Cost Management

For Bangalore University

(As per CBCS Syllabus 2014-15 as Revised in March 2017)

B.COM VI SEMESTER

About the Authors



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Dedicated to

Our teachers who taught us this subject

Our students who made us learn it better

Our friends who encouraged us to write this book

Preface

The most technologically efficient machine man has ever invented is the book —Northrop Frye

Keep reading books, but remember that a book is only a book, and you should learn to think for yourself —Maxim Gorky

One of the major challenges for any business enterprise is to keep cost under control and if possible, reduce it. This is the need of the hour. While the knowledge of cost control and cost reduction is the foundation, the skill for its application is what business enterprises are seeking for. Cost Management deals with the tools and techniques of cost control and cost reduction. This book consists of some of the traditional and modern tools and techniques used in control and reduction of cost, and provide a complete insight of some select techniques. It is written for the specific requirements of the syllabus prescribed by Bangalore University, and hence does not cover the entire ambit of the subject. However, the topics covered are presented in a systematic and meticulous manner, providing the reader a 'feel-good' factor about the subject.

Complete care has been taken to make the book error-free. However, mistakes might have crept in inadvertently. We request our readers to bring to our notice, any such errors, omissions and mistakes, for enabling us to rectify in our future editions.

We thank Dr. M. Ramachandra Gowda, Registrar, Bangalore Central University and Dr. K.N. Pushpalatha, General Secretary, BSVP Trust, who have encouraged us and extended support in carrying out this work.

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Last but not the least, our acknowledgements are due to the Almighty who has blessed us with the knowledge and given us strength for spreading the same.

Dr. V. Rajesh Kumar Dr. R. K. Sreekantha

Syllabus

Cost Management VI Semester

Bangalore University

(As per CBCS Syllabus 2014-15 as Revised in March 2017)

AC.6.6. Cost Management (VI Semester)	(IA: 30 M + Written: 70M)	Chapter in the Book
Unit 1: COST CONTROL AND COST REDUCTION Meaning of cost control and cost reduction, areas covered by cost control and cost reduction – product design, target costing, value analysis, value engineering, value chain analysis, business process re-engineering (theory only).		Chapter 1
Unit 2: MARGINAL COSTING Absorption costing, cost classification under absorption costing, meaning and definition of marginal costing – absorption costing versus marginal costing – need for marginal costing, arguments against and in favor of marginal costing – marginal cost equation – uses and limitations of Marginal Costing – break even analysis – problems on break even analyses.		Chapter 2
Unit 3: STANDARD COSTING Historical costing – introduction – meaning and definition of advantages and disadvantages of standard costing – preliminari costing – variance analysis – material variance, labour variance a material variances and labor variances.	standard cost and standard costing – es in establishing system of standard and overheads variance – problems on	Chapter 3
Unit 4: BUDGETARY CONTROL Introduction – meaning and definition of budget and budgetary control – objectives of budgetary control – essential requirements of budgetary control – advantages and disadvantages of budgetary control – meaning, types of functional budgets – flexible budgets, cash budgets, sales budget and production budget, problems on flexible budgets and cash budgets.		Chapter 4
Unit 5: ACTIVITY BASED COSTING Introduction – weakness of conventional system – concept of ABC – Kaplan and Cooper's approach – cost drivers and cost pools – allocation of overheads under ABC – characteristics of ABC – steps in the implementation of ABC – benefits from adaptation of ABC system – difficulties faced by the industries in the successful implementation of ABC – problems on ABC.		Chapter 5

Skill Development

- Preparation of Income Statement using Absorption Costing and Marginal Costing Technique
- Illustrate make or buying decisions helps in decision making
- Preparation of Sales Budget with Imaginary Figures
- List any 10 industries where Standard Costing is used

Question Paper Pattern

Cost Management VI Semester

Bangalore University

(As per CBCS Syllabus 2014-15 as Revised in March 2017)

Maximum Marks: 70

Duration: 03 Hours

Note:

- 1. Question paper consists of three sections: Section A, B and C
- 2. Question 1 carries 10 marks
- 3. Questions 2 to 6 each carries 6 marks
- 4. Questions 7 to 11 each carries 14 marks

Particulars	Marks	Nature of Question
SECTION-A (Conceptual Questions) Q-1: Answer any <i>five</i> sub questions out of <i>seven</i> (a) (b) (c) (d) (e) (f) (g) $(5Q \times 2 \text{ marks})$	10 marks	Theoretical
SECTION-B (Analytical Questions) Answer any <i>three</i> questions out of <i>five</i> Q-2 Q-3 Q-4 Q-5 Q-6 (3Q × 6 marks)	18 marks	Numerical
SECTION-C (Essay Type Questions) Answer any three questions out of five Q-7 Q-8 Q-9 Q-10 Q-11	42 marks	Numerical
Gross Total	70 Marks	

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Solved Question Paper (May 2017)

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chapter **1**

Cost Control and Cost Reduction

CHAPTER OUTLINE

- 1.1 Cost Management
- 1.2 Components of Cost Management
- 1.3 Cost Control and Cost Reduction
- 1.4 Differences between Cost Control and Cost Reduction

1.5 Scope or Areas of Cost Control/Reduction

- 1.5.1 Product Design
- 1.5.2 Organisation
- 1.5.3 Factory Layout and Equipment
- 1.5.4 Production Plan/Method
- 1.5.5 Office and Administration
- 1.5.6 Marketing, Sales and Distribution
- 1.5.7 Finance Costs
- 1.5.8 Social Costs
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1.7 Target Costing

- 1.7.1 Differences between Cost Plus and Target Costing Methods
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1.8. Value Chain Analysis

- 1.8.1 Background
- 1.8.2 Meaning and Definition of Value Chain Analysis
- 1.8.3 Difference between Traditional Strategic Management Systems and Value Chain Analysis
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- 1.8.5 Grouping of Activities
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Summary

1.1 COST MANAGEMENT

Cost refers to the expenditure incurred for producing a product or for rendering a service. Costing refers to the methods and processes of ascertaining cost. Cost Management is the system of allocating costs to production/service, thereby enabling and achieving Cost Control and Cost Reduction.

In today's time of rapid technological change, tough global and domestic completion, Cost Management is central to sustained corporate profitability and competitiveness. The focus of any Management today is to conquer Cost, before it conquers them.

The three key components for survival of any business entity are Cost, Quality and Performance of its product/service. Customers continuously demand high quality products with better performance, at lower prices. Shareholders demand a higher return on their investment. Only controlling and reducing costs can meet these demands.

The challenge for any business entity is being able to manufacture products/render services within stipulated cost framework, meeting the growing needs and demands of all stakeholders, and staying ahead of the competitors. So, in the modern business environment, Cost Management involves the managerial use of cost information explicitly directed at one or more of the four stages of Strategic Management viz., Formulating Strategies, Communicating these strategies through the organisation, Developing and carrying out tactics to implement the strategies, and Developing and implementing controls to monitor the success of objectives.

THEORY QUESTIONS

- 1. What is Cost?
- 2. What is Costing?
- 3. What is Cost Management?
- 4. Define Cost Management.
- 5. Explain briefly the need for Cost Management.

1.2 COMPONENTS OF COST MANAGEMENT

From the previous discussion, the following can be deduced as components of Cost Management:

- 1. Cost Control and Cost Reduction
- 2. Strategic Positioning of the Business

This chapter focuses on the first component i.e., Cost Control and Cost Reduction.

THEORY QUESTION

1. What is Cost Management? State the components of Cost Management.

1.3 COST CONTROL AND COST REDUCTION

Cost Control, as defined by C.I.M.A., is the "regulation by executive action of the cost of operating an undertaking, particularly where such action is guided by cost accounting".

In simple words, Cost Control is the prevention of waste within the existing environment. It is the process of regulating the action so as to keep the elements of Cost, within the set parameters. It involves the comparison of actual results against the set norms, targets or standards and taking corrective action, where found appropriate.

Cost Reduction, as defined by C.I.M.A, is "the achievement of real and permanent reduction in the unit of goods manufactured or services rendered without impairing the suitability for the use intended". It involves examination of the purposes for which costs are incurred and, by a variety of means, eliminates or reduces the reasons for spending. It continuously attempts to achieve genuine savings in Production Costs, Distribution Costs, Selling Costs and Administration Costs.

Cost Reduction is the process of seeking ways to achieve a given result through improved design, better methods, new layouts, incentive schemes, establishing new standards, etc. Cost Reduction is essentially oriented towards achieving two objectives viz., reduction of overall costs and protection of the end-use or purpose of the product without impairing the suitability.

THEORY QUESTIONS

- 1. What is Cost Control?
- 2. State the definition of Cost Control, as given by C.I.M.A.
- 3. What is Cost Reduction?
- 4. State the definition of Cost Reduction, as given by C.I.M.A.
- 5. Explain the concepts of Cost Control and Cost Reduction.

1.4 DIFFERENCES BETWEEN COST CONTROL AND COST REDUCTION

For a better understanding of Cost Control and Cost Reduction, it is essential to distinguish between the two. Following are the various aspects of difference between Cost Control and Cost Reduction:

Cost Control	Cost Reduction
Cost Control involves a comparison of actual with the standards or budgets, to regulate the actual costs.	Cost Reduction is the achievement of real and permanent reduction in unit cost of products manufactured or service rendered.
In Cost Control, the emphasis is on the present and past behaviour of costs.	In Cost Reduction, the emphasis is on present costs and largely on future costs.
Under Cost Control, the quality of product or service is not guaranteed.	Under Cost Reduction, product's utility, quality and characteristics are retained.
The process of Cost Control involves setting up a target or standard, investigating variances and taking remedial measures to correct them.	Cost Reduction is not concerned with maintenance of performance, according to any standards.

Cost Control	Cost Reduction	
Cost Control is possible only for items of cost for which standards can be set.	Cost Reduction is uniformly applicable to all areas of business.	
Cost Control is achieved through compliance with standards. Standards by themselves are not examined.	Cost Reduction is a continuous process of critical examination and challenging of standards.	
Cost Control is a preventive measure.	Cost Reduction is a corrective measure.	
Cost Control lacks dynamism.	Cost Reduction is a fully dynamic approach.	
 The popular methods of Cost Control are: 1. Budgetary Control 2. Standard Costing 	 The popular methods of Cost Reduction are: Marginal Costing Activity-Based Costing Target Costing Life Cycle Costing Total Quality Management Theory of Constraints Just-in-Time Material Requisition Planning Manufacturing Resources Planning Computer-Aided Manufacturing Synchronous Manufacturing Business Process Re-engineering Value Chain Analysis Value Engineering 	

THEORY QUESTIONS

- 1. List any two differences between Cost Control and Cost Reduction.
- 2. Distinguish between Cost Control and Cost Reduction.
- 3. What is Cost Control? How is it different from Cost Reduction?
- 4. Explain the concept of Cost Control and Cost Reduction. List out the differences between the two.

Problem 1 (Problem on classification into Cost Control and Cost Reduction)

Classify the following items under the most appropriate category i.e., Cost Control/Cost Reduction:

- (a) Costs exceeding budgets or standards are investigated
- (b) Preventive Function
- (c) Corrective Function
- (d) Measures to standardise, for increasing productivity
- (e) Provision of proper storage facilities for materials
- (f) Continuous comparison of actuals with the standards set
- (g) Challenges the standards set
- (h) Value Analysis

Solution

Costs exceeding budgets or standards are investigated	Cost Control
Preventive Function	Cost Control
Corrective Function	Cost Reduction
Measures to standardise, for increasing productivity	Cost Reduction

Provision of proper storage facilities for materials	Cost Control
Continuous comparison of actuals with standards set	Cost Control
Challenges the standards set	Cost Reduction
Value Analysis	Cost Reduction

1.5 SCOPE OR AREAS OF COST CONTROL/REDUCTION

Following are some of the important areas an entity must focus for controlling and reducing costs:

1.5.1 Product Design

Product Design is the first step in the manufacturing process. All possible efforts must be made by the Management for efficient designing of a new product or improving the design of an existing product. A right and persistent effort on this can lead to cost savings on account of higher yield, lower wastage, reduced operation time, increased productivity, standardisation and simplification of the manufacturing process, etc.

1.5.2 Organisation

The structure of an organisation influences the cost and performance of a business entity. When well identified and put in place, the structure of the organisation, which defines the roles, responsibilities, authority chain, etc., leads to lesser doubts, efficient systems, effective communication, faster work and instant corrective actions, which in turn results in reduced costs.

1.5.3 Factory Layout and Equipment

An appropriate factory layout results in proper movement of material, less wastage, clearly defined responsibilities, elimination of duplication and optimal utilisation of all resources. Further, adequate and timely maintenance of equipment leads to lesser damages/repairs, elimination of idle time and improvement in performance. All these, in turn, lead to Cost Reduction and increased profitability.

1.5.4 Production Plan/Method

A well-experimented and established production method would have lesser wastage, higher productivity and optimal utilisation of resources with less or no idle time. Any or all these, in turn, help in Cost Reduction and improved performance.

1.5.5 Office and Administration

The effectiveness of tactical strategies depends on the administration systems of the entity. Clarity in the structure, well-defined roles and responsibilities, a meaningful reporting system and appropriate documentation leads to faster work, saves time and reduces man-power, thereby reducing cost and improving results of the organisation.

1.5.6 Marketing, Sales and Distribution

The success of marketing and sales does not depend on demand and competition alone. It depends upon the extent to which the organisation is able to supply the product or service to the customers, at the prices expected by them. Price can be manipulated only when cost is under control and when there is a scope for its reduction. Further, when the costs associated with sales, like salesman commission, discounts, cost of distribution, mark-ups and incentives to the channel members, are controlled, garnering a better share and countering competitors will be a possibility.

1.5.7 Finance Costs

Financing the requirements of a business involves a cost. Depending on the source from which funds are mobilised, the cost varies. Meeting the expectations of owners and other stakeholders is difficult unless the cost of financing is kept low and under control. However, when the same can be achieved, there will be improvement in both short-term and long-term prospects of the entity.

1.5.8 Social Costs

In the present business environment, unless a business connects with the society, it cannot get recognised and its progress and prosperity will be at stake. Performing certain responsibilities towards the society at large is mandatory and involves a huge cost. However, when planned and implemented appropriately, the cost of Corporate Social Responsibility will be more of a benefit than a burden.

THEORY QUESTIONS

- 1. List the areas where Cost Control and Cost Reduction are applied.
- 2. What are Cost Control and Cost Reduction? Explain the scope of Cost Reduction.

1.6 TOOLS AND TECHNIQUES OF COST CONTROL AND COST REDUCTION

For addressing the need of Cost Reduction in all the aforementioned areas, effective tools and techniques are required. Following is the list of some of the popular tools and techniques, which help in Cost Control and Cost Reduction:

- 1. Marginal Costing (Cost-Volume-Profit Analysis)
- 2. Standard Costing
- 3. Budgetary Control
- 4. Activity-Based Costing
- 5. Target Costing
- 6. Value Analysis
- 7. Value Engineering
- 8. Life Cycle Costing
- 9. Total Quality Management
- 10. Theory of Constraints
- 11. Just-in-Time
- 12. Material Requisition Planning
- 13. Manufacturing Resources Planning
- 14. Computer-Aided Manufacturing
- 15. Synchronous Manufacturing
- 16. Value Chain Analysis
- 17. Business Process Re-engineering

Most of these methods are found in practice, particularly in India, and are observed to have given improved results.

[BU B.Com November (2014)]



A preliminary survey conducted by authors showed the following popularity and extent of usage (among respondent companies) of various Cost Management tools by the Indian corporate sector.

A detailed discussion on Marginal Costing, Standard Costing, Budgetary Control and Activity Based Costing is provided in the subsequent chapters.

In this chapter, a brief framework is provided for the following techniques of Cost Management:

- 1. Target Costing
- 2. Value Chain Analysis
- 3. Business Process Re-engineering

THEORY QUESTIONS

- 1. List any six tools of Cost Control and Cost Reduction.
- 2. What is Just-in-Time Manufacturing?
- 3. What are Cost Control and Cost Reduction? List the various tools and techniques, which enable Cost Control and Cost Reduction?

1.7 TARGET COSTING

Target Costing is defined as "a structured approach to 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".

Target Costing is almost exactly opposite of Cost Plus Margin Modelling, where a company produces a product with no cost structure in mind. Under cost plus margin model, the total cost of manufacturing the product is first computed and then the profit margin is added to arrive at the final price.

1.8 + Cost Management

In Target Costing, the price the customer is willing to pay for the product is first ascertained. Then, after adjusting for the profit margin, the cost at which the product must be manufactured is arrived at.

[BU B.Com November (2014)]

THEORY QUESTIONS

- 1. What is Target Costing?
- 2. Define Target Costing.
- 3. What is Cost-Plus Margin Costing?

1.7.1 Differences between Cost Plus and Target Costing Methods

The following diagrams highlight the essential difference between Cost Plus Method (i.e., Traditional Method) and Target Costing Method:



Traditional Costing Method

Target Costing Method



Cost Plus Method Target Costing Method Market considerations are not part of Cost Planning. Competitive market considerations drive Cost Planning. Price determines cost. Costs determine price. Waste and inefficiency is the focus of Cost Reduction Cost Reduction is achieved by simultaneous product/ efforts. process design Cost Reduction is not customer driven. Customer input guides Cost Reduction. Cost accountants manage costs. Cross-functional teams manage costs. Suppliers involved after product is designed. Suppliers involved in concept and design of product. Little or no involvement of Value Chain in Cost Planning. Involves the Value Chain in Cost Planning.

The specific differences between the two methods are given in the following table:

THEORY QUESTIONS

- 1. List any two differences between Traditional Costing and Target Costing.
- 2. What is Target Costing? How is it different from Cost Plus method of costing?
- 3. Distinguish between Traditional Costing Method and Target Costing Method.
- 4. Diagrammatically present the difference in Traditional and Target Costing Methods.

1.7.2 Features of Target Costing

The following are the main features of Target Costing:

- 1. It is a price-led costing system.
- 2. It is a customer-focused method.
- 3. It is design centred i.e., the Cost Reduction is achieved through Product Design.
- 4. It is cross-functional i.e., it involves participation of teams from all functions responsible for the product.
- 5. It is lifecycle oriented i.e., it aims at reducing the overall cost of the product over the entire product life cycle.
- 6. It is Value-Chain based i.e., it involves all members of the Value Chain viz., suppliers, distributors, service providers and customers.

