, the method that does not consider different cost behaviour patterns is the:
- (a) Step method
(b) Reciprocal method
(c) Single rate-method
(d) Dual rate-method
- (ix) The information relating to the direct material cost of a company is as under:

	₹
Standard price per unit	3.60
Actual quantity purchased in units	1,600
Standard quantity allowed for actual production in units	1,450
Material price variance on purchase (favourable)	240

What is the actual purchase price per unit?

- (a) ₹ 3.45
(b) ₹ 3.75
(c) ₹ 3.20
(d) ₹ 3.25

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- (x) A company manufactures two products using common material handling facility. The total budgeted material handling cost is ₹60,000. The other details are:

	Product X	Product Y
Number of units produced	30	30
Material moves per product line	5	15
Direct labour hour per unit	200	200

Under activity based costing system the material handling cost to be allocated to product X (per unit) would be:

- (a) ₹1,000
(b) ₹ 500
(c) ₹ 1,500
(d) ₹2,500

Section – B

Answer any five questions from Question No. 2 to 8 Each question carries 16 marks.

[5 × 16 = 80]

2. (a) K & Co. manufactures and sells 15,000 units of a product. The Full Cost per unit is ₹200. The Company has fixed its price so as to earn a 20% Return on an Investment of ₹18,00,000.
- Required:
- Calculate the Selling Price per unit from the above. Also, calculate the Mark-up % on the Full Cost per unit.
 - If the Selling Price as calculated above represents a Mark-up % of 40% on Variable cost per unit, calculate the Variable cost per unit.
 - Calculate the Company's Income if it had increased the Selling Price to ₹230. At this price, the company would have sold 13,500 units. Should the Company have increased the Selling price to ₹460?
 - In response to competitive pressures, the Company must reduce the price to ₹210 next year, in order to achieve sales of 15,000 units. The Company also plans to reduce its investment to ₹16,50,000. If a 20% Return on Investment should be maintained, what is the Target Cost per unit for the next year? [8]
- (b) The ORC Club of a large public sector undertaking has a cinema theatre for the exclusive use of themselves and their families. It is a bit difficult to get good motion pictures for show and so pictures are booked as and when available.

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The theatre has been showing the picture 'Blood Bath' for the past two weeks. This picture, which is strictly for adults only has been a great hit and the manager of the theatre is convinced that the attendance will continue to be above normal for another two weeks, if the show of 'Blood Bath' is extended. However, another popular movie, eagerly looked forward to by both adults and children alike, 'Appu on the Airbus' is booked for next two weeks. Even if 'Blood Bath' is extended the theatre has to pay the regular rental on 'Appu on the Airbus' as well.

Normal attendance at theatre is 2,000 patrons per week, approximately one fourth of whom are children under the age of 12. Attendance of 'Blood Bath' has been 50% greater than the normal total. The manager believes that this would taper off during the second two weeks, 25% below that of the first two weeks, during the third week and $33\frac{1}{3}\%$ below that of the first two weeks, during the fourth week. Attendance for 'Appu on the Airbus' would be expected to be normal throughout its run regardless of the duration. All runs at the theatre are shown at a regular price of ₹2 for adults and ₹1.20 for children fewer than 12. The rental charge for 'Blood Bath' is ₹900 for one week or ₹1,500 for two weeks. For 'Appu on the Airbus' it is ₹750 for one week or ₹1,200 for two weeks. All other operating costs are fixed - ₹4,200 per week, except for the cost of potato wafers and cakes, which average 60% of their selling price, sales of potato wafers and cakes regularly average ₹1.20 per patron, regardless of age.

The Manager can arrange to show 'Blood Bath' for one week and 'Appu on the Airbus' for the following week or he can extend the show of 'Blood Bath' for two weeks or else he can show 'Appu on the Airbus' for two weeks as originally booked.

Show by computation, the most profitable course of action he has to pursue. [8]

3. PH Ltd., has a productive capacity of 2,00,000 units of product BXE per annum. The company estimated its normal capacity utilisation at 90% for 2022-23. The variable costs are ₹22 per unit and the fixed factory overheads were budgeted at ₹7,20,000 per annum. The variable selling overheads amounted to ₹6 per unit and the fixed selling expenses were budgeted at ₹5,04,000. The operating data for 2022-23 are as under:

Production	1,60,000 units
Sales @ ₹40 per unit	1,50,000 units
Opening stock of finished goods	10,000 units

The cost analysis revealed an excess spending of variable factory overheads to the extent of ₹80,000. There are no variances in respect of other items of cost.

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Required:

- (i) Determine the budgeted break-even point for 2022-23
 - (ii) What increase in price would have been necessary to achieve the budgeted profit?
 - (iii) Present statements of profitability for 2022-23 using:
 - (a) Marginal costing basis.
 - (b) Absorption costing basis
- [16]**

4. (a) One kilogram of product 'Kit' requires two chemicals A and B. The following were the details of product 'Kit' for the month of June, 2023:

Standard mix:

Chemical 'A' 50%

Chemical 'B' 50%

Standard price per kilogram of Chemical 'A' ₹12 and Chemical 'B' ₹15

Actual input of Chemical 'B' 70 kilograms.

Actual price per kilogram of Chemical 'A' ₹15

Standard normal loss 10% of total input.

Materials Cost variance total ₹650 adverse.

Materials Yield variance total ₹135 adverse.