THEORY QUESTIONS

1. State any two features of Target Costing.

[BU B.Com November (2016)]

2. What is Target Costing? Briefly explain the features of Target Costing.

1.7.3 Steps in Target Costing

Following are the steps in practising or carrying out Target Costing:

- 1. Identify the market requirements with regard to design, utility and need for a new product or improvements of existing product.
- 2. Set Target Selling Price, based on customer expectations and sales forecast.
- 3. Set Target Production Volumes, based on relationships between price and volume.
- 4. Establish Target Profit Margin for each product, based on company's long-term profit objectives, projected volumes, course of action, etc.
- 5. Set Target Cost for the product (Target Cost = Target Selling Price Target Profit Margin).
- 6. Determine the Current Cost of producing the new product, based on available resources and conditions.

- 7. Set Cost Reduction Target in order to reduce the Current Cost to Target Cost.
- 8. Analyse the Cost Reduction Target into various components and identify Cost Reduction opportunities using Value Engineering and Value Analysis.
- 9. Achieve Cost Reduction and Target Profit by effective implementation of Cost Reduction decisions.
- 10. Focus on further possibilities of Cost Reduction i.e., continuous improvement program.

THEORY QUESTIONS

- 1. Briefly list the steps in adopting Target Costing.
- 2. What is Target Costing? Explain the steps involved in Target Costing.

1.7.4 Components of Target Costing

The success of Target Costing depends on the efforts and action towards reducing Current Cost to Target Cost. For achieving that, an analysis of cost and identification of Cost Reduction opportunities must be identified. This is made possible with certain activities, which are called components of Target Costing. The components (or activities) of Target Costing are:

- 1. Value Analysis
- 2. Value Engineering

Value Analysis is defined as "a planned scientific approach to Cost Reduction, which reviews the material composition of a product and production design so that modification and improvements can be made, which do not reduce the value of the product to the customer or the user". Value Analysis entails studying the activities that are involved in producing the product to detect non-value adding activities that may be eliminated or minimised to save costs but without reducing the functionality or quality of the product.

Value Engineering is the application of Value Analysis to new products. It involves searching for opportunities to modify the design of each component or part of a product to reduce cost, but without reducing the functionality or quality of the product. Value Engineering is an approach to improving the value of an item or process by first understanding the functions of the item and its value, then by identifying its constituent components and their associated costs. It then seeks to find improvements to the components by either reducing their cost or increasing the value of their functions.

Value Analysis and Value Engineering help in bringing down Current Cost to Target Cost by addressing or exploring issues like:

- 1. Can any functions in the production process be eliminated?
- 2. Can any quality or features of a product (which are unnecessary) be eliminated?
- 3. Can the design be minimised i.e., can the features be reduced?
- 4. Can better Product Design to suit manufacturing process be developed?
- 5. Can there be substitution for the parts?
- 6. Can there be combination of steps?
- 7. Can suppliers' assistance be taken?
- 8. Are there better ways of doing things?

- 1. List the various components of Target Costing.
- 2. What is Value Analysis?
- 3. What is Value Engineering?
- 4. Explain the various components of Target Costing.
- 5. Explain the meaning of Value Analysis and Value Engineering and list out the various issues addressed by these techniques.

1.7.5 Advantages of Target Costing

Following points highlight the benefits for an organisation, which adopts Target Costing:

- It is a pro-active approach to Cost Management.
- It reinforces top-to-bottom commitment to process and product innovation, and is aimed at identifying issues to be resolved.
- 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.
- 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 the lowest cost.
- It ensures proper planning, well ahead of actual production and marketing.
- Implementation of Target Costing enhances employee awareness and empowerment.
- It enables fostering strong partnership with suppliers.
- It minimises or eliminates non-value adding activities.
- It encourages selection of lowest cost value-adding activities.
- It reduces the time to market the product.
- It enables the firm in achieving competitive advantage over other firms in the industry. The firm, which achieves Cost Reduction targets realistically, stands to gain in the long run.

THEORY QUESTIONS

- 1. List any four advantages of Target Costing.
- 2. What is Target Costing? State any six advantages of Target Costing.
- 3. Explain the technique of Target Costing, highlighting the advantages of the technique.

1.7.6 Problems with Target Costing

Though the Target Costing System results in clear, substantial benefits in most cases, it has a few problems that one should be aware of and guard against. The following are such problems:

- 1. The development process might 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 the Cost Reduction targets are not equitably shared.
- 3. Representatives from different departments on the design team can sometimes make decision difficult, since there might be too many opinions regarding design issues.
- 4. Effective implementation of Target Costing requires development of detailed cost data. This could be expensive at times.
- 5. Use of Target Costing may reduce the quality of products due to cheap components of inferior quality.

Most of these problems can be addressed by a good team leader who has an exceptional knowledge of the design process, good interpersonal skills, and a commitment to stay within both time and cost budgets for a design project.

- 1. List any two problems associated with Target Costing.
- 2. What is Target Costing? Explain the problems in implementation of Target Costing.
- 3. Explain Target Costing along with its advantages and associated problems.

1.8 VALUE CHAIN ANALYSIS

1.8.1 Background

For any firm to survive competition and sustain in the long run, it needs to gain a competitive advantage. Competitive advantage can be gained either through Product Differentiation or Cost Leadership.

Product Differentiation creates a unique position for the firm in the market, through product functionality, service or quality. It brings unique value to the customer, which could be in the form of better quality, timely delivery, quick response to after-sales service demand, added features to the product, etc. A firm can gain competitive advantage through Product Differentiation, either by charging premium price or by increased market share.

Cost Leadership is about offering equivalent value to customers, as that of competitors, at a lower cost. Cost leadership requires reduction in the costs associated with the activities pertaining to manufacturing the product or rendering the service. A firm can achieve competitive advantage by Cost Leadership, either by increasing the market share through lower price or by increased amount of profit margin.

	Product Differentiation	Cost Leadership
Basic Feature	It occurs when customers perceive that a firm's product is of higher quality, involves less risk and/or outperforms competing products offered by competitors. Customers are thus willing to pay a premium price for this product.	A firm enjoys a relative cost advantage if its total costs are lower than the market average.
Gained by	 Ability to deliver goods in a timely manner Better quality Provision of after-sales services Offer a wider range of goods and services 	 Access to low-cost of raw materials Innovative process technology Low-cost access to distribution channels Economies of scale Superior operating management
Achieved by	 Increasing prices until it just offsets the improvement in customer benefits, thus maintaining current market share; or Pricing below the 'full premium' level in order to build market share. 	 Pricing the products lower than its competitors' so as to gain market share and maintain current profitability; or Matching with the price of competing products and increase its profitability.
Outcome	Offers customers 'better value for an equivalent price'.	Offers customers 'equivalent value for a lower price'.

The following table provides a summary of the two models of competitive advantage:

Many tools, techniques and strategies have been in use traditionally for gaining competitive advantage (i.e., for enjoying differentiation advantage or low-cost advantage). All such strategies are referred as Traditional Strategic Management Systems.

A recent development in achieving competitive advantage is Value Chain Analysis.

- 1. What is Competitive Advantage? What are the sources of Competitive Advantage?
- 2. What is Product Differentiation?
- 3. What is Cost Leadership?
- 4. Write a short note on Product Differentiation.

- 5. Write a short note on Cost Leadership.
- 6. What is Competitive Advantage? Compare and contrast the different modes of gaining Competitive Advantage.

1.8.2 Meaning and Definition of Value Chain Analysis

Value Chain Analysis is a process by which a firm identifies and analyses various activities that add value to the final product.

Value Chain for any firm is the value-creating activities, all the way from the basic raw material sources from component suppliers to the ultimate end-use product delivered into the final consumers' hands (John Shank and V Govindarajan).

According to Michael Porter, the most noted Guru of Strategic Management, Value Chain is the series of internal processes or activities a company performs to design, produce, market, deliver and support its product. A firm's value chain and the way it performs individual activities are a reflection of its history, its strategy, its approach of implementing its strategy, and the underlying economies of the activities themselves.

The concepts, tools and techniques of Value Chain Analysis apply to all those organisations, which produce and sell a product or provide a service.

THEORY QUESTIONS

- 1. What is Value Chain?
- 2. What is Value Chain Analysis?
- 3. Write a short note on Value Chain Analysis.

1.8.3 Difference between Traditional Strategic Management Systems and Value Chain Analysis

The following table highlights the contrasting features between the Traditional Strategic Management Systems and Value Chain Analysis.

Basis	Traditional Strategic Management	Value Chain Analysis
Focus	Internal improvement	External (i.e., competitors)
Perspective	Seeks Cost Reduction in "Value Added" Process	Seeks competitive advantage based on the entire set of linked activities from suppliers to end-use customers.
Value Perspective	Focus on Value Addition	Focus on Value Creation
Use of Cost Drivers	Application at the overall firm level	A set of unique Cost Drivers is used for each value activity
Number of Cost Drivers	Single Cost Driver	Many Cost Drivers viz., Structural Drivers and Executional Drivers
Emphasis	Products produced or services rendered	Activities and their inter-linking
Benchmarking	Internal bench-marking	Bench-marking with competitors
Cost preferences	Focus on control of Manufacturing Costs	Focus on gaining advantage and not only on Cost Control and Cost Reduction
Nature of data	Only internal information	Both internal and external information
Alignment with strategy	No	Yes
Orientation	Short-term	Long-term

THEORY QUESTIONS

- 1. Explain the differences between the different systems of gaining competitive advantage.
- 2. What are the features of Traditional Strategic Management System?
- 3. Explain the features of Value Chain Analysis.

1.8.4 Components of Value Chain Analysis

Adoption of Value Chain Analysis involves the following processes:

- 1. Grouping of Activities
- 2. Assessing Competitive Advantage
- 3. Developing Strategic Framework for gathering information and implementing the system

Each component is explained in detail as follows:

THEORY QUESTIONS

- 1. List the various components of Value Chain Analysis.
- 2. What is Value Chain Analysis? State the various components of Value Chain Analysis.

1.8.5 Grouping of Activities

Michael Porter suggested that all business activities must be grouped under two headings, for exploring the possibility and for implementation of Value Chain Analysis viz., Primary Activities and Support Activities.

Primary Activities are those, which are directly involved in transforming inputs into outputs and delivery and after-sales support to output. They are handled by line functions in an organisation. They include:

- Inbound Logistics: Materials Handling, Warehousing, Inventory Control, Transportation.
- Operations: Machine Operating, Assembly, Packaging, Testing and Maintenance.
- Outbound Logistics: Order Processing, Warehousing, Transportation and Distribution.
- Marketing and Sales: Advertising, Promotion, Selling, Pricing, Channel Management.
- Service: Installation, Servicing, Spare Part Management.

Support Activities are activities that support Primary Activities. They are handled by the organisation's staff functions. They include:

- Procurement: Purchasing Raw Materials, Lease properties, Supplier Contract Negotiations.
- Firm Infrastructure: General Management, Planning, Finance, Legal, Investor Relations.
- Human Resource Management: Recruitment, Education, Promotion, Reward Systems.
- Technology: Research and Development, IT, Product and Process Development.

THEORY QUESTIONS

- 1. How should activities be grouped, according to Michael Porter, for the purpose of Value Chain Analysis?
- 2. What are Primary Activities? List the various Primary Activities, as suggested by Michael Porter.
- 3. What are Supporting Activities? List the various Support Activities, as suggested by Michael Porter.
- 4. What is Value Chain Analysis? What are the components of Value Chain Analysis? Write a brief note on the Grouping of Activities for the purpose of Value Chain Analysis.

1.8.6 Assessing Competitive Advantage

There are three tiers of Value Chain Analysis for assessing the Competitive Advantage of a firm, viz., Internal Cost Analysis, Internal Differentiation Analysis and Vertical Linkage Analysis. Each of these tiers is explained as follows:

1. Internal Cost Analysis

The purpose of this analysis is to understand the cost of internal processes and activities and identify the source of profitability. Following are the steps involved in Internal Cost Analysis:

- Identify the firm's value-creating process.
- Determine the portion of the Total Cost of the product or services attributable to each value-creating process.
- Identify the Cost Drivers for each process.
- Identify the links between processes.
- Evaluate the opportunities for achieving relative cost advantage.

2. Internal Differentiation Analysis

The purpose of this analysis is to understand the sources of differentiation within internal value-creating processes and offer customers better value for an equivalent price. Following are the steps involved in Internal Differentiation Analysis:

- Identify the customers' value-creating process.
- Evaluate differentiation strategies for enhancing customer value.
- Determine the best sustainable differentiation strategies.

3. Vertical Linkage Analysis

The purpose of this analysis is to understand the relationships and associated costs among external suppliers and customers in order to maximise the value delivered to customers and to minimise cost. Following are the steps involved in Vertical Linkage Analysis:

- Identify the industry's value chain and assign costs, revenues and assets to value-creating processes.
- Diagnose the cost drivers for each value-creating process; and
- Evaluate the opportunities for sustainable competitive advantage.

This analysis must be non-mutually exclusive (i.e., analysis of one component must not prevent analysis of other components), continuous and inclusive (i.e., must be a part of strategic planning).

THEORY QUESTIONS

- 1. List the components of Assessing Competitive Advantage under Value Chain Analysis.
- 2. What is Internal Cost Analysis? State its purpose.
- 3. List out the steps in performing Internal Cost Analysis.
- 4. Write a short note on Internal Cost Analysis.
- 5. What is Internal Differentiation Analysis? State it purpose.
- 6. List out the steps in performing Internal Differentiation Analysis.
- 7. Write a short note on Internal Differentiation Analysis.
- 8. What is Vertical Linkage Analysis? State its purpose.
- 9. List out the steps in performing Vertical Linkage Analysis.
- 10. Write a short note on Vertical Linkage Analysis.
- 11. Explain, in detail, the various tiers of Assessing Competitive Advantage under Value Chain Analysis.

1.8.7 Strategic Framework

Value Chain Analysis requires a Strategic Framework for organising information (both internal and external), analysing information, summarising findings, and providing recommendations. There are three generally accepted Strategic Frameworks for Value Chain Analysis viz., Industry Structure Analysis, Core Competence

Analysis and Segmentation Analysis. Each of these frameworks and their requirements are explained as follows:

1. Industry Structure Analysis

The purpose of this analysis is to understand the long-term prospects of the industry by identifying the opportunities and threats in the industry. The best model for this purpose is the Five Forces Model, suggested by Michael Porter. The model suggests that the prospects of an industry depend upon five threats (or forces) viz.,

- Threat of new entrants
- Threat of competition
- Threat of substitute products
- Bargaining power of customers
- Bargaining power of suppliers

When majority of these threats are at low level or moderate level, the industry can be expected to have longterm sustenance. On the contrary, where the majority of these threats are at high level, the industry can be expected to collapse sooner.

When industry prospects are better understood, achieving competitive advantage is a step closer.

2. Core Competencies Analysis

Core Competency is a distinctive or unique skill or technological knowhow that creates distinctive customer value. The core competencies are a function of collective skillset of people, organisation structure resources and technological knowhow. Core competency is the primary source of a company's competitive advantage.

Following are the questions that help in identifying the core competency of a business entity:

- Does the company or its skillset or the resources provide potential access to a wide variety of markets?
- Does it make a significant contribution to the perceived customer benefits of the end product?
- Can it be imitated? If no, does it reduce the threat of imitation by competitors?

An affirmative response to all these indicate that the firm has core competencies.

Applying the Value Chain Analysis approach to core competencies for competitive advantage includes the following steps:

- Validate core competencies in current businesses.
- Export or leverage core competencies to the value chain of other existing businesses.
- Use core competencies to reconfigure the value chains of existing businesses.
- Use core competencies to create new value chain.

3. Segmentation Analysis

The purpose of this analysis is to identify the competitive advantages and disadvantages of different segments. A firm may use this information to decide whether to exist the segment, enter a new segment, reconfigure one or more segments, or embark on Cost Reduction/differentiation programs.

Following are the steps for Segmentation Analysis, for its use in Value Chain Analysis:

- Identify segmentation variables and categories on any basis (either on the basis of customer characteristics, or product characteristics, etc.)
- Construct a segmentation matrix.
- Analyse segment attractiveness.

- Identify key success factors for each segment.
- Analyse attractiveness of broad versus narrow segment scope.

THEORY QUESTIONS

- 1. What is the need for a Strategic Framework in Value Chain Analysis?
- 2. List the components of Strategic Framework for Value Chain Analysis.
- 3. What is Industry Structure Analysis? State its purpose.
- 4. List the five forces or threats, as suggested by Michael Porter, for analysing industry.
- 5. Write a short note on Industry Analysis, as required for Value Chain Analysis.
- 6. What is core-competence?
- 7. What is core-competence analysis?
- 8. How can core-competence be identified?
- 9. List the steps in applying Value Chain Analysis for Core-competence.
- 10. Write a short note on Core-competence Analysis.
- 11. What is Segmentation Analysis? State its purpose.
- 12. Briefly explain the various steps in Segmentation Analysis.
- 13. What are the components of Strategic Framework of Value Chain Analysis? Explain each of them in detail.
- 14. What is Value Chain Analysis? Briefly explain the various components of Value Chain Analysis.

1.8.8 Limitations of Value Chain Analysis

Value Chain Analysis is criticised on the following grounds:

- 1. Internal data on costs, revenues and assets used for Value Chain Analysis are derived from financial information of a single period. For long-term strategic decision-making, changes in cost structures, market prices and capital investments etc., may not be readily available.
- 2. Identifying stages in an industry's value chain is limited to the ability to locate at least one firm that participates in a specific stage. Breaking a value stage into two or more stages when an outside firm does not compete in these stages is strictly judgmental.
- 3. Finding the costs, revenues and assets for each value chain activity poses/gives rise to serious difficulties. There is no scientific approach and much depends upon trial and error and experimentation methods.
- 4. Isolating Cost Drivers for each value-creating activity, identifying value chain linkages across activities, and computing supplier and customer profit margins present serious challenges.
- 5. Value Chain Analysis is not easily understandable to all employees and hence may face resistance from employees as well as managers.
- 6. Value Chain Analysis is not an exact science. It is more "art" than preparing precise accounting reports. Certain judgments and factors of analysis are purely subjective and differ from person to person.

- 1. List any four limitations of Value Chain Analysis.
- 2. What is Value Chain Analysis? Explain its limitations.
- 3. Explain the features and limitations of Value Chain Analysis.
- 4. What is Value Chain Analysis? Bring out its differences with the Traditional Strategic Management System. Also explain its limitations.

1.9 BUSINESS PROCESS RE-ENGINEERING

1.9.1 Definition

Michael Hammer, who propounded this concept, defines Business Process Re-engineering as "the fundamental re-thinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance such as, cost, quality, service and speed".

THEORY QUESTIONS

- 1. What is Business Process Re-engineering?
- 2. Define Business Process Re-engineering.

1.9.2 Components of Business Process Re-engineering

From the definition, the following can be identified as the components of Business Process Re-engineering:

- 1. Challenging the Basic Assumptions: Fundamental re-thinking of business processes requires Management to challenge the basic assumptions under which it operates and to ask rudimentary questions like "Why do we do what we do?", "Why do we do it the way we do it?", etc.
- 2. Clean-Slate Approach: Radical Redesign relies on a fresh start clean-slate approach to examining an organisation's business processes. This approach focuses on answers to question, "If we are a brand new company, how would we operate our company"? The goal is to reinvent what is done and how it is done rather than to tinker with the present system by making marginal, incremental, superficial improvements to what's already being done.
- **3. Dramatic Improvements:** Achieving Dramatic Improvements in performance measurements is related to the preceding two elements. The fundamental re-thinking and radical redesign of business processes are aimed toward making quantum leaps in performance.
- **4.** Focus on End-to-End Process: Re-engineering focuses on end-to-end Business Processes rather than on individual activities that comprise the processes. Business Process Re-engineering takes a holistic view of business process as comprising a string of activities that cuts across traditional departmental or functional lines.

THEORY QUESTIONS

- 1. List the various components of Business Process Re-engineering.
- 2. What is Business Process Re-engineering? Explain the components of this technique.

1.9.3 Principles of Business Process Re-engineering

The following are the principles of a successful Business Process Re-engineering:

- 1. Organise around outcomes, not tasks.
- 2. Have those who need the results of a process perform the process.
- 3. Integrate the processing of information into the work process that produces the information.
- 4. Treat geographically dispersed resources as though they are centralised.
- 5. Line parallel activities instead of integrating their results.
- 6. Put the decision point where the work is performed, and build controls in the process.
- 7. Capture information once and at the source.
THEORY QUESTIONS

- 1. List any four principles of Business Process Re-engineering.
- 2. What is Business Process Re-engineering? Explain the principles governing Business Process Re-engineering.

1.9.4 Stages in Business Process Re-engineering

The following are the stages in implementing Business Process Re-engineering:

- 1. Process Identification: Each process performed being re-engineered, is broken down into a series of processes.
- 2. Process Rationalisation: Processes, which are non-value adding to be discarded.
- 3. Process Redesign: Remaining processes are redesigned.
- 4. Process Reassembly: Re-engineered processes are implemented in the most efficient manner.

THEORY QUESTIONS

- 1. List the various stages of Business Process Re-engineering.
- 2. What is Business Process Re-engineering? Briefly explain the various stages of Business Process Reengineering.
- 3. Explain, in detail, the technique of Business Process Re-engineering, and list out the various components, principles and stages in the technique.

SUMMARY

- **Cost** refers to the expenditure incurred for producing a product or for rendering a service.
- > Costing refers to the methods and processes of ascertaining cost.
- Cost Management is the system of allocating costs to production/service, enabling and achieving Cost Control and Cost Reduction.
- Cost Management involves the managerial use of cost information explicitly directed at one or more of the four stages of Strategic Management viz., Formulating Strategies, Communicating these strategies through the organisation, Developing and carrying out tactics to implement the strategies, and Developing and implementing controls to monitor the success of objectives.
- > Components of Cost Management: Cost Control and Reduction, Strategic Positioning of the Business.
- Cost Control refers to "the regulation by executive action of the cost of operating an undertaking, particularly where such action is guided by cost accounting".
- Cost Reduction, as defined as C.I.M.A, is "the achievement of real and permanent reduction in the unit of goods manufactured or services rendered, without impairing the suitability for the use intended". It involves examination of the purposes for which costs are incurred and, by a variety of means, eliminates or reduces the reasons for spending. It continuously attempts to achieve genuine savings in Production Costs, Distribution Costs, Selling Costs and Administration Costs.
- Scope or Areas of Cost Control/Cost Reduction: Product Design, Organisation, Factory Layout and Equipment, Production Plan, Office and Administration, Marketing, Sales and Distribution, Finance Costs and Social Costs.
- Tools and Techniques for Cost Control and Cost Reduction: Marginal Costing (Cost–Volume–Profit Analysis), Standard Costing, Budgetary Control, Activity-Based Costing, Target Costing, Value Analysis, Value Engineering, Life Cycle Costing, Total Quality Management, Theory of Constraints, Just-in-Time, Material Requisition Planning, Manufacturing Resources Planning, Computer Aided Manufacturing, Synchronous Manufacturing, Value Chain Analysis, Business Process Re-engineering, and many others.

- Target Costing is "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".
- > Components of Target Costing: Value Analysis, Value Engineering.
- Value Analysis is defined as "a planned, scientific approach to Cost Reduction, which reviews the material composition of a product and production design so that modification and improvements can be made, which do not reduce the value of the product to the customer or the user".
- Value Engineering is an approach for improving the value of an item or process by first understanding the functions of the item and its value, then by identifying its constituent components and their associated costs. It then seeks to find improvements to the components by either reducing their cost or increasing the value of their functions.
- Value-Chain Analysis is a process by which a firm identifies and analyses various activities that add value to the final product.
- Value Chain for any firm is the value-creating activities all the way from the basic raw material sources from component suppliers to the ultimate end-use product delivered into the final consumers' hands.
- Components of Value Chain Analysis: Grouping of Activities, Assessing Competitive Advantage and Strategic Framework.
- > Grouping of Activities: Primary Activities and Support Activities.
- Assessing Competitive Advantage involves Internal Cost Analysis, Internal Differentiation Analysis and Linkage Analysis.
- Strategic Framework for Value Chain Analysis involves Industry Structure Analysis, Core Competence Analysis and Segmentation Analysis.
- Business Process Re-engineering is "the fundamental re-thinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance such as, cost, quality, service and speed".
- Stages in Business Process Re-engineering: Process Identification, Process Rationalisation, Process Redesign, Process Reassembly.

<u>chapter</u>2

Marginal Costing

CHAPTER OUTLINE

2.1 Introduction

2.2 Absorption Costing

- 2.2.1 Classification of Costs under Absorption Costing
- 2.2.2 Criteria for Absorbing Overheads into Cost of Product
- 2.2.3 Decision-making Process under Absorption Costing
- 2.2.4 Advantages of Absorption Costing
- 2.2.5 Limitations of Absorption Costing

2.3 Marginal Costing

- 2.3.1 Meaning of terms relating to Marginal Costing
- 2.3.2 Decision-Making Process under Marginal Costing
- 2.3.3 Features of Marginal Costing
- 2.3.4 Scope of Marginal Costing
- 2.3.5 Absorption Costing versus Marginal Costing
- 2.3.6 Advantages of Marginal Costing/Arguments in favour of Marginal Costing
- 2.3.7 Limitations of Marginal Costing/Criticisms against Marginal Costing

2.4 Break-even Analysis

- 2.4.1 Scope of Break-even Analysis
- 2.4.2 Assumptions underlying Break-even Analysis

Problems on Break-Even Analysis

Summary

Snapshot of Formulae

Exercises

.....

2.1 INTRODUCTION

For ascertaining the cost of a product manufactured, particularly for absorbing overheads and for ascertaining profits, two methods are used in practice, viz.,

- 1. Absorption Costing
- 2. Marginal Costing

Under absorption costing, cost recognition is based on functional classification of costs. However, this method has its own limitations, which has led to the introduction of marginal costing.

This chapter explains the method of absorption costing, its limitations, the need for marginal costing, differences between the two methods, scope of marginal costing, its merits and limitations, and one of the deciding components of marginal costing viz., Break-even Point.

2.2 ABSORPTION COSTING

Absorption Costing is a procedure of cost recognition, wherein costs are classified on the basis of functions. It is a principle whereby, fixed as well as variable costs are allocated to the cost units and the total overheads are absorbed according to the activity level. Under this method, fixed costs are treated as product costs and are absorbed on the basis of pre-determined recovery rates.

THEORY QUESTIONS

Section A Type Questions

- 1. List the two methods for ascertaining cost and profits of products manufactured.
- 2. Define Absorption Costing.

2.2.1 Classification of Costs under Absorption Costing

Under Absorption Costing, costs are classified on the basis of the functions they perform, rather than their nature. Accordingly, for ascertaining the total cost of a product or service, costs are classified into Factory Expenses, Office and Administration Expenses, Selling and Distribution Expenses, and Research and Development Expenses. These costs (or expenses) are also called Overheads. No distinction is made between fixed and variable costs in ascertaining Total Cost and Profit from a product or service.

THEORY QUESTION

Section A Type Questions

1. What is Absorption Costing? Mention the classification of cost under this method of costing.

2.2.2 Criteria for Absorbing Overheads into Cost of Product

Under absorption costing, for ascertaining the total cost of a product or a service, the overheads are absorbed or recovered on the basis of various criterion mentioned as follows:

- As a percentage of direct material cost
- As a percentage of direct labour cost
- As a percentage of prime cost
- On the basis of units produced
- On the basis of labour hours
- On the basis of machine hours

THEORY QUESTION

Section B Type Questions

1. What is Absorption Costing? List the different criteria for absorbing overheads under this method of costing.

2.2.3 Decision-making Process under Absorption Costing

Following are the steps for making decisions under absorption costing:

- 1. Ascertain Direct Costs for each product or service
- 2. Absorb Indirect Costs (i.e., Overheads) for each product or service, based on the selected criteria.
- 3. Find out Total Cost for each product or service.
- 4. Find out Profits for each product or service separately, by deducting Total Cost from the Sales Revenue.
- 5. Calculate Combined Profits (or Total Profits) by summing up profits from each product or service.
- 6. On the basis of the Combined Total Cost and/or Combined Profits and/or Combined Sales Revenue, make appropriate decisions.

THEORY QUESTION

Section B Type Questions

1. Outline the decision-making process under absorption costing.

2.2.4 Advantages of Absorption Costing

Adopting absorption costing method has the following advantages:

- It conforms to the 'accrual concept' of accounting, and thereby ensures that both financial accounting and cost accounting results match, and are able to be reconciled.
- The stock valuation is in adherence to the accounting standard, and thereby mismatch between financial and cost accounting results is minimised.
- Cost is not separated into fixed and variable entities under this method. Since such a separation is not easy and not always accurate, absorption costing can be considered as simple, accurate and reliable.
- Absorption costing method provides clear information on the extent of overheads absorbed (i.e., under-absorbed or over-absorbed). This helps in analysing the utilization of costs and reduces inefficient utilization of resources.
- Under absorption costing, the price of a product is decided on the basis of 'cost + profit'. This ensures that all the costs are covered in the price of the product.

THEORY QUESTIONS

Section A Type Questions

1. State any two advantages of absorption costing.

Section B Type Questions

2. What is Absorption Costing? Explain the advantages of this system of costing.

2.2.5 Limitations of Absorption Costing

While absorption costing is a simple method for ascertaining costs and profits, it has the following limitations and concerns:

• There are many practices for absorbing overheads into the cost of product. The lack of uniformity has led to arbitrary allocation and apportionment of overheads, making cost-control difficult.

2.4 + Cost Management

- Under this method, all overheads may not be charged against revenue during the period they are incurred. This may lead to mismatch of results between financial accounting and cost accounting.
- When the overheads are under-absorbed or over-absorbed, which is a possibility under absorption costing, there is a possibility of under-pricing or over-pricing the product. This could affect the profitability, either on account of not realizing the actual potential or on account of losing to competitors.
- Cost classification on the basis of behaviour (i.e., fixed and variable) is not recognised, which would result in faulty decision-making.
- Under this method, the valuation of inventory is carried out considering all costs. This could have an impact on profitability and the results obtained may not be accurate.
- With different alternatives for production and sales, the cost also changes. Unless the change in costs is captured decision-making may be difficult and faulty. Absorption costing does not facilitate capturing of change in costs with change in decisions and alternatives.

These limitations of Absorption Costing have initiated the need for Marginal Costing.

THEORY QUESTIONS

Section B Type Questions

- 1. What is Absorption Costing? State any two limitations of absorption costing method.
- 2. Explain in detail the various limitations of absorption costing, with examples.

Section C Type Questions

3. What is Absorption Costing? Bring out the advantages and limitations of absorption costing.

2.3 MARGINAL COSTING

As defined by ICMA, London, 'Marginal Costing is the ascertainment, by differentiating between fixed costs and variable costs, of marginal costs and of the effect of profit on changes in the value of type and output'.

According to the definition, Marginal Costing involves:

- 1. Classifying costs into Variable Cost and Fixed Cost.
- 2. Ascertaining Marginal Cost based on the classification.
- 3. Making decisions based on Marginal Cost, by analysing its effect on profit, with changes in value and type of output.

For a better understanding of marginal costing, it is essential to understand the meaning of certain terminologies.

THEORY QUESTION

Section A Type Questions

1. Define Marginal Costing.

2.3.1 Meaning of Terms Relating to Marginal Costing

1. Variable Cost

Variable Cost refers to the cost, which varies proportionately with production or output. It is the cost wherein the total amount varies proportionately with production, but the per-unit cost remains same at all levels of production. Variable costs are incurred only when there is production. So, when there is no production, the variable costs will be nil. Hence, variable costs are also called Product Costs. Variable Costs include Direct Material Cost, Direct Labour Cost, any Other Direct Expenses, Variable Portion of Production, Selling and Distribution Overheads.

2. Fixed Cost

Fixed Cost refers to the cost that remains constant at all levels of production. It is the cost wherein the total amount remains same at different levels of production, but the per-unit cost varies inversely with production. Fixed costs are incurred irrespective of the level of output. These are expenses, which relate to a given period, and are incurred irrespective of whether there is production or not. Hence, fixed costs are also called Period Costs. Examples of fixed cost are Rent, Salary, Insurance, etc.

3. Semi-Variable Cost

Semi-variable Cost refers to the cost, in which one portion varies proportionately with production or output and another portion remains constant at all levels of production. It is a cost, wherein neither the total cost nor the per-unit cost is same at different levels of production. Examples of semi-variable cost are power bills, water bills, telephone bills, etc.

4. Marginal Cost

According to ICMA, London, Marginal Cost refers to 'the amount at any given volume of output by which aggregate costs are changed if the volume of output is increased or decreased by one unit'.

The cost whose aggregate amount changes with change in volume of output is Variable Cost. Hence, the basic meaning of Marginal Cost is 'variable cost'. However, for the purpose of Marginal Costing,

Marginal Cost = Variable Cost + Specific Fixed Cost + Opportunity Cost

(*Note:* Unless clear information is provided regarding other costs, only variable cost must be considered as Marginal Cost)

5. Common Fixed Cost

Common Fixed Costs are the fixed costs incurred irrespective of the situation, context or decision. For example, let us say rent is $\overline{1,00,000}$ per month for the factory premises, whether production activity is carried out or not, rent has to be paid. Such fixed cost is Common Fixed Cost.

6. Specific Fixed Cost

Specific Fixed Costs are the fixed costs incurred only in certain contexts or for a particular alternative. For example, let us say 10 contract workers are required for producing some component used in the assembly of final product, and each worker is paid ₹10,000 per month. So, when the production work is carried out, the Salary to the contract workers will be ₹1,00,000. However, if it is decided to buy the component instead of producing them, the requirement of contract workers will not arise and hence the salary cost need not be incurred. Such fixed cost is Specific Fixed Cost.

7. Opportunity Cost

Opportunity Cost refers to the value of the benefit lost when a particular alternative is chosen. For example, let us say the machines used for producing a component can be rented out to other manufacturers at the rate of $\overline{1,00,000}$ per month. In case, the company does not produce the component, it can give the machines on rent and earn $\overline{1,00,000}$ per month. However, where the company produces the component using these machines, it loses the opportunity of earning $\overline{1,00,000}$ per month. Such loss of potential revenue in this example is Opportunity Cost.

8. Contribution

Usually, profits are calculated by deducting total cost from sales. That is, Profits = Sales – Total Cost.

However, under Marginal Costing, Cost is separated into Variable Cost and Fixed Costs. So, under Marginal Costing, profits are ascertained as under.

Sales – (Variable Cost + Fixed Cost) Or Sales – Variable Cost – Fixed Cost

When, only variable cost is deducted from Sales Revenue, the resulting figure is called Contribution. So, Contribution refers to the excess of Sales Revenue over Variable Cost (or Marginal Cost). It indicates the extent to which the product is contributing towards the final profits.

9. Marginal Cost Equation

From Contribution, when fixed costs are deducted, the final profits can be arrived at. That is,

Contribution – Fixed Costs = Profits

From this equation, we can also state that Fixed Cost + Profits = Contribution.

This relationship between sales and cost components is called Marginal Cost Equation, which is presented as follows:

Sales - Variable Cost = Contribution = Fixed Cost + Profits

THEORY QUESTIONS

Section A Type Questions

- 1. What is Variable Cost? Give examples.
- 2. What is Fixed Cost? Give examples.
- 3. Explain 'Semi-variable Cost' with examples.
- 4. What is 'Marginal Cost'? Explain with suitable examples.

Section B Type Questions

- 1. Write short note on Classification of cost under Marginal Costing.
- 2. What is Common Fixed Cost? How is it different from Specific Fixed Cost?
- 3. Explain the term 'Opportunity Cost'.
- 4. What is 'Contribution'? Explain in detail, with example.
- 5. Write a short note on 'Marginal Cost Equation'.
- 6. Explain in detail the various terms associated with Marginal Costing System.

2.3.2 Decision-Making Process under Marginal Costing

Following are the steps in making decisions under Marginal Costing:

- 1. Ascertain Sales Revenue and Total Variable Costs for each product.
- 2. Calculate Contribution of each product by deducting Variable Costs from Sales Revenue.
- 3. Find Total Contribution (or Combined Contribution) by summing up contribution from each product.
- 4. From Total or Combined Contribution, deduct Total Fixed Costs and arrive at Total Profits.
- 5. On the basis of Contribution (individual and combined), make appropriate decisions.

THEORY QUESTION

Section B Type Questions

1. What is Marginal Costing? Briefly explain the decision-making process under this method.

2.3.3 Features of Marginal Costing

Following are some of the features of marginal costing.

- Under marginal costing, all costs are classified into Variable Costs and Fixed Costs.
- Variable costs are considered as product costs and fixed costs are considered as period costs. Hence, fixed costs are not included in ascertaining cost and profit of a particular product.
- Decisions under marginal costing are based on contribution (i.e., excess of sales revenue over variable cost).
- Prices are determined on the basis of marginal cost and contribution margin.
- Stock of work-in-progress and finished goods is valued at marginal cost.
- Any transfer of products from one process to another process is made at marginal cost.
- Fixed costs are considered in total in the Profit and Loss Account, and not for each product individually.
- Any difference in the magnitude of opening stock and closing stock does not affect the cost and profits, since stock is valued only at marginal (i.e., variable) cost.