You are required to calculate:

1. Materials mix variance total
2. Materials usage Variance total
3. Materials price variance total
4. Actual loss of actual input
5. Actual input of chemical 'A'

Actual price per kilogram of Chemical 'B' **[10]**

- (b) What is Bench trending and how does it differ from Bench Marking? **[6]**

5. (a) A Company with two manufacturing division is organized on profit centre basis. Division 'A' is the only source for the supply of a component that is used in Division B in the manufacture of a product KPO. One such part is used each unit of the product KPO. As the demand for the product is not steady. Division B can obtain order for increased quantities only by spending more on sales promotion and by reducing the selling prices. The manager of Division B has accordingly prepared the following forecast of sales quantities and selling prices.

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Sales units per day	Average Selling price per unit of KPO (₹)
1,000	5.25
2,000	3.98
3,000	3.30
4,000	2.78
5,000	2.40
6,000	2.01

The manufacturing cost of KPO in Division B is ₹3,750 first 1,000 units and ₹750 per 1,000 units in excess of 1,000 units.

Division A incurs a total cost of ₹1,500 per day for an output to 1,000 components and the total costs will increase by ₹900 per day for every additional 1,000 components manufactured. The Manager of Division A states that the operating results of Division will be optimised if the transfer price of the component is set at ₹1.20 per unit and he has accordingly set the aforesaid transfer price for his supplies of the component to Division A.

You are required:

- (i) Prepare a schedule showing the profitability at each level of output for Division A and Division B
- (ii) Find the profitability of the company as a whole at the output level which (A) Division A's net profit is maximum. (B) Division B's net profit is maximum.
- (iii) If the company is not organised on profit centre basis, what level of output will be chosen to yield the maximum profit. [8]

- (b) XYZ Ltd. makes three main products, using broadly the same production methods and equipment for each. A conventional product costing system is used at present, although and Activity Based Costing (ABC) system is being considered. Details of the three products, for typical period are:

	Labour Hours per unit	Machine Hours per unit	Material per unit	Volumes unit
Product X	½	1½	₹20	750
Product Y	1½	1	₹12	1,250
Product Z	1	3	₹25	7,000

Direct labour costs ₹6 per hour and production overheads are absorbed on a machine hour basis. The rate for the period is ₹28 per machine hour. You are required:

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- (i) to calculate the cost per unit for each product using conventional methods. Further analysis shows that the total of production overheads can be divided as follows

	%
Costs relating to set-ups	35
Costs relating machinery	20
Costs relating materials handling	15
Costs relating to inspection	<u>30</u>
Total production overhead	<u>100%</u>

The following activity volumes are associated with the product line for the period as a whole. Total activities for the period

	Number of Set- ups	Number of movements of materials	Number of Inspections
Product X	75	1	150
Product Y	115	2	180
Product Z	480	8	670
	670	12	1,000

You are required:

- (i) To calculate the cost per unit for each product using ABC principles;
(ii) To comment on the reasons for any differences in the costs in your answers. [8]

6. (a) The ABC Pvt. Ltd., which has a satisfactory preventive maintenances system in its plant has installed a new Hot Air Generator based on electricity instead of fuel oil for drying its finished products. The Hot Air Generator required periodic shutdown maintenance. If the shutdown is scheduled yearly, the cost of maintenance will be as under:

Maintenance Cost	Probability
₹15,000	0.3
₹20,000	0.4
₹25,000	0.3

The costs are expected to be almost linear, i.e., if the shutdown is scheduled twice a year the maintenance cost will be double.

There is no previous experience regarding the time taken between breakdowns. Costs associated with breakdown will vary depending upon the periodicity of maintenance.

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The probability distribution of breakdown cost is estimated as under:

Breakdown Costs per annum	Shutdown once a year	Shutdown twice a year
₹75,000	0.2	0.5
₹80,000	0.5	0.3
₹1,00,000	0.3	0.2

Simulate the total costs – maintenance and breakdown costs – and recommend whether shutdown overhauling should be resorted to once a year or twice a year?

[8]

6. (b) A captain of a cricket team has to allot five middle batting positions to five batsmen. The average runs scored by each batsman at these positions are as follows:

		Batting Position				
		III	IV	V	VI	VII
Batsmen	A	40	40	35	25	50
	B	42	30	16	25	27
	C	50	48	40	60	50
	D	20	19	20	18	25
	E	58	60	59	55	53

Make the assignment so that the expected total average runs scored by these batsmen are maximum.

[8]

7. (a) A Company manufactures 3 products which are processed through 3 different production stages. The time required to manufacture one unit of each of the three products and the daily capacity of the stages are given in the following table:

State	Time/unit in minutes			Stage capacity (minutes)
	Product 1	Product 2	Product 3	
1	1	2	1	430
2	3	-	2	460
3	1	4	-	420
Profit/unit	₹3	₹2	₹5	

- (i) Set the data in a simplex table.
(ii) Find the table for optimum solution

[8]

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- (b) The following table gives data on normal time & cost and crash time & cost for a project.

Activity	Normal		Crash	
	Time (days)	Cost (₹)	Time (days)	Cost (₹)
1 – 2	6	600	4	1,000
1 – 3	4	600	2	2,000
2 – 4	5	500	3	1,500
2 – 5	3	450	1	650
3 – 4	6	900	4	2,000
4 – 6	8	800	4	3,000
5 – 6	4	400	2	1,000
6 – 7	3	450	2	800

The direct cost per day is ₹100

- (i) Draw the network and identify the critical path [8]
(ii) What are the normal project duration and associated cost?

8. Write Short note (any four) [4×4 =16]

- (a) Business Process Re-engineering
(b) Cost reduction & control
(c) Socio Economic Costing
(d) Pareto Analysis