THEORY QUESTION

Section B Type Questions

1. Explain in detail the characteristic features of marginal costing system.

2.3.4 Scope of Marginal Costing

Using the technique of marginal costing, most decisions an organisation needs can be made. Following are the list of decision areas for which marginal costing can be used:

- 1. Planning activity level
- 2. Deciding on Break-even Point
- 3. Optimal product mix
- 4. Make or buy decisions
- 5. Addition of a new product/market
- 6. Discontinuing an existing product/market
- 7. Pricing decisions
- 8. Marketing decisions
- 9. Expansion versus contraction decisions
- 10. Change versus status-quo decisions

THEORY QUESTIONS

Section B Type Questions

- 1. What is Marginal Costing? List the decision areas covered under marginal costing.
- 2. Write a short note on the scope of marginal costing.

2.3.5 Absorption Costing versus Marginal Costing

Following are the differences between Absorption Costing and Marginal Costing:

Absorption Costing	Marginal Costing
Under this method, all costs irrespective of their nature are included in the cost of product.	Under this method, only variable costs are included in the cost of product.
Costs are classified on the basis of functions they perform. Costs classified on this basis are Factory Overheads, Selling and Distribution Overheads, Office and Administration Overheads, and Research and Development Overheads.	Costs are classified on the basis of their behaviour. Costs classified on this are Variable Costs and Fixed Costs.
Fixed costs are regarded as product costs. They are absorbed into the cost of product on some pre-defined criteria.	Fixed costs are regarded as period costs. They are not absorbed into cost of product. They are shown in Profit and Loss Account.
Cost data is presented to show profits from each product individually.	Cost data is presented to show only contribution from each product.
Decision-making is based on profits.	Decision-making is based on contribution
Inventory is valued at total cost. Hence, any variation in the magnitude of opening and closing stock will have an impact on profitability of the entity.	Inventory is valued only at variable cost. Hence, any variation in the magnitude of opening and closing stock does not affect cost and profitability of the entity.
This method does not establish relationship between sales and profit.	This method establishes relationship between sales and profit.

THEORY QUESTIONS

Section A Type Questions

1. State any two differences between Absorption Costing and Marginal Costing.

Section B Type Questions

2. What is Marginal Costing? Compare and contrast Marginal Costing with Absorption Costing.

2.3.6 Advantages of Marginal Costing/Arguments in Favour of Marginal Costing

Following are the merits of marginal costing or arguments in favour of marginal costing:

- Marginal costing does away with the need for allocation, apportionment and absorption of fixed overhead, thereby avoiding accounting complications of under or over-absorption.
- Since stocks are valued only at marginal cost, it represents a realistic and fair value.
- Since the reporting to management is based on sales, and not based on production, the quantum and value of closing stock does not influence decision-making.
- This method provides the most logical basis for price fixation.
- The division of costs into fixed and variable entities enables better and efficient cost-control.
- This method is simple in application and is easy for exercise of cost control.
- Most vital information required for any decision is provided for, by this method.
- This method also provides a clear foundation for fixing and testing responsibilities, since fixed cost, which is an arbitrary apportionment, is not considered at all.

THEORY QUESTIONS

Section B Type Questions

- 1. What is Marginal Costing? State any four benefits of marginal costing system.
- 2. Explain in detail the arguments favouring adoption of marginal costing system.

2.3.7 Limitations of Marginal Costing/Criticisms Against Marginal Costing

Following are some of the limitations of marginal costing or criticisms against marginal costing:

- Classifying costs into fixed and variable components is not an easy task. In case it is not done accurately, the entire decision-making process can be faulty.
- Where fixed costs are very large, like in capital-intensive industries, ignoring fixed costs for decisionmaking may not be appropriate.
- Fixing selling price only on the basis of marginal cost may not be always appropriate, particularly when there is a huge difference between production and sales.
- Industries in which the production period is quite longer will have huge stocks of work-in-progress. Making decisions for such industries using marginal costing may not be appropriate.
- The assumption that fixed cost remains constant may not always hold good. Usually, when output crosses a particular limit, fixed costs could also change. Further, fixed costs may change from period to period. In such cases, unless fixed costs are considered, the decisions may not be reliable.
- The assumption that variable cost per unit remains same at all levels of production may not be true always. Beyond a certain level of production, the cost can be higher on account of shortage of material, shortage of skilled labour or any other resources. In such cases, application of marginal costing may not produce the desired results.
- When fixed costs are ignored and profits are presented, it may be misread and that could lead to demand for higher salaries, higher taxes etc., which may not be justifiable.
- Valuing stocks at marginal costing is a deviation from accounting standard and hence there is a risk of non-adherence in financial reporting.

THEORY QUESTIONS

Section A Type Questions

1. List any four limitations of marginal costing system.

Section B Type Questions

1. What is Marginal Costing? Explain in detail the criticisms against marginal costing.

Section C Type Questions

- 1. Explain the features, advantages and limitations of marginal costing system.
- 2. What is Marginal Costing? Explain its scope, features and limitations.

2.4 BREAK-EVEN ANALYSIS

Break-even Analysis refers to a system of determination of the level of activity where Total Cost equals Total Sales (i.e., the level of activity at which there is no profit or no loss). A broader meaning refers to determination of probable profit at any level of activity. The relationship among Cost of Production, Volume of Production, Profit and the Sale Value is established by Break-even Analysis. Hence, this analysis is also called Cost–Volume–Profit Analysis.

THEORY QUESTIONS

Section A Type Questions

- 1. What is Break-even Analysis?
- 2. What is CVP Analysis?

Section B Type Questions

3. What is Break-even Analysis? Why is it also called Cost-Volume-Profit Analysis?

2.4.1 Scope of Break-even Analysis

Break-even analysis involves the following:

- 1. Calculating Profit-Volume Ratio (PV Ratio)
- 2. Determining Break-even Point
- 3. Ascertaining Margin of Safety
- 4. Identifying Angle of Incidence
- 5. Calculating Profits at a given level of production
- 6. Calculating Number of Units to be sold for earning Desired Profits
- 7. Calculating Selling Price for a given Break-even Point
- 8. Calculation of Point of Indifference

Each of them is briefly explained as follows:

1. Profit–Volume Ratio (P/V Ratio)

Profit–Volume Ratio is the relationship between Sales Value and Contribution. It can be measured using any of the following formulae:

- $\frac{\text{Total Contribution}}{\text{Total Sales}} \times 100$
- $\frac{\text{Contribution per unit}}{\text{Selling Price per unit}} \times 100$
- $\frac{\text{Change in Contribution}}{\text{Change in Sales}} \times 100$
- $\frac{\text{Change in Profits}}{\text{Change in Sales}} \times 100$

2. Break-even Point (BEP)

Break-even Point refers to the level of activity at which there is no profit or loss. That is, it is the level of activity at which Total Sales = Total Cost, or it is the level of sales at which Total Contribution = Fixed Cost.

The purpose of BEP is to help the entity in deciding the level of activity it must engage in for making profits.

Break-even Point can be calculated using any of the following formulae:

• Break-even Sales $(\mathbf{\overline{t}}) = \frac{(\text{Fixed Cost} \times \text{Sales})}{\text{Contribution}}$

• Break-even Sales $(\bar{\mathbf{x}}) = \frac{\text{Fixed Cost}}{1 + 1}$

$$PV$$
 Ratio

 Break-even Sales (units) = Fixed Cost Contribution per unit Or = Break-even Sales (₹) Selling Price per unit

 Cash Break-even Sales = Cash Fixed Cost PV Ratio Or = Cash Fixed Cost Contribution per unit

3. Margin of Safety

Margin of Safety refers to the difference between the Actual Sales and the Break-even Sales. This is the extent of sales on which the company is generating profits.

The size of Margin of Safety shows the strength of the business. A low Margin of Safety indicates that the firm has large fixed expenses and is more vulnerable to change in sales, and a high Margin of Safety implies that a slight fall in sales may not affect the business much.

Margin of Safety can be calculated using any of the following formulae:

• Margin of Safety
$$(\bar{\mathbf{x}}) = \frac{\text{Total Profits}}{\text{PV Ratio}}$$

Or

Total Sales (₹) – Break-even Sales (₹)

• Margin of Safety (units) = $\frac{\text{Total Profits}}{\text{Contribution per unit}}$

Or

Total Sales (units) - Break-even Sales (units)

4. Angle of Incidence

When Sales Revenue, Total Variable Cost, Fixed Cost and Total Cost at different levels of production are presented on a graph, the resulting chart is called a Break-even Chart.

A Break-even Chart shows Break-even Point, loss till Break-even Point of sales and profits after Break-even Point of sales. It also shows the Angle of Incidence.

Angle of Incidence is the angle at which the Total Sales Line cuts the Total Cost Line. A wide angle indicates the firm's ability to make profits at a higher rate and a narrow angle indicates lower rate of profit-making ability.

A wide Angle of Incidence and a high Margin of Safety indicate sound business conditions.

5. Profits at a given Production or Sales Level

Profits at any given level of sales can be calculated by using Marginal Cost Equation, which is

Sales – Variable Cost = Contribution

Contribution – Fixed Cost = Profits

The same can be ascertained using the following format:

	(₹)
Sales	XXXX
Less: Variable Cost	XXXX
Contribution	XXXX
Less: Fixed Cost	XXXX
Profits	XXXX

6. Number of Units to be Sold for Earning Desired Profits

For earning a desired amount of profits, the amount of Sales (in $\overline{\mathbf{x}}$) or Units to be sold can be ascertained by using the following formulae:

•	Sales (in ₹) for earning Desired Profits = $\frac{\text{Desired Profits + Fixed Cost}}{\text{PV Ratio}}$
•	Sales (in $\overline{\mathbf{x}}$) for earning Desired Profits = Break-even Sales (in $\overline{\mathbf{x}}$) + $\left(\frac{\text{Desired Profits}}{\text{PV Ratio}}\right)$
•	Sales (in units) for earning Desired Profits = $\frac{(\text{Desired Profits + Fixed Cost})}{\text{Contribution per unit}}$
•	Sales (in units) for earning Desired Profits = Break-even Sales (in units) + $\left(\frac{\text{Desired Profits}}{\text{Contribution per unit}}\right)$

7. Calculation of Selling Price for a given Break-even Units

Given Break-even units, the selling price can be determined by using the following formulae:

Since BEP (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$

And Contribution per unit = Selling Price per unit – Variable Cost per unit

Given Break-even units = $\frac{\text{Fixed Cost}}{(\text{Required Selling Price per unit} - \text{Variable Cost per unit})}$

So, Required Selling Price per unit = $\left(\frac{\text{Fixed Cost}}{\text{Given Break-even Units}}\right)$ + Variable Cost per unit

8. Calculation of Point of Indifference

Point of Indifference or Indifference Point refers to the level of sales at which two different entities or two different systems earn same amount of profits. It can be calculated using the following formula:

Indifference Point = $\frac{\text{Difference in Fixed Cost}}{\text{Difference in PV Ratio}}$

Point of Indifference can help in identification of the firm or system, which is likely to earn higher profits in the event of high demand and low demand. A detailed explanation is provided in the problem section of the chapter.

THEORY QUESTIONS

Section A Type Questions

- 1. What is Profit-Volume Ratio? How can it be calculated?
- 2. What is Margin of Safety? How can it be ascertained?
- 3. Outline the format for calculating profit or loss, under Marginal Costing system.
- 4. What is Angle of Incidence?

Section B Type Questions

- 1. What is Break-even Point? Explain the different ways of calculating Break-even Point
- 2. Write a short note on Break-even Point.
- 3. Explain the concept of 'Angle of Incidence'.
- 4. State the formulae for calculating desired sales (in units or value) for earning desired profits.
- 5. What is Point of Indifference? How can it be calculated?
- 6. What is 'Indifference Point'? What is its utility?
- 7. Explain in detail the scope of Break-even Analysis.

2.4.2 Assumptions Underlying Break-even Analysis

Following are the assumptions for Break-even Analysis:

- All costs can be classified either as Variable or Fixed Costs.
- Selling price remains constant at all levels of production and demand.
- Variable cost per unit remains same at all levels of production, but total variable cost varies proportionately with production.
- Fixed cost remains constant at all levels of production.
- There is only one product; and in case of multiple products, the sales mix remains constant.
- There is no change in efficiency of workers with change in output.
- There is no significant change in opening and closing inventory.
- There is no change in working conditions, technology, production process or quality of output.
- All resources required for production are abundantly available.
- Both revenue and cost functions are linear over the range of activity under consideration.

THEORY QUESTIONS

Section B Type Questions

- 1. What is Break-even Analysis? List any four assumptions underlying Break-even Analysis.
- 2. Explain in detail the assumptions underlying Break-even Analysis.
- 3. What is Break-even Analysis? Explain the scope of and assumptions under Break-even Analysis.

PROBLEMS ON BREAK-EVEN ANALYSIS

Problem 1 (Problem on calculation of Break-even Point and Margin of Safety)

You are given the following information for the coming year of a factory:

Particulars	Amount
Budgeted output	80,000 units
Fixed expenses	₹4,00,000
Selling price per unit	₹20
Variable expenses per unit	₹10

Calculate Break-even Point and Margin of Safety.

Solution

For calculating Break-even Point, arranging information in the following format would be appropriate and in the format, it would be useful to show sales and variable cost per unit and fixed cost in total.

(Budgeted	Output -	80,000	Units)

		Per Unit (₹)	Total (₹)
Sales		20	16,00,000
Less: Variable Cost		10	8,00,000
(Contribution	10	8,00,000
Less: Fixed Cost			4,00,000
	Profits		4,00,000

Calculation of Break-even Point (in ₹)

Break-even Point (in ₹) can be calculated using different formulae. All of them are illustrated as follows:

• Break-even Point (in
$$\overline{\mathbf{x}}$$
) = $\frac{\text{(Fixed Cost \times Sales)}}{\text{Contribution}} = \frac{\overline{\mathbf{x}}4,00,000 \times \overline{\mathbf{x}}16,00,000}{\overline{\mathbf{x}}8,00,000} = \overline{\mathbf{x}}8,00,000$

• Break-even Point (in
$$\overline{\mathbf{e}}$$
) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{₹8,00,000}{₹16,00,000} \times 100 = 50\%$$

Or

PV Ratio =
$$\frac{₹10}{₹20} \times 100 = 50\%$$

Break-even Point (in ₹) = $\frac{₹4,00,000}{50\%}$ = ₹8,00,000

Calculation of Break-even Point (in units)

Break-even Point (in units) can be calculated using different formulae. All of them are illustrated as follows:

- Break-even Point (in units) = $\frac{\text{Break-even Sales (in } \overline{\textbf{x}})}{\text{Selling Price per unit}} = \frac{\overline{\textbf{x}},00,000}{\overline{\textbf{x}},200} = 40,000 \text{ units}$ Fixed Cost $\overline{\textbf{x}},00,000$
- Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{₹4,00,000}}{\text{₹10 per unit}} = 40,000 \text{ units}$

Calculation of Margin of Safety (in ₹)

Margin of Safety (in ₹) can be calculated using different formulae. All of them are illustrated as follows:

• Margin of Safety (in ₹) = Actual (or Budgeted) Sales – Break-even Sales = ₹16,00,000 – ₹8,00,000 = ₹8,00,000

• Margin of Safety (in
$$\overline{\mathbf{x}}$$
) = $\frac{\text{Total Profits}}{\text{PV Ratio}} = \frac{\overline{\mathbf{x}}4,00,000}{50\%} = \overline{\mathbf{x}}8,00,000$

Calculation of Margin of Safety (in units)

Margin of Safety (in units) can be calculated using different formulae. All of them are illustrated as follows:

- Margin of Safety (in units) = $\frac{\text{Margin of Safety (in } \texttt{R})}{\text{Selling Price per unit}} = \frac{\texttt{R},00,000}{\texttt{R},20} = 40,000 \text{ units}$
- Margin of Safety (in units) = Actual (or Budgeted) Sales Break-even Sales = 80,000 units – 40,000 units = 40,000 units
- Margin of Safety (in units) = $\frac{\text{Total Profits}}{\text{Contribution per unit}} = \frac{\text{₹4,00,000}}{\text{₹10 per unit}} = 40,000 \text{ units}$

Note: Students can choose to use any of the formula or the most suitable for the given information. Showing calculations using all formulae is not required.

Problem 2 (Problem on calculation of Break-even Point and Margin of Safety)

From the following details, ascertain Profits, Break-even Sales and Margin of Safety.

Particulars	Amount
Fixed Cost	₹5,00,000
Variable Cost	₹10 per unit
Selling Price	₹15 per unit
Output	1,75,000 units

Solution

(Budgeted Output - 1,75,000 Units)

	Per Unit (₹)	Total (₹)
Sales	15	26,25,000
Less: Variable Cost	10	17,50,000
Contribution	5	8,75,000
Less: Fixed Cost		5,00,000
Profits		3,75,000

Calculation of Break-even Point (in ₹)

Break-even point (in ₹) can be calculated using different formulae. All of them are illustrated as follows:

- Break-even Point (in $\overline{\mathfrak{T}}$) = $\frac{(\text{Fixed Cost} \times \text{Sales})}{\text{Contribution}} = \frac{(\overline{\mathfrak{T}}5,00,000 \times \overline{\mathfrak{T}}26,25,000)}{\overline{\mathfrak{T}}8,75,000} = \overline{\mathfrak{T}}15,00,000$
- Break-even Point (in $\overline{\xi}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{₹8,75,000}{₹26,25,000} \times 100 = 33\frac{1}{3}\%$$

Or
PV Ratio =
$$\frac{₹5}{₹15} \times 100 = 33\frac{1}{3}\%$$

Break-even Point (in ₹) = $\frac{₹5,00,000}{33\frac{1}{3}\%} = ₹15,00,000$

Calculation of Break-even Point (in units)

Break-even point (in units) can be calculated using different formulae. All of them are illustrated as follows:

- Break-even Point (in units) = $\frac{\text{Break-even Sales (in }\bar{\mathbf{x}})}{\text{Selling Price Per Unit}} = \frac{\bar{\mathbf{x}}15,00,000}{\bar{\mathbf{x}}15} = 1,00,000 \text{ units}$ • Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{₹5,00,000}}{\text{₹5 per unit}} = 1,00,000 \text{ units}$

Calculation of Margin of Safety (in ₹)

Margin of Safety (in ₹) can be calculated using different formulae. All of them are illustrated as follows:

- Margin of Safety (in ₹) = Actual (or Budgeted) Sales Break-even Sales = ₹26,25,000 ₹15,00,000 = ₹11,25,000
- Margin of Safety (in $\overline{\mathbf{x}}$) = $\frac{\text{Total Profits}}{\text{PV Ratio}} = \frac{\overline{\mathbf{x}}_{3,75,000}}{33\frac{1}{2}\%} = \overline{\mathbf{x}}_{11,25,000}$

Calculation of Margin of Safety (in units)

Margin of Safety (in units) can be calculated using different formulae. All of them are illustrated as follows:

- Margin of Safety (in units) = $\frac{\text{Margin of Safety (in } \overline{\textbf{x}})}{\text{Selling Price per unit}} = \frac{\overline{\textbf{x}}11,25,000}{\overline{\textbf{x}}15} = 75,000 \text{ units}$
- Margin of Safety (in Units) = Actual (or Budgeted) Sales Break-even Sales

= 1.75.000 Units - 1.00.000 Units = 75.000 units

• Margin of Safety (in units) = $\frac{\text{Total Profits}}{\text{Contribution per unit}} = \frac{\overline{\$}3,75,000}{\overline{\$}5} = 75,000 \text{ units}$

Note: Students can choose to use any of the formula or the most suitable for the given information. Showing calculations using all formulae is not required.

Problem 3 (Problem on calculation of Break-even Point and Margin of Safety)

A manufacturing company has the following income statement:

Particulars	Amount (₹)
Sales	1,00,000
Variable Cost	60,000
Fixed Cost	25,000

Find out at what level of sales the company breaks even and what will be the margin of safety.

Solution

Since the 'per-unit' details are not available, Break-even Point and Margin of Safety can be calculated only in rupees.

For calculating Break-even Point, arranging information in the following format would be appropriate:

	Total (₹)
Sales	1,00,000
Less: Variable Cost	60,000
Contribution	40,000
Less: Fixed Cost	25,000
Profits	15,000

Calculation of Break-even Point (in ₹)

Break-even Point (in ₹) can be calculated using different formulae. All of them are illustrated as follows:

- Break-even Point (in $\overline{\mathfrak{e}}$) = $\frac{\text{(Fixed Cost \times Sales)}}{\text{Contribution}} = \frac{(\overline{\mathfrak{e}}25,000 \times \overline{\mathfrak{e}}1,00,000)}{\overline{\mathfrak{e}}40,000} = \overline{\mathfrak{e}}62,500$
- Break-even Point (in $\overline{\mathfrak{R}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{₹40,000}{₹1,00,000} \times 100 = 40\%$$

Break-even Point (in ₹) =
$$\frac{₹25,000}{40\%}$$
 = ₹62,500

Calculation of Margin of Safety (in ₹)

Margin of Safety (in ₹) can be calculated using different formulae. All of them are illustrated as follows:

- Margin of Safety (in ₹) = Actual (or Budgeted) Sales Break even Sales = ₹1,00,000 ₹62,500 = ₹37,500
- Margin of Safety (in $\overline{\mathbf{x}}$) = $\frac{\text{Total Profits}}{\text{PV Ratio}} = \frac{\overline{\mathbf{x}}15,000}{40\%} = \overline{\mathbf{x}}37,500$

Problem 4 (Problem on calculation of Break-even Point and Number of units to be sold for desired profits)

Particulars Amoun	
Fixed Cost	₹72,000
Variable Cost	₹15 per unit
Selling price	₹24 per unit

Calculate:

(a) Break-even Point in terms of units and rupees

(b) Number of units that must be sold to earn a profit of ₹90,000

Solution

Since the actual or budgeted units of sale are not mentioned, calculation of total profits is not possible.

Contribution per unit = Selling Price per unit – Variable Cost per unit = ₹24 – ₹15 = ₹9

Calculation of Break-even Point (in ₹)

• Break-even Point (in $\overline{\mathfrak{R}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{₹9}{₹24} \times 100 = 37.5\%$$

Break-even Point (in ₹) = $\frac{₹72,000}{37.5\%}$ = ₹1,92,000

Calculation of Break-even Point (in units)

• Break-even Point (in units) = $\frac{\text{Break-even Sales (in }\overline{\textbf{\xi}})}{\text{Selling Price per unit}} = \frac{\overline{\textbf{\xi}}_{1,92,000}}{\overline{\textbf{\xi}}_{24}} = \textbf{8,000 units}$

Or

• Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{₹72,000}{₹9 \text{ per unit}} = 8,000 \text{ units}$

Calculation of Number of Units for earning profits of ₹90,000

• Number of Units to be sold for earning desired profits =
$$\frac{\text{(Desired Profits + Fixed Cost)}}{\text{Contribution per unit}}$$

$$=\frac{(\underline{390,000}+\underline{372,000})}{\underline{39}}=18,000 \text{ units}$$

Or

• Number of Units to be sold for earning desired profits = Break-even Point (in units) + $\left(\frac{\text{Desired Profits}}{\text{Contribution per unit}}\right)$ = 8,000 units + $\left(\frac{₹90,000}{₹9 \text{ per unit}}\right)$

= 8,000 units + 10,000 units = **18,000 units**

Problem 5 (Problem on calculation of Break-even Point, and calculation of Selling Price when BEP is given)

The fixed cost is ₹50,000; variable cost per unit is ₹5 and selling price is ₹10 per unit. Determine:

- (a) Break-even Point
- (b) New Break-even Point, if selling price is reduced by 10%
- (c) Selling price if Break-even Point is 8,000 units

Solution

Since the actual or budgeted units of sale are not mentioned, calculation of total profits is not possible.

Contribution per unit = Selling Price per unit – Variable Cost per unit = ₹10 – ₹5 = ₹5

(a) Calculation of Break-even Point

• Break-even Point (in ₹) = <u>Fixed Cost</u> <u>PV Ratio</u>

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{\overline{\xi}_5}{\overline{\xi}_{10}} \times 100 = 50\%$$

Break-even Point (in ₹) = $\frac{₹50,000}{50\%}$ = ₹1,00,000

• Break-even Point (in units) = $\frac{\text{Break-even Sales (in } \overline{\textbf{x}})}{\text{Selling Price per unit}} = \frac{\overline{\textbf{x}}_{1,00,000}}{\overline{\textbf{x}}_{10}} = 10,000 \text{ units}$

Break-even Point (in units) =
$$\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{₹50,000}}{\text{₹5 per unit}} = 10,000 \text{ units}$$

(b) Calculation of New Break-even Point when selling price is reduced by 10%

• Contribution per unit = Selling Price per unit – Variable Cost per unit = $(\overline{10} - 10\% \text{ of } \overline{10}) - \overline{5} = \overline{5} - \overline{5} = \overline{5} + \overline{5} +$

	Break-even Point (in ₹) –	(Fixed Cost \times Selling Price)	_	(₹50,000 × ₹9)	- ₹1 12 500
•	Break-even 1 offic (III ()) =	Contribution	_	₹4	- (1,12,300

• Break-even Point (in units) = $\frac{\text{Break-even Sales (in }}{\text{Selling Price per unit}} = \frac{\overline{1,12,500}}{\overline{59}} = 12,500 \text{ units}$

Or

Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{₹50,000}}{\text{₹4 per unit}} = 12,500 \text{ units}$

(c) Calculation of Selling Price if Break-even Point is 8,000 units

Given Break-even units, the Selling Price can be ascertained using the following formula:

Required Selling Price per unit = $\left(\frac{\text{Fixed Cost}}{\text{Given Break-even units}}\right)$ + Variable Cost per unit

So, Required Selling Price per unit = $\left(\frac{₹50,000}{₹8,000 \text{ unit}}\right) + ₹5.00 = ₹6.25 + ₹5.00 = ₹11.25$

Problem 6 (Problem on calculation of Break-even Point and Selling Price at given Break-even Point)

You are given the following data:

Particulars	Amount
Sales price	₹350 per unit
Variable Cost	₹200 per unit
Fixed expenses	₹16,50,000

Ascertain:

(a) Break-even Point

- (b) Selling price per unit if Break-even Point is brought up to 15,000 units
- (c) Selling price per unit if Break-even Point is brought down to 10,000 units

Solution

(a) Calculation of Break-even Point

Since the actual or budgeted units of sale are not mentioned, calculation of total profits is not possible.

• Contribution per unit = Selling Price per unit – Variable Cost per unit = ₹350 – ₹200 = ₹150

• Calculation of Break-even Point (in ₹)

Break-even Point (in
$$\overline{\mathbf{v}}$$
) = $\frac{\text{(Fixed Cost} \times \text{Selling Price)}}{\text{Contribution}} = \frac{(\overline{\mathbf{v}}16,50,000 \times \overline{\mathbf{v}}350)}{\overline{\mathbf{v}}150} = \overline{\mathbf{v}}38,50,000$

• Calculation of Break-even Point (in units)

Break-even Point (in units) = $\frac{\text{Break-even Sales (in }\overline{\textbf{\xi}})}{\text{Selling Price per unit}} = \frac{\overline{\textbf{\xi}38,50,000}}{\overline{\textbf{\xi}350}} = 11,000 \text{ units}$

Or

Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{₹16,50,000}}{\text{₹150 per unit}} = 11,000 \text{ units}$

2.20 + Cost Management

(b) Calculation of Selling Price per unit if Break-even units must be 15,000

Given Break-even units, the Selling Price can be ascertained using the following formula:

Required Selling Price per unit = $\left(\frac{\text{Fixed Cost}}{\text{Given Break-even units}}\right)$ + Variable Cost per unit So, Required Selling Price per unit = $\left(\frac{₹16,50,000}{15,000 \text{ unit}}\right) + ₹200 = ₹110 + ₹200 = ₹310$

Calculation of Selling Price per unit if Break-even units must be 10.000 (c)

Given Break-even units, the Selling Price can be ascertained using the following formula:

Required Selling Price per unit = $\left(\frac{\text{Fixed Cost}}{\text{Given Break-even units}}\right)$ + Variable Cost per unit

So, Required Selling Price per unit = $\left(\frac{₹16,50,000}{10,000 \text{ unit}}\right) + ₹200 = ₹165 + ₹200 = ₹365$

Problem 7 (Problem on calculation of PV Ratio, Margin of Safety, Profit at given level of Sales and **Units for required Profits)**

From the following information calculate:

- (a) PV Ratio
- (b) Margin of Safety
- (c) Profits, if sales are ₹1,30,000
- (d) Additional units to be sold if the present profit is to be increased by ₹5,400

Fixed Cost	₹18,000
Sales	5000 units
Selling Price	₹20 per unit
Beak-even units	3,000

Solution

(a) Calculation of Variable Cost per unit

Break-even units = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$

 $3,000 \text{ units} = \frac{\text{₹18,000}}{\text{Contribution per unit}}$

So, Contribution per unit =
$$\frac{\overline{18,000}}{3,000 \text{ units}} = \overline{1600}$$

Contribution per unit = Selling Price per unit - Variable Cost per unit ₹6 = ₹20 – Variable Cost per unit Hence, Variable Cost per unit = $\overline{20} - \overline{26} = \overline{14}$

(b) Calculation of PV Ratio

PV Ratio = $\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{\text{₹}6}{\text{₹}20} \times 100 = 30\%$

(c) Calculation of Margin of Safety

Margin of Safety = Actual Sales – Break-even Sales = 5,000 units – 3,000 units = **2,000 units** Margin of Safety (in ₹) = Margin of Safety (in units) × Selling Price per unit = 2,000 units × ₹20 per unit = ₹**40,000**

(d) Profits when Sales are ₹1,30,000

Sales is given as ₹1,30,000 Selling Price per unit is ₹20

Hence, units sold = $\frac{\overline{1,30,000}}{\overline{20}} = \overline{6,500}.$

Calculation of Profits

(Units sold -6500)

	Per Unit (₹)	Total (₹)
Sales	20	1,30,000
Less: Variable Cost	14	91,000
Contribution	6	39,000
Less: Fixed Cost		18,000
Profits		21,000

(e) Calculation of additional units to be sold for increasing the current profits by ₹5,400 For this purpose, the current profits must be first calculated. The same is calculated as follows:

Calculation of Current Profits

	Per Unit (₹)	Total (₹)
Sales	20	1,00,000
Less: Variable Cost	14	70,000
Contribution	6	30,000
Less: Fixed Cost		18,000
Profits		12,000

The current profits are ₹12,000. It must be increased by ₹5,400. So, the desired profits are ₹17,400. Since, the fixed costs are ₹18,000, for earning desired profits of ₹17,400, the desired contribution must be ₹**35,400** (i.e., Desired Profits ₹17,400 + Fixed Cost ₹18,000).

The number of units to be sold for earning desired profits can be calculated using the following formula:

Sales (in units) for earning Desired Profits = $\frac{\text{(Desired Profits + Fixed Cost)}}{\text{Contribution per unit}} = \frac{\text{(Estred Profits + Fixed Cost)}}{\text{(For unit)}} = 5900 \text{ units}$

Present Sales are 5000 units. Hence, additional units to be sold for increasing profits by ₹5,400 are **900 units** (i.e., 5,900 units – 5,000 units).

Alternatively,

Beyond Break-even units, any change in profits is proportionate to contribution per unit.

So, additional units to be sold = $\frac{\text{Increase desired in Profits}}{\text{Contribution per unit}} = \frac{\text{₹}5,400}{\text{₹}6} = 900 \text{ units}$

Problem 8 (Problem on calculation of Break-even Point, Required Sales for desired profits and profits for given sales)

Particulars	Amount
Units of output	5,00,000 units
Fixed Cost	₹7,50,000
Variable Cost per unit	₹2
Selling Price per unit	₹5

You are required to determine:

- (a) Break-even Point
- (b) Sales needed for a profit of ₹6,00,000
- (c) Profits if 4,00,000 units are sold at ₹6 per unit

Solution

(a) Calculation of Break-even Point

For calculating Break-even Point, arranging information in the following format would be necessary:

(Output - 5,00,000 Units)

	Per Unit (₹)	Total (₹)
Sales	5	25,00,000
Less: Variable Cost	2	10,00,000
Contribution	3	15,00,000
Less: Fixed Cost		7,50,000
Profits		7,50,000

Calculation of Break-even Point (in ₹)

Break-even Point (in ₹) can be calculated using different formulae. All of them are illustrated as follows:

- Break-even Point (in $\overline{\mathfrak{T}}$) = $\frac{\text{(Fixed Cost \times Sales)}}{\text{Contribution}} = \frac{(\overline{\mathfrak{T}}7,50,000 \times \overline{\mathfrak{T}}25,00,000)}{\overline{\mathfrak{T}}15,00,000} = \overline{\mathfrak{T}}12,50,000$
- Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

PV Ratio = $\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{₹15,00,000}{₹25,00,000} \times 100 = 60\%$

Or

PV Ratio =
$$\frac{₹3}{₹5} \times 100 = 60\%$$

Break-even Point (in ₹) = $\frac{₹7,50,000}{60\%}$ = ₹12,50,000

Calculation of Break-even Point (in units)

Break-even Point (in units) can be calculated using different formulae. All of them are illustrated as follows:

• Break-even Point (in units) = $\frac{\text{Break-even Sales (in }\overline{\textbf{T}})}{\text{Selling Price per unit}} = \frac{\overline{\textbf{T}12,50,000}}{\overline{\textbf{T}5}} = 2,50,000 \text{ units}$

• Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{₹7,50,000}}{\text{₹3 per unit}} = 2,50,000 \text{ units}$

Calculation of Sales for a desired Profits of ₹6,00,000

Sales for earning desired profits can be calculated using the following formula:

Sales (in ₹) =
$$\frac{\text{(Desired Profits + Fixed Cost)}}{\text{PV Ratio}} = \frac{(₹6,00,000 + ₹7,50,000)}{60\%} = ₹22,50,000$$

Sales (in Units) =
$$\frac{\text{(Desired Profits + Fixed Cost)}}{\text{Contribution per unit}} = \frac{(₹6,00,000 + ₹7,50,000)}{₹3 \text{ per unit}} = 4,50,000 \text{ units.}$$

(b) Calculation of Profits for given Sales

Profits for given level of sales can be calculated using the following format:

(Number	of	Units -	4,00	,000)
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	Per Unit (₹)	Total (₹)
Sales	6	24,00,000
Less: Variable Cost	2	8,00,000
Contribution	4	16,00,000
Less: Fixed Cost		7,50,000
Profits		8,50,000

Note: It is assumed that there is no change in variable cost.

Problem 9 (Problem on calculation of Break-even Sales and Profits at different level of sales)

An analysis of C Ltd. gives the following information:

Cost Element	Variable Cost (% of Sales)	Fixed Cost (₹)
Direct material	32.8	
Direct labour	28.4	
Factory overhead	12.6	1,89,900
Administration overhead	1.1	66,700
Distribution overhead	4.1	58,400
	79.0	3,15,000

Budgeted sales: ₹18,50,000

You are required to find:

- (a) Break-even Sales Volume
- (b) Profit of the budgeted sales
- (c) Profits if actual sales dropped by 10%
- (d) Profits if actual sales increased by 5% of budgeted sales

Solution

(a) Calculation of Break-even Sales

Since details of Number of Units are not provided, Break-even Sales can be calculated only in rupees

Break-even Sales (in $\overline{\mathbf{e}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$ Fixed Cost = $\overline{\mathbf{e}}$ 3,15,000. PV Ratio is percentage of Contribution to Sales. The problem states that Variable Cost is 79% of Sales. Hence, Contribution to Sales is 21%, this **PV Ratio is 21%**.

Break-even Sales (in ₹) = $\frac{₹3,15,000}{21\%}$ = ₹15,00,000

(b) Calculation of Profits for budgeted sales

Profits for any given level of sales can be calculated using the following format:

		Total (₹)
Budgeted Sales		18,50,000
Less: Total Variable Cost (79% of Sales)		14,61,500
	Contribution	3,88,500
Less: Fixed Cost (given)		3,15,000
	Profits	73,500

Note: Details for each element of variable cost can also be shown, instead of showing total Variable Cost.

(c) Calculation of Profits if actual sales are 10% less than budgeted sales Profits in this case can be calculated using the following format:

	Total (₹)
Actual Sales (₹18,50,000 – 10% of ₹18,50,000)	16,65,000
Less: Total Variable Cost (79% of Sales)	13,15,350
Contribution	3,49,650
Less: Fixed Cost (given)	3,15,000
Profits	34,650

(d) Calculation of Profits if actual sales are 5% over the budgeted sales Profits in this case can be calculated using the following format:

		Total (₹)
Actual Sales (₹18,50,000 + 5% of ₹18,50,000)		19,42,500
Less: Total Variable Cost (79% of Sales)		15,34,575
	Contribution	4,07,925
Less: Fixed Cost (given)		3,15,000
	Profits	92,925

Problem 10 (Problem on calculation of required sales for desired profits)

Compute the Break-even Point (in units and ₹) from the following data:

Particulars	Amount (₹)
Selling price per unit	12
Variable cost per unit	7
Total fixed cost	50,000

What sales (in units) are required to earn a pre-tax profit of ₹65,000? What sales (in units) are required to earn an after-tax income of ₹65,000? Assume the tax rate as 35%.

Solution

Required Sales (in units) for earning desired profits can be calculated using the following formula:

Sales (in units) = $\frac{\text{(Desired Profits + Fixed Cost)}}{\text{Contribution per unit}}$

Contribution per unit = Selling Price per unit – Variable Cost per unit = $\overline{12} - \overline{7} = \overline{5}$

(i) When pre-tax profits of ₹65,000 is desired

Sales (in units) = $\frac{(₹65,000 + ₹50,000)}{₹5 \text{ per unit}} = \frac{₹1,15,000}{₹5 \text{ per unit}} = 23,000 \text{ units}$

(ii) When a post-tax profit of ₹65,000 is desired

If pre-tax profits are ₹100, at the tax rate of 35%, the tax liability will be ₹35. So, post-tax profits will be ₹65. That is, when post-tax profits are ₹65, pre-tax profits are ₹100.

For a post-tax profit of ₹65,000, the pre-tax profit must be

Desiring post-tax profits of ₹65,000 is same as desiring a pre-tax profit of ₹1,00,000.

Required Sales (in units) =
$$\frac{(\overline{1},00,000 + \overline{5},0000)}{\overline{5}$$
 per unit = $\frac{\overline{1},50,000}{\overline{5}$ per unit = **30,000 units**

Problem 11 (Problem on calculation of Break-even Point)

Following is the data relating to two companies: ABC Ltd. and XYZ Ltd.

	ABC Ltd.	XYZ Ltd.
Units produced and sold	85,000 units	85,000 units
Revenue	₹1,70,000	₹1,70,000
Variable Cost	₹34,000	₹85,000
Fixed Cost	₹85,000	₹34,000
Operating income	₹51,000	₹51,000

Find Break-even point of both companies, in units and in value.

Solution

(A) For ABC Ltd.

For calculating Break-even Point, arranging information in the following format would be necessary:

(Budgeted Output - 85,000 Units)

	Per Unit (₹)	Total (₹)
Sales	2.00	1,70,000
Less: Variable Cost	0.40	34,000
Contributio	n 1.60	1,36,000
Less: Fixed Cost		85,000
Profi	ts	51,000

Calculation of Break-even Point (in ₹)

Break-even Point (in ₹) can be calculated using different formulae. All of them are illustrated as follows:

• Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\text{(Fixed Cost \times Sales)}}{\text{Contribution}} = \frac{(\overline{\mathbf{x}}85,000 \times \overline{\mathbf{x}}1,70,000)}{\overline{\mathbf{x}}1,36,000} = \overline{\mathbf{x}}1,06,250$

• Break-even Point (in
$$\overline{\mathbf{T}}$$
) = $\frac{\text{Fixed Cos}}{\text{PV Ratio}}$

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{₹1,36,000}{₹1,70,000} \times 100 = 80\%$$

Or

PV Ratio =
$$\frac{₹1.60}{₹2.00} \times 100 = 80\%$$

Break-even Point (in ₹) =
$$\frac{₹85,000}{80\%}$$
 = ₹1,06,250

Calculation of Break-even Point (in units)

Break-even Point (in units) can be calculated using different formulae. All of them are illustrated as follows:

- Break-even Point (in units) = $\frac{\text{Break-even Sales (in } \texttt{R})}{\text{Selling Price per unit}} = \frac{\texttt{R}1,06,250}{\texttt{R}2} = \texttt{53,125 units}$
- Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{₹85,000}}{\text{₹1.60 per unit}} = 53,125 \text{ units}$

(B) For XYZ Ltd.

For calculating Break-even Point, arranging information in the following format would be necessary:

	Per Unit (₹)	Total (₹)
Sales	2.00	1,70,000
Less: Variable Cost	1.00	85,000
Contribution	1.00	85,000
Less: Fixed Cost		34,000
Profits		51,000

(Budgeted Output – 85,000 Units)

Calculation of Break-even Point (in ₹)

Break-even Point (in ₹) can be calculated using different formulae. All of them are illustrated as follows:

• Break-even Point (in \mathfrak{F}) = $\frac{\text{(Fixed Cost \times Sales)}}{\text{Contribution}} = \frac{(\mathfrak{F}34,000 \times \mathfrak{F}1,70,000)}{\mathfrak{F}85,000} = \mathfrak{F}68,000$

• Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{₹85,000}{₹1,70,000} \times 100 = 50\%$$

Or

PV Ratio =
$$\frac{₹1.00}{₹2.00} \times 100 = 50\%$$

Break-even Point (in ₹) = $\frac{₹34,000}{50\%}$ = ₹68,000

Calculation of Break-even Point (in units)

Break-even Point (in units) can be calculated using different formulae. All of them are illustrated as follows:

• Break-even Point (in units) = $\frac{\text{Break-even Sales (in } \texttt{F})}{\text{Selling Price per unit}} = \frac{\texttt{F}68,000}{\texttt{F}2} = 34,000 \text{ units}$

• Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{₹34,000}{₹1.00 \text{ Per unit}} = 34,000 \text{ units}$

Problem 12 (Problem on calculation of Break-even Point, when there are changes in the components)

Z Manufacturing Company produces a special kind of cement which is packaged and sold in bags of 20 kg. During the past month, its revenue and cost patterns were as follows:

Particulars	Amount
Selling Price per bag	₹30
Variable Cost per bag	₹16
Fixed cost	₹10,000
Quantity	3000

Consider each of the following separately:

- (a) What is the Break-even Point Quantity?
- (b) Assume 10% increase in production volume. What is percentage change in profits?
- (c) Assume 10% increase in selling price. What is the new Break-even Point?
- (d) Assume 50% increase in fixed cost. What is the new Break-even Point?
- (e) Assume that variable cost increases to ₹20 per bag. What is the new Break-even Point?

Solution

(a) Calculation of Break-even Point

For calculating Break-even Point, arranging information in the following format would be necessary:

	Per Bag (₹)	Total (₹)
Sales	30	90,000
Less: Variable Cost	16	48,000
Contribution	14	42,000
Less: Fixed Cost		10,000
Profits		32,000

Calculation of Break-even Point (in ₹)

Break-even Point (in
$$\overline{\mathfrak{T}}$$
) = $\frac{(\text{Fixed Cost} \times \text{Sales})}{\text{Contribution}} = \frac{(\overline{\mathfrak{T}}10,000 \times \overline{\mathfrak{T}}90,000)}{\overline{\mathfrak{T}}42,000} = \overline{\mathfrak{T}}21,428.57$

= ₹21,450 (approximated to nearest multiple of ₹30)

(Quantity - 3,000 Bags)

Break-even Point (in $\overline{\mathbf{\xi}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$ PV Ratio = $\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{\overline{\mathbf{\xi}}42,000}{\overline{\mathbf{\xi}}90,000} \times 100 = 46.67\%$ Or PV Ratio = $\frac{\overline{\mathbf{\xi}}14}{\overline{\mathbf{\xi}}30} \times 100 = 46.67\%$ Break-even Point (in $\overline{\mathbf{\xi}}$) = $\frac{\overline{\mathbf{\xi}}10,000}{46.67\%} = \overline{\mathbf{\xi}}21,428.57$

= ₹21,450 (approximated to nearest multiple of ₹30)

Calculation of Break-even Point (in units)

Break-even Point (in units) =
$$\frac{\text{Break-even Sales (in } \overline{\textbf{T}})}{\text{Selling Price per unit}} = \frac{\overline{\textbf{T}}21,428.57}{\overline{\textbf{T}}30} = 714.29 \text{ Bags}$$

Break-even Point (in units) =
$$\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{₹10,000}}{\text{₹14 per unit}} = 714.29 \text{ Bags}$$

= 715 Bags (approximately)

(Quantity - 3,300 Bags)

(b) Calculation of percentage change in profits, when production volume increases by 10% Given production volume is 3,000 bags. If there is an increase in production volume by 10%, the output will be 3300 bags. Profits for change in production volume can be calculated using the following format:

	Per Bag (₹)	Total (₹)
Sales	30	99,000
Less: Variable Cost	16	52,800
Contribution	14	46,200
Less: Fixed Cost		10,000
Profits		36,200

For production volume of 3,000 bags, the profits were ₹32,000, and for production volume of 3,300 bags, the profits are ₹36,200.

That is, for an increase in production volume by 10%, the profits have increased by ₹4,200.

Percentage increase in profits = $\left(\frac{\overline{4},200}{\overline{3},2000}\right) \times 100 = 13.125\%$

(c) Calculation of new Break-even Point when selling price increases by 10%

Given, selling price is ₹30. If there is an increase in selling price by 10%, the new selling price will be ₹33.

	Per Bag (₹)	Total (₹)
Sales	33	99,000
Less: Variable Cost	16	48,000
Contribution	17	51,000
Less: Fixed Cost		10,000
Profits		41,000

For calculating Break-even Point, arranging information in the following format will be necessary: (Quantity – 3,000 Bags)

Calculation of Break-even Point (in ₹)

Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\text{(Fixed Cost \times Sales)}}{\text{Contribution}} = \frac{(\overline{\mathbf{x}}10,000 \times \overline{\mathbf{x}}99,000)}{\overline{\mathbf{x}}51,000} = \overline{\mathbf{x}}19,411.76$

= ₹19,437 (approximated to nearest multiple of ₹33)

Break-even Point (in $\overline{\mathfrak{R}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

PV Ratio = $\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{\text{₹51,000}}{\text{₹99,000}} \times 100 = 51.51\%$

Or

PV Ratio =
$$\frac{₹17}{₹33} \times 100 = 51.51\%$$

Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\overline{\mathbf{x}}10,000}{51.51\%}$ = $\overline{\mathbf{x}}19,411.76 = \overline{\mathbf{x}}19,437$ (approximated to nearest multiple of $\overline{\mathbf{x}}33$)

Calculation of Break-even Point (in units)

Break-even Point (in units) = $\frac{\text{Break-even Sales (in } \overline{\textbf{\xi}})}{\text{Selling Price per unit}} = \frac{\overline{\textbf{\xi}19,411.76}}{\overline{\textbf{\xi}33}} = 588.23 \text{ Bags}$

= 589 Bags (approximately)

Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{₹10,000}{₹17 \text{ per unit}} = 588.23 \text{ Bags}$

= 589 Bags (approximately)

(d) Calculation of new Break-even Point when fixed cost increases by 50%

Given, fixed cost is ₹10,000. If fixed cost increases by 50%, the new fixed cost will be ₹15,000 For calculating Break-even Point, arranging information in the following format will be necessary:

(Quantity - 3,000 Bags)

	Per Bag (₹)	Total (₹)
Sales	30	90,000
Less: Variable Cost	16	48,000
Contribution	14	42,000
Less: Fixed Cost		15,000
Profits		27,000

Calculation of Break-even Point (in ₹)

Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\text{(Fixed Cost \times Sales)}}{\text{Contribution}} = \frac{(\overline{\mathbf{x}}15,000 \times \overline{\mathbf{x}}90,000)}{\overline{\mathbf{x}}42,000} = \overline{\mathbf{x}}32,142.86$

= ₹32,160 (approximated to nearest multiple of ₹30)

Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{₹42,000}{₹90,000} \times 100 = 46.67\%$$

Or

PV Ratio =
$$\frac{₹14}{₹30} \times 100 = 46.67\%$$

Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\overline{\mathbf{x}}15,000}{46.67\%}$ = $\overline{\mathbf{x}}32,142.86 = \overline{\mathbf{x}}32,160$ (approximated to nearest multiple of $\overline{\mathbf{x}}30$)

Calculation of Break-even Point (in units)

Break-even Point (in units) =
$$\frac{\text{Break-even Sales (in } \text{₹})}{\text{Selling Price per unit}} = \frac{\text{₹32,142.86}}{\text{₹30}} = 1071.43 \text{ Bags}$$

= 1072 Bags (approximately)
Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{₹15,000}}{\text{₹14 per unit}} = 1071.43 \text{ Bags}$

= 1072 Bags (approximately)

(e) Calculation of new Break-even Point when variable cost increases to ₹20 per bag

For calculating Break-even Point, arranging information in the following format would be necessary:

		Per Bag (₹)	Total (₹)
Sales		30	90,000
Less: Variable Cost		20	60,000
	Contribution	10	30,000
Less: Fixed Cost			10,000
	Profits		20,000

Calculation of Break-even Point (in ₹)

• Break-even Point (in
$$\overline{\mathbf{x}}$$
) = $\frac{(\text{Fixed Cost} \times \text{Sales})}{\text{Contribution}} = \frac{(\overline{\mathbf{x}}10,000 \times \overline{\mathbf{x}}90,000)}{\overline{\mathbf{x}}30,000} = \overline{\mathbf{x}}30,000$

• Break-even Point (in ₹) = <u>Fixed Cost</u> <u>PV Ratio</u>

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{₹30,000}{₹90,000} \times 100 = 33.33\%$$

Or

PV Ratio =
$$\frac{₹10}{₹30} \times 100 = 33.33\%$$

• Break-even Point (in
$$\overline{\mathbf{T}}$$
) = $\frac{\overline{\mathbf{T}}10,000}{33.33\%} = \overline{\mathbf{T}}30,000$

Calculation of Break-even Point (in units)

•	Break-even Point (in units) =	Break-even Sales (in ₹)	_ ₹30,000	- 1 000 Bags
		Selling Price per unit	₹30	- 1,000 Dags
•	Break-even Point (in units) =	Fixed Cost	₹10,000	- 1 000 Bags
		Contribution per unit	₹10 per unit	– 1,000 Bags

Problem 13 (Problem on calculation of Break-even Point when there are changes in the components)

The fixed cost is ₹40,000 and the variable cost is 60% on sales.

- (a) Determine Break-even Point
- (b) Find out new Break-even Point, if
 - Fixed cost increases by ₹10,000
 - Variable cost increases by 15% on sales
 - Selling price increases by 20%
 - Variable cost reduces by 10%

Solution

(a) Calculation of Break-even Point

Break-even Point $(\overline{\mathbf{x}}) = \frac{\text{Fixed Cost}}{\text{PV Ratio}}$

Fixed cost is given as ₹40,000.

PV Ratio is not given. However, the problem states that variable cost is 60% on sales.

When variable cost is 60% of sales, the Contribution is 40% of sales. So, PV Ratio is 40%.

In short, PV ratio is complement of variable cost-to-sales ratio.

That is PV Ratio = 100 - Variable Cost Ratio

So, PV Ratio = 100 - 60 = 40%

Break-even Point = $\frac{₹40,000}{40\%}$ = ₹1,00,000

(b) Calculation of New Break-even Point when fixed cost increases by ₹10,000.

Break-even Point
$$(\overline{\mathbf{x}}) = \frac{\text{Fixed Cost}}{\text{PV Ratio}}$$

Fixed Cost was given as ₹40,000. If it increases by ₹10,000, it will be ₹50,000. PV Ratio is 40%.

So, Break-even Point = $\frac{₹50,000}{40\%}$ = ₹1,25,000

(c) Calculation of New Break-even Point when variable cost increases by 15% on sales

Break-even Point $(\overline{\mathbf{x}}) = \frac{\text{Fixed Cost}}{\text{PV Ratio}}$

Fixed Cost is ₹40,000. Variable cost is originally given as 60% on Sales. If it increases by 15%, variable cost will be 75% on sales.

PV Ratio = 100 - Variable Cost Ratio

So, New PV Ratio = 100 - 75 = 25%.

Break-even Point = $\frac{\overline{\mathbf{x}}40,000}{25\%} = \overline{\mathbf{x}}\mathbf{1,60,000}$

(d) Calculation of New Break-even Point when selling price increases by 20%

The original selling price is not known. However, it is known that variable cost is 60% on sales.

So, if selling price is ₹100 per unit, the variable cost is ₹60 per unit.

The problem mentions of only increase in selling price by 20%, and not about any change in variable cost. According to the change, selling price per unit is ₹120, variable cost is ₹60 and contribution will be ₹60.

PV Ratio =
$$\frac{\text{Contribution per unit}}{\text{Selling Price per unit}} \times 100 = \frac{\textbf{E}60}{\textbf{E}120} \times 100 = \textbf{50\%}$$

Break-even Point $(\mathbf{R}) = \frac{\text{Fixed Cost}}{\text{PV Ratio}}$

Fixed cost is ₹40,000.

So, Break-even Point (in ₹) = ₹40,000/50% = ₹80,000

(e) Calculation of New Break-even Point when variable cost reduces by 10%

The original variable cost is not known. However, it is known that variable cost is 60% on sales.

So, if selling price is ₹100 per unit, the variable cost is ₹60 per unit.

The problem states that variable cost reduces by 10%.

So, variable cost per unit = $\overline{\mathbf{0}} = \overline{\mathbf{0}} = \overline{\mathbf{0}}$

Selling price being ₹100, the contribution per unit will be ₹100 – ₹54 = ₹46

PV Ratio = $\frac{\text{Contribution per unit}}{\text{Selling Price per unit}} \times 100 = \frac{₹46}{₹100} \times 100 = 46\%$

Break-even Point $(\overline{\mathbf{x}}) = \frac{\text{Fixed Cost}}{\text{PV Ratio}}$

Fixed cost is ₹40,000.

So, Break-even Point (in ₹) = $\frac{₹40,000}{46\%}$ = ₹86,956.52

Problem 14 (Problem on calculation of Break-even Point when the company is dealing with more than one product)

A company manufactures and sells four types of products: P, Q, R and S. The sales mix in the total value comprises of P: $33\frac{1}{3}$ %; Q: $41\frac{2}{3}$ %; R: $16\frac{2}{3}$ % and S: $8\frac{1}{3}$ %. The total budgeted sales (100%) is ₹60,000 per month.

The operating costs are:

- (a) <u>Variable costs</u>
 - P: 60% of selling price
 - Q: 68% of selling price
 - R: 80% of selling price
 - S: 40% of selling price
- (b) Fixed cost: ₹14,700 per month.

Calculate the Break-even Point for the products on an overall basis.

Solution

For calculating Break-even Point, it is necessary to prepare a Statement of Profit for the company as a whole.

	Р	Q	R	S	Total
Sales Mix	$33\frac{1}{3}\%$	$41\frac{2}{3}\%$	$16\frac{2}{3}\%$	$8\frac{1}{3}\%$	
Variable cost as a percentage of Sales	60%	68%	80%	40%	
Sales	20,000	25,000	10,000	5,000	60,000
Less: Variable Cost	12,000	17,000	8,000	2,000	39,000
Contribution	8,000	8,000	2,000	3,000	21,000
Less: Fixed Cost					14,700
Profits					6,300

Statement of Profit

Overall Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\text{Total Fixed Cost}}{\text{Overall PV Ratio}}$

Total Fixed Cost = ₹14,700

Overall PV Ratio = $\frac{\text{Total Contribution}}{\text{Total Sales}} \times 100 = \frac{\text{₹}21,000}{\text{₹}60,000} \times 100 = 35\%$

So, overall Break-even Point = $\frac{\overline{14,700}}{35\%} = \overline{42,000}$

Problem 15 (Problem on calculation of Break-even Point when the company is dealing with more than one product)

Calcutta Company Ltd. manufactures and sells four types of products under the brand names ACE, UTILITY, LUXURY AND SUPREME. The sales mix in value comprises of:

Brand	Percentage
ACE	$33\frac{1}{3}$
UTILITY	$41\frac{2}{3}$
LUXURY	$16\frac{2}{3}$
SUPREME	$8\frac{1}{3}$
	100

The total budgeted sales (100%) are ₹6,00,000 per month. The operating costs of each brand are given as follows:

Brand	Percentage of Selling Price
ACE	60%
UTILITY	68%
LUXURY	80%
SUPREME	40%

The fixed costs are ₹1,50,000 per month. Calculate the Break-even Point for the products on an overall basis.

It has been proposed to change the sales mix as follows, the total sales per month remaining ₹6,00,000:

Brand	Percentage
ACE	25
UTILITY	40
LUXURY	20
SUPREME	15
	100

Assuming that this proposal is accepted, calculate the new Break-even Point.

Solution

For calculating Break-even Point, it is necessary to prepare a Statement of Profit for the company as a whole.

	Р	Q	R	S	Total
Sales Mix	$33\frac{1}{3}\%$	$41\frac{2}{3}\%$	$16\frac{2}{3}\%$	$8\frac{1}{3}\%$	
Variable Cost as a percentage of Sales	60%	68%	80%	40%	
Sales	2,00,000	2,50,000	1,00,000	50,000	6,00,000
Less: Variable Cost	1,20,000	1,70,000	80,000	20,000	3,90,000
Contribution	80,000	80,000	20,000	30,000	2,10,000
Less: Fixed Cost					1,50,000
Profits					60,000

Statement of Profit

Overall Break-even Point (in ₹) = Total Fixed Cost Overall PV Ratio

Total Fixed Cost = ₹1,50,000

Overall PV Ratio = $\frac{\text{Total Contribution}}{\text{Total Sales}} \times 100 = \frac{₹2,10,000}{₹6,00,000} \times 100 = 35\%$

So, Overall Break-even Point = $\frac{₹1,50,000}{35\%}$ = ₹4,28,571.43 per month

Calculation of Break-even Point when there is a change in sales mix

Statement of Profit for revised sales mix

	Р	Q	R	S	Total
Sales Mix	25%	40%	20%	15%	
Variable Cost as a percentage of Sales	60%	68%	80%	40%	
Sales	1,50,000	2,40,000	1,20,000	90,000	6,00,000
Less: Variable Cost	90,000	1,63,200	96,000	36,000	3,85,200
Contribution	60,000	76,800	24,000	54,000	2,14,800
Less: Fixed Cost					1,50,000
Profits					64,800
Overall Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\text{Total Fixed Cost}}{\text{Overall PV Ratio}}$

Total Fixed Cost = ₹1,50,000

Overall PV Ratio = $\frac{\text{Total Contribution}}{\text{Total Sales}} \times 100 = \frac{₹2,14,800}{₹6,00,000} \times 100 = 35.8\%$

So, Overall Break-even Point = $\frac{₹1,50,000}{35.8\%}$ = ₹4,18,994.41 per month

Problem 16 (Problem on calculation of Break-even Point when the company is dealing with more than one product)

M Ltd. manufactures three products: P, Q and R. The unit selling prices of these products are ₹100, ₹80 and ₹50 respectively. The corresponding unit variable costs are ₹50, ₹40 and ₹14. The proportions (quantity-wise) in which these products are manufactured and sold are 20%, 30% and 50%, respectively. The total fixed costs are ₹14,00,000.

With the given information, you are required to work out the overall break-even quantity and the product-wise break-up of such quantity.

Solution

Since details of Total Sales in value (i.e., in ₹) are not available, Break-even Point must be calculated in units.

 $Overall Break-even Point (in units) = \frac{Total Fixed Cost}{Contribution per unit}.$

Total Fixed Cost = ₹14,00,000.

Since the company is selling more than one product and the number of units of each is not provided, Composite Contribution per unit must be calculated.

The following table shows the calculation of Composite Contribution per unit:

Product	Selling Price per unit (₹)	Variable Cost per unit (₹)	Contribution per unit (₹)	Weight	Contribution * Weight (₹)
Р	100	50	50	0.20	10
Q	80	40	40	0.30	12
R	50	14	36	0.50	18
					40

So, the Composite Contribution (i.e., Weighted Average Contribution) per unit is ₹40.

Therefore, overall Break-even Point =
$$\frac{\overline{14,00,000}}{\overline{40} \text{ per unit}} = 35,000 \text{ units}.$$

Calculation of product-wise break-even quantity

The product wise Break-even quantity must be in proportion to the weight of each product in the sales mix.

Product	Weight	Quantity (Units)
Р	20%	7,000
Q	30%	10,500
R	50%	17,500
		35,000

Verification

When the above-calculated quantity of each product is sold, the total contribution must be equal to fixed cost. That is, the total contribution for the sale of quantity mentioned must be $\gtrless 14,00,000$.

Calculation of Contribution for the break-even quantity of each product is shown as follows:

Product	Quantity Units	Contribution per unit	Total Contribution
		(₹)	(₹)
Р	7000	50	3,50,000
Q	10500	40	4,20,000
R	17500	36	6,30,000
			14,00,000

Problem 17 (Problem on Marginal Cost Equation)

What will be the variable cost, if Break-even Point is ₹30,000, profit is ₹1,500 and fixed cost ₹6,000?

Solution

Sales - Variable Cost - Fixed Cost = Profits

That is, Sales - Variable Cost = Contribution = Fixed Cost + Profits

At Break-even Point, there is no profit or loss.

Hence, at Break-even Point, Sales - Variable Cost = Fixed Cost

That is, ₹30,000 – Variable Cost = ₹6,000.

So, at Break-even Point, Variable Cost = ₹30,000 - ₹6,000 = ₹24,000

The problem states that there is a profit of ₹1,500. Hence, the actual sales are not ₹30,000.

Margin of Safety = Actual Sales - Break-even Sales

So, Actual Sales = Break-even Sales + Margin of Safety

Break-even Sales are ₹30,000.

Margin of Safety can be calculated using the following formula:

$$PV Ratio = \frac{Contribution}{Sales} \times 100$$

Break-even Sales are ₹30,000 and at Break-even Point Variable Costs are ₹24,000. So, Contribution is ₹6,000 (₹30,000 – ₹24,000).

Therefore,

PV Ratio =
$$\frac{₹6,000}{₹30,000} \times 100 = 20\%$$

Margin of Safety =
$$\frac{₹1,500}{20\%}$$
 = ₹7,500

So, Actual Sales = ₹30,000 + ₹7,500 = ₹37,500

Variable cost for actual sales can be calculated using the following equation:

Sales – Variable Cost = Fixed Cost + Profits

Problem 18 (Problem on calculation of Margin of Safety)

A company earned a profit of ₹30,000 during the year 2017–18. If the marginal cost and selling price of a product are ₹8 and ₹10 per unit, respectively, find the Margin of Safety.

Solution

Margin of Safety (in $\overline{\epsilon}$) = $\frac{\text{Profits}}{\text{PV Ratio}}$

So,

Margin of Safety =
$$\frac{₹30,000}{20\%}$$
 = ₹1,50,000

Problem 19 (Problem on calculation of Margin of Safety)

X Ltd. has earned a contribution of ₹2,00,000 and a net profit of ₹1,50,000 on sales of ₹8,00,000. What is the Margin of Safety?

Solution

Margin of Safety (in
$$\overline{\mathbf{\xi}}$$
) = $\frac{\text{Profits}}{\text{PV Ratio}}$
PV Ratio = $\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{\overline{\mathbf{\xi}}2,00,000}{\overline{\mathbf{\xi}}8,00,000} \times 100 = \mathbf{25\%}$

PV Ratio = $\frac{\text{Contribution}}{\text{Sales}} \times 100 = \left[\frac{(\overline{10} - \overline{8})}{\overline{10}}\right] \times 100 = 20\%$

So,

Margin of Safety = $\frac{₹1,50,000}{25^{9/2}}$ = ₹6,00,000

Problem 20 (Problem on calculation of Profits, when Break-even Point and Margin of Safety are given)

The profit–volume ratio of X Ltd. is 50% and the margin of safety is 40%. You are required to calculate the net profit if the sales volume is ₹1,00,000.

Solution

Actual Sales are ₹1,00,000.

Margin of Safety is 40%. That is, Margin of Safety is 40% of Actual Sales. So, Margin of Safety is ₹40,000.

Margin of Safety = Actual Sales - Break-even Sales

Since, Actual Sales and Margin of Safety is known, Break-even Sales can be calculated with the help of the previous formula.

So, Break-even Sales = Actual Sales – Margin of Safety = ₹1,00,000 – ₹40,000 = ₹60,000.

At Break-even Sales, there is no profit or loss.

That is, at Break-even Point, Sales - Variable Cost = Fixed Cost

Break-even Sales are ₹60,000.

PV Ratio is given as 50%. That is contribution is 50% of Sales. This also means that Variable cost is 50% of Sales, since Variable Cost Ratio and PV Ratio are complementary to each other.

So, ₹60,000 – ₹30,000 = Fixed Cost. Hence, Fixed Cost = ₹30,000.

Calculation of Profits for sales of ₹1,00,000

As per Marginal Costing Equation, Sales - Variable Cost - Fixed Cost = Profits

- Actual Sales are ₹1,00,000.
- Variable Cost is 50% of Sales
- Fixed Cost is ₹30,000.

So, profits for sales volume of ₹1,00,000 are

₹1,00,000 – ₹50,000 – ₹30,000 = Profits

Hence, profits = **₹20,000**.

Problem 21 (Problem on calculation of Profits, when Break-even Point and Margin of Safety are given)

The PV Ratio of Escorts Co. is 50% and Margin of Safety is 40%. You are required to work out the net profit and Breakeven Point if the actual sales are ₹10,00,000.

Solution

Actual Sales are ₹10,00,000.

Margin of Safety is 40%. That is, Margin of Safety is 40% of Actual Sales. So, Margin of Safety is ₹4,00,000.

Margin of Safety = Actual Sales - Break-even Sales

Since, Actual Sales and Margin of Safety are known, Break-even Sales can be calculated with the help of the previous formula.

So, Break-even Sales = Actual Sales – Margin of Safety = $\gtrless 10,00,000 - \end{Bmatrix} 4,00,000 = \end{Bmatrix} 6,00,000.$

At Break-even Sales, there is no profit or loss.

That is, at Break-even Point, Sales - Variable Cost = Fixed Cost

Break-even Sales are ₹6,00,000.

PV Ratio is given as 50%. That is contribution is 50% of Sales. This also means that Variable cost is 50% of Sales, since Variable Cost Ratio and PV Ratio are complementary to each other.

So, ₹6,00,000 – ₹3,00,000 = Fixed Cost

Hence, Fixed Cost = **₹3,00,000**.

Calculation of Profits for sales of ₹10,00,000

As per Marginal Costing Equation, Sales - Variable Cost - Fixed Cost = Profits

- Actual Sales are ₹10,00,000.
- Variable Cost is 50% of Sales
- Fixed Cost is ₹3,00,000.

So, profits for sales volume of ₹10,00,000 are

₹10,00,000 - ₹5,00,000 - ₹3,00,000 = Profits

Hence, profits = **₹2,00,000**.

Problem 22 (Problem on calculation of Break-even Point when Margin of Safety is given)

If Margin of Safety is ₹2,40,000 (40% of sales) and PV Ratio is 30% of AB Ltd. calculate its (a) Break-even Sales (b) Amount of Profit on Sales of ₹9,00,000.

Solution

(a) Calculation of Break-even Sales Margin of Safety is ₹2,40,000 which is 40% of Actual Sales. So, Actual Sales = $\frac{₹2,40,000}{40}$ × 100 = ₹6,00,000. Margin of Safety = Actual Sales – Break-even Sales Using this formula, Break-even Sales can be calculated as Actual Sales – Margin of Safety So, Break-even Sales = ₹6,00,000 – ₹2,40,000 = ₹3,60,000. (b) Calculation of Profits when Sales are ₹9,00,000 Break-even Sales are ₹3,60,000. At Break-even point, there is no profit or loss. That is, Break-even Sales – Variable Cost – Fixed Cost = Zero Or, at Break-even Sales, Contribution = Fixed Cost. PV Ratio is given as 30%. That is, Contribution is 30% of Sales. So, for Sales of ₹3,60,000, Contribution is (₹3,60,000 × 30%) = ₹1,08,000. Hence, Fixed Cost = ₹1,08,000. PV Ratio of 30% indicates that Variable Cost to Sales is 70%. Profit on Sales of ₹9,00,000 can be calculated using the following format:

Statement of Profit

	(₹)
Sales	9,00,000
Less: Variable Cost (70% of Sales)	6,30,000
Contribution	2,70,000
Less: Fixed Cost	1,08,000
Profits	1,62,000

Problem 23 (Problem on calculation of Break-even Point and Margin of Safety)

A Ltd maintains a margin of safety of 37.5% with an overall contribution-to-sales ratio of 40%. Its fixed costs amount to ₹5 lakh. Calculate the following:

- (a) Break-even Sales
- (b) Total Sales
- (c) Total Variable Costs
- (d) Current Profits
- (e) New Margin of Safety if the sales volume is increased by 7.5%

Solution

(a) Calculation of Break-even Sales

Margin of Safety is 37.5%. It means that Margin of Safety is 37.5% of Actual Sales.

Since, Margin of Safety is 'Sales over and above Break-even Sales', this statement also means that Break-even Sales are 62.5% of Actual Sales.

Break-even Sales can be calculated using the following formula:

Break-even Sales (in
$$\overline{\mathbf{\xi}}$$
) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

Fixed cost (given) = ₹5,00,000 PV Ratio (given) = 40%

So, Break-even Sales = $\frac{₹5,00,000}{40\%}$ = ₹12,50,000

(b) Calculation of Total Sales

From the statement in the problem, Margin of Safety is 37.5% of Actual Sales. So, Break-even Sales is 62.5% of Actual Sales.

Break-even Sales has been ascertained as ₹12,50,000, which is 62.5% of Actual (or Total) Sales.

So, Actual (or Total) Sales = $\frac{₹12,50,000}{62.5} \times 100 = ₹20,00,000.$

(c) Calculation of Total Variable Costs

Total Sales are ₹20,00,000.

PV Ratio (i.e., Contribution to Sales) is 40%.

Hence, Variable Cost is 60% of Sales.

So, Total Variable Cost = ₹20,00,000 × 60% = ₹12,00,000.

(d) Calculation of Current Profits

Current profits can be calculated using the following format of Statement of Profit.

Statement of Profit

	(₹)
Total Sales	20,00,000
Less: Variable Cost (60% of sales)	12,00,000
Contribu	tion 8,00,000
Less: Fixed Cost	5,00,000
Pro	ofits 3,00,000

(e) Calculation of New Margin of Safety when sales volume is increased by 7.5%

Current Total Sales = ₹20,00,000 If sales volume is increased by 7.5%, new Total Sales will be (₹20,00,000 + 7.5% of ₹20,00,000) **₹21,50,000**. Margin of Safety = Actual Sales – Break-even Sales

So, new Margin of Safety = ₹21,50,000 - ₹12,50,000 = ₹9,00,000

Problem 24 (Problem on calculation of Profits and Actual Sales, given Break-even Point)

(a) Ascertain profit when sales is ₹2,00,000; fixed cost is ₹40,000; and Break-even Point is ₹1,60,000.

(b) Ascertain sales when fixed cost is ₹20,000; profit is ₹10,000; and Break-even Point is ₹40,000.

Solution

(a) Calculation of Profits for given sales

Break-even Sales is given as ₹1,60,000. At Break-even Sales, Contribution = Fixed Cost Fixed cost is given as ₹40,000. So, for Break-even Sales of ₹1,60,000, Contribution is ₹40,000

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{\text{₹40,000}}{\text{₹1,60,000}} \times 100 = 25\%$$

PV Ratio of 25% indicates that Variable cost is 75% of Sales.

Profits for Sales of ₹2,00,000 can be calculated using the following format of Statement of Profit:

Statement of Profit

	(₹)
Total Sales	2,00,000
Less: Variable Cost (75% of Sales)	1,50,000
Contribution	50,000
Less: Fixed Cost (given)	40,000
Profits	10,000

(b) Calculation of Sales for given Profits

Break-even Sales is given as ₹40,000. At Break-even Sales, Contribution = Fixed Cost. Fixed Cost is given as ₹20,000. So, for Break-even Sales of ₹40,000, contribution is ₹20,000.

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{₹20,000}{₹40,000} \times 100 = 50\%$$

Profits are given as ₹10,000.

With the help of Profits and PV Ratio, Margin of Safety can be calculated using the following formula:

Margin of Safety (in $\overline{\mathbf{x}}$) = $\frac{\text{Profits}}{\text{PV Ratio}} = \frac{\overline{\mathbf{x}}10,000}{50\%} = \overline{\mathbf{x}}20,000$

Margin of Safety (in $\overline{\mathbf{x}}$) = Actual Sales (in $\overline{\mathbf{x}}$) – Break-even Sales (in $\overline{\mathbf{x}}$)

On the basis of the previous formula, Actual Sales can be calculated as

Break-even Sales + Margin of Safety

Hence, Actual Sales = ₹40,000 + ₹20,000 = ₹**60,000**.

Problem 25 (Problem on calculation of Sales and Profits)

The ratio of variable cost to sales is 70%. The Break-even Point occurs at 60% of the capacity sales. Find the capacity sales when fixed costs are 390,000. Also compute profit at 75% of the capacity sales.

Solution

(a) Calculation of Capacity Sales

Break-even Sales (in
$$\overline{\mathbf{x}}$$
) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

Fixed Cost is given as ₹90,000. PV Ratio is not provided for. However, Variable Cost Ratio is given as 70%. Hence, **PV Ratio** = 100 - 70 = 30%

So, Break-even Sales = $\frac{₹90,000}{30\%}$ = ₹3,00,000

Problem states that Break-even Sales are 60% of Capacity Sales.

Hence, Capacity Sales = $\frac{₹3,00,000}{60} \times 100 = ₹5,00,000$

(b) Calculation of Profits for Sales at 75% Capacity

Profits can be calculated using the following format of Statement of Profits

	(₹)
Sales (75% of Capacity = 75% of ₹5,00,000)	3,75,000
Less: Variable Cost (70% of Sales)	2,62,500
Contribution	1,12,500
Less: Fixed Cost (given)	90,000
Profits	22,500

Problem 26 (Problem on calculation of Break-even Point and number of units to be sold for earning desired profits)

The following data is given to you:

Particulars	Amount
Selling price per unit	₹20
Variable manufacturing cost per unit	₹11
Variable selling cost per unit	₹3
Fixed factory overhead	₹5,40,000
Fixed selling overhead	₹2,52,000

You are required to compute:

- (a) Break-even point (value)
- (b) Number of units that must be sold to earn a profit of ₹60,000 per annum
- (c) How many units must be sold to earn a net income of 10% on sales?

Solution

(a) Calculation of Break-even Point

Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$
Total Fixed Cost = Fixed Factory Overheads + Fixed Selling Overhead = ₹5,40,000 + ₹2,52,000 = ₹7,92,000 Selling Price per unit = ₹20
Variable Cost per unit = $\overline{11} + \overline{3} = \overline{14}$ Contribution per unit = $\overline{11} + \overline{3} = \overline{14}$
PV Ratio = $\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{\overline{<}6}{\overline{<}20} \times 100 = 30\%$
So, Break-even Sales (in ₹) = $\frac{₹7,92,000}{30\%}$ = ₹26,40,000
Break-even Point (in units) = $\frac{\text{Total Fixed Cost}}{\text{Contribution per Unit}} = \frac{₹7,92,000}{₹6} = 1,32,000 \text{ Units}$

Statement of Profit

(b) Calculation of Number of Units to be sold for earning a desired profit of ₹60,000

Number of units to be sold for earning desired profits = $\frac{\text{Desired Profits + Fixed Cost}}{\text{Contribution per unit}}$

So, Number of units to be sold = $\frac{(₹60,000 + ₹7,92,000)}{₹6}$ = 1,42,000 Units

(c) Calculation of Number of Units for earning a profit of 10% on Sales

Selling Price per unit is ₹20 Let the number of units to be sold be X Then, the total sales will be **20X** Desired Profits are 10% on Sales Hence, the desired profits will be **2X** (i.e., 10% of 20X) Variable Cost per unit is ₹14 Hence, for X units, the total variable cost will be 14X Total Fixed Costs are ₹7,92,000 Profits are calculated using the following equation: Profits = Sales - Variable Costs - Fixed Costs So, 2X = 20X - 14X - ₹7,92,000That is, 2X = 6X - ₹7,92,000or 6X - 2X = ₹7,92,000

Therefore, $X = \frac{\overline{7},92,000}{4} = 1,98,000$ Units.

So, the number of units to be sold for earning a profit of 10% on Sales is **1,98,000** Verification

The answer can be verified by calculating profits for sale of 1,98,000 units.

Statement of Profit

	(₹)
Sales (1,98,000 units × ₹20 per unit)	39,60,000
Less: Variable Cost (1,98,000 units × ₹14 per unit)	27,72,000
Contribution	11,88,000
Less: Fixed Cost (given)	7,92,000
Profits	3,96,000

Sales are ₹39,60,000 and profits are ₹3,96,000 which is 10% on sales.

Hence, the number of units to be sold for earning profits of 10% of sales is 1,98,000

Problem 27 (Problem on calculation of Break-even Point and number of units to be sold for earning desired profits)

Asan Industries specialise in the manufacture of small-capacity motors. The cost structure of a motor is as under:

Material: ₹50

Labour: ₹80

Variable overheads: 75% of labour cost

Fixed overheads of the company amount to ₹2.40 lakh per annum

The sale price of the motor is ₹230 each

- (a) Determine the number of motors that have to be manufactured and sold in a year in order to break even.
- (b) How many motors have to be made and sold to make a profit of $\overline{1}$ lakh per year?
- (c) If the sale price is reduced by ₹15, how many motors have to be sold to break even?

Solution

(a) Calculation of Break-even units

Break even Sales (in units) -	Fixed Cost
Break-even Sales (in units) =	Contribution per unit

Fixed Costs (given) = ₹2,40,000

Calculation of Contribution per unit

	₹ Per Motor	₹ Per Motor
Selling Price		230.00
Less: Variable Cost		
Material	50.00	
Labour	80.00	
Variable overheads (75% of Labour Cost)	60.00	190.00
Contribution per unit		40.00

So, Break-even Point (in units) = $\frac{\overline{2},40,000}{\overline{4}0 \text{ per motor}} = 6,000 \text{ motors}$

(b) Calculation of Number of Motors to be sold for earning a profit of ₹1,00,000

Number of units to be sold for earning desired profits = $\frac{\text{(Desired Profits + Fixed Cost)}}{\text{Contribution per unit}}$

So, Number of motors to be sold = $\frac{(\bar{1},00,000 + \bar{1},2,40,000)}{\bar{1},000} = 8,500$ motors

(c) Calculation of new Break-even Point when selling price is reduced by ₹15 per motor

Break-even Sales (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$

Fixed costs (given) = ₹2,40,000.

Calculation of Contribution per unit

	Cost Per Motor (₹)	Cost Per Motor (₹)
Selling Price		215.00
Less: Variable Cost		
Material	50.00	
Labour	80.00	
Variable overheads (75% of Labour Cost)	60.00	190.00
Contribution per unit		25.00

So, Break-even Point (in units) =
$$\frac{₹2,40,000}{₹25 \text{ per motor}} = 9,600 \text{ motors}$$

Problem 28 (Problem on calculation of profits at given sales, and calculation of sales for desired profits)

Malnad Timber Corporation estimates the variable cost to be ₹24 per unit and fixed cost ₹2,10,000 per annum. The plant capacity is 30,000 units annually. Management estimates that 10,000 units can be sold if the selling price is ₹60 per unit, 15,000 units if the selling price is ₹50 per unit, 20,000 units if the selling price is ₹40 per unit, and 30,000 units if the selling price is ₹35 per unit.

- (a) You are required to find the price, which will yield the largest net profit.
- (b) At what rate would the sale of 20,000 units yield the net profit that would be produced by the sale of 10,000 units at ₹60 per unit?

Solution

(a) Calculation of Profits at different volume of sales

Profits at different volume and price can be calculated using the following format of Statement of Profits:

	Sales Volume and Selling Price per unit			
	10,000 Units @ ₹60 per Unit	15,000 Units @ ₹50 per Unit	20,000 Units @ ₹40 per Unit	30,000 Units @ ₹35 per Unit
Sales	6,00,000	7,50,000	8,00,000	10,50,000
Less: Variable Cost @ ₹24 per unit	2,40,000	3,60,000	4,80,000	7,20,000
Contribution	3,60,000	3,90,000	3,20,000	3,30,000
Less: Fixed Cost	2,10,000	2,10,000	2,10,000	2,10,000
Profits	1,50,000	1,80,000	1,10,000	1,20,000

Statement of Profits

Sale of **15,000 units at a price of ₹50 per unit** yields the largest profit.

(b) Calculation of Selling price for desired profits

Selling 10,000 units at ₹60 per unit results in a profit of ₹1,50,000 Hence, the desired profits are ₹1,50,000, which must be earned by a sale of 20,000 units. Fixed costs are ₹2,10,000. Desired Profits + Fixed Cost = Required Contribution So, Required Contribution = ₹1,50,000 + ₹2,10,000 = ₹3,60,000 By Selling 20,000 units the Contribution that could be generated is ₹3,60,000 That is, Required Contribution per unit = $\frac{₹3,60,000}{20,000 \text{ units}} = ₹18$

Variable cost is ₹24 per unit Required Contribution per unit + Variable Cost per unit = Required Selling Price per unit Hence, Selling Price per unit for earning profits of ₹1,50,000 by selling 20,000 units is ₹18 + ₹24 = ₹42

Problem 29 (Problem on calculation of number of units to be sold for earning desired profits)

Handle Containers Ltd. produces and supplies industrial containers to a chemical company. Due to competition, the firm is considering the proposal to reduce the selling price. However, if it is desired to maintain the present level of profits as shown below:

Particulars	Amount (₹)
Present sales (30,000 containers)	3,00,000
Variable cost (₹6 per unit)	1,80,000
Contribution	1,20,000
Fixed cost	70,000
Profits	50,000

Indicate the number of containers to be produced and sold to maintain the present level of profits if the prices are reduced by 5%, 10% and 15%.

Solution

Present level of Profits = ₹50,000

For maintaining the same level of profits, the required contribution is ₹1,20,000 (i.e., Desired Profits ₹50,000 + Fixed Cost ₹70,000)

Number of units to be sold for earning desired profits = $\frac{\text{Required Contribution}}{\text{Contribution per unit}}$

Contribution pe

Contribution per unit = Selling Price per unit - Variable Cost per unit

Present Selling Price is ₹10 (Sales ₹3,00,000/30,000 Containers) per container.

Present Variable Cost is ₹6 per container (given).

Calculation of number of units to be sold for earning desired profits is shown in the following table:

Table showing calculation of Number of units to be sold

	When Selling Price is reduced by		
	5%	10%	15%
Present Selling Price	10.00	10.00	10.00
Less: Reduction in Selling Price	00.50	01.00	01.50
	09.50	09.00	08.50
Less: Variable Cost per unit	06.00	06.00	06.00
Contribution per container	03.50	03.00	02.50
Required Contribution	₹1,20,000	₹1,20,000	₹1,20,000
Number of containers to be sold for earning	₹1,20,000	₹1,20,000	₹1,20,000
required contribution =	₹3.50	₹3.00	₹2.50
Required Contribution/Contribution per container	= 34,285.71 or	= 40,000	= 48,000
	34,286 (rounded off)		

Problem 30 (Problem on calculation of Break-even Point, when cost details at different levels of output are given)

Determine Break-even Point from the given data:

Output: 39,000 units; total cost: ₹2,47,000

Output: 1,04,000 units; total cost: ₹4,42,000

Unit selling price: ₹5

Solution

Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$

For calculating Break-even Point in this case, the following must be ascertained:

- (a) Fixed Cost
- (b) Contribution per unit
- (c) PV Ratio

(a) Calculation of Fixed Cost

Problem has provided information on Total Cost at two different levels of output.

Total cost comprises of two components: Variable Cost and Fixed Cost.

Fixed cost being constant, any change in total cost with change in output is on account of change in variable cost.

For an output of 39,000 units, the total cost is ₹2,47,000, and

For an output of 1,04,000 units, the total cost is ₹4,42,000

For an increase in the output by 65,000 units, the increase in total cost is ₹1,95,000

This represents Total Variable Cost for the additional units of 65,000 units.

So, Variable Cost per unit = $\frac{\overline{1,95,000}}{65,000 \text{ units}} = \overline{33}$

In short, Variable Cost per unit = $\frac{\text{Difference in Total Cost}}{\text{Difference in Production}}$

Calculation of fixed cost is shown in the following table:

		When Output is	
		39,000 Units	1,04,000 Units
Total Cost		2,47,000	4,42,000
Less: Variable Cost (₹3 per unit)		1,17,000	3,12,000
	Fixed Cost	1,30,000	1,30,000

(b) Calculation of Contribution per unit

Contribution per unit = Selling Price per unit – Variable Cost per unit So, **Contribution per unit** = ₹5 - ₹3 = ₹2

Calculation of PV Ratio

PV Ratio = $\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{\overline{2}}{\overline{2}} \times 100 = 40\%$

(c) Calculation of Break-even Point

Break-even Point $(\overline{\mathbf{x}}) = \frac{\text{Fixed Cost}}{\text{PV Ratio}} = \frac{\overline{\mathbf{x}}1,30,000}{40\%} = \overline{\mathbf{x}}3,25,000$ Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\overline{\mathbf{x}}1,30,000}{\overline{\mathbf{x}}2} = 65,000$ units

Problem 31 (Problem on calculation of Break-even Point when profit/loss at different levels of output are given)

A company sells its product at ₹15 per unit. In a period if it produces and sells 8,000 units, it incurs a loss of ₹5 per unit. If the volume is raised to 20,000 units it earns a profit of ₹4 per unit. Calculate Break-even Point both in terms of rupees as well as in units.

Solution

Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

Break-even Point (in Units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$

For calculating Break-even Point in this case, the following must be ascertained:

- (a) Fixed Cost
- (b) Contribution per unit
- (c) PV Ratio

(a) Calculation of Fixed Cost

Problem has provided information on Profit or Loss at different levels of output.

When 8000 units are sold, the company incurs a loss of ₹5 per unit, and

When 20,000 units are sold, the company makes a profit of ₹4 per unit

That is, for a sale of 8,000 units, Profits are (-) ₹40,000 (i.e., Loss)

And for sale of 20,000 Units, Profits are ₹80,000

Sales – Total Cost = Profits (or Loss)

That is, Total Cost = Sales - Profits

From the given details, Total cost at each level of Sales can be calculated, which is shown in the following table:

	When Sales is	
	8,000 Units	20,000 Units
Sales (@ ₹15 per Unit)	1,20,000	3,00,000
Less: Profits	(-) 40,000	80,000
Total Cost	1,60,000*	2,20,000

Note: Subtraction of negative profits results in addition

Total cost comprises of two components viz., Variable Cost and Fixed Cost.

Fixed cost being constant, any change in total cost with change in output is on account of change in variable cost. For an output and sales of 8,000 units, the total cost is ₹1,60,000, and

For an output and sales of 20,000 units, the total cost is ₹2,20,000.

Variable Cost per Unit =
$$\frac{\text{Difference in Total Cost}}{\text{Difference in Production}}$$

So, Variable cost per unit =
$$\frac{\text{₹}60,000}{12,000 \text{ Units}} = \text{₹5}$$

Calculation of fixed cost is shown in the following table:

		When Output Sales are	
		8,000 units	20,000 units
Total Cost		1,60,000	2,20,000
Less: Variable Cost (₹5 per unit)		40,000	1,00,000
	Fixed Cost	1,20,000	1,20,000

(b) Calculation of Contribution per unit

Contribution per unit = Selling Price per unit – Variable Cost per unit So, **Contribution per unit** = $\overline{\mathbf{x}} \mathbf{15} - \overline{\mathbf{x}} \mathbf{5} = \overline{\mathbf{x}} \mathbf{10}$

(c) Calculation of PV Ratio

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{₹10}{₹15} \times 100 = 66.67\%$$

Calculation of Break-even Point

Break-even Point (₹) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}} = \frac{₹1,20,000}{66.67\%} = ₹1,80,000$ Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{(1,20,000)}}{\text{(1,100)}} = 12,000 \text{ units}$

Problem 32 (Problem on calculation of Break-even Point when profits at different levels of output are given)

The sales and cost of a company during two periods were as follows:

Period	Sales (₹)	Profits (₹)
Ι	1,00,000	10,000
II	1,50,000	20,000

- (a) Find the Break-even Point.
- (b) What amount of sales will generate a profit of ₹40,000?
- (c) What will be the profits if the sales are ₹1,20,000?

Solution

(a) Calculation of Break-even Point

Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

For calculating Break-even Point in this case, the following must be ascertained:

- Fixed Cost
- PV Ratio

Calculation of Fixed Cost

Problem has provided information on Profits at different levels of Sales.

For Sales of ₹1,00,000, the profits are ₹10,000 and

For Sales of ₹1,50,000, the profits are ₹20,000

Sales – Total Cost = Profits (or Loss)

That is, Total Cost = Sales - Profits

So, Total Cost for Sales of ₹1,00,000 is ₹90,000 and

Total Cost for Sales of ₹1,50,000 is ₹1,30,000

Total cost comprises of two components viz., Variable Cost and Fixed Cost.

Fixed cost being constant, any change in total cost with change in output is on account of change in variable cost.

Variable Cost Ratio = $\frac{\text{Difference in Total Cost}}{\text{Difference in sales}}$

So, Variable Cost Ratio =
$$\frac{₹40,000}{50,000 \text{ units}} = 80\%$$

Calculation of fixed cost is shown in the following table:

	When Sales is	
	₹1,00,000 ₹1,50,000	
Total Cost	90,000	1,30,000
Less: Variable Cost (80% of Sales)	80,000	1,20,000
Fixed Cost	10,000	10,000

Calculation of PV Ratio

Variable cost Ratio (i.e., Variable cost as a percentage of Sales) is 80% Hence, **PV Ratio** = 100 - 80 = 20% Alternatively,

PV Ratio = $\frac{\text{Difference in Profits}}{\text{Difference in Sales}} \times 100 = \frac{₹10,000}{₹50,000} \times 100 = 20\%$

Calculation of Break-even Point

Break-even Point (₹) = $\frac{₹10,000}{20\%}$ = ₹50,000

(b) Calculation of Sales for desired Profits of ₹40,000

Required Sales for earning Desired Profits = $\frac{\text{Desired Profits + Fixed Cost}}{\text{PV Ratio}}$

So, Required Sales = $\frac{₹40,000 + ₹10,000}{20\%} = ₹2,50,000$

(c) Calculation of Profits for Sales of ₹1,20,000

The profit for given sales is calculated using the following format:

Statement of Front	
	(₹)
Total Sales	1,20,000
Less: Variable Cost (80% of Sales)	96,000
Contribution	24,000
Less: Fixed Cost	10,000
Profits	14,000

Statement of Profit

Problem 33 (Problem on calculation of Break-even Point and Margin of Safety)

The following figures relate to a company manufacturing a varied range of products:

Year ended	Sales (₹)	Total Cost (₹)
31 December 2016	22,23,000	19,83,600
31 December 2017	24.51,000	21,43,200

Assuming stability in price, with variable costs carefully controlled to reflect predetermined relationships, and unvarying figure costs, calculate:

- (a) Profit-Volume Ratio, to reflect the rate of growth for profit and sales
- (b) Fixed Cost
- (c) Fixed Cost % to Sales
- (d) Break-even point and
- (e) Margin of Safety for the year 2016 and 2017

Solution

(a) Calculation of Profit-Volume Ratio

$$PV Ratio = \frac{Difference in Profits}{Difference in Sales} \times 100$$

Sales and profits for 2016 and 2017 are shown in the following table:

Year ended	Sales (₹)	Total Cost (₹)	Profits (₹)
31 December 2016	22,23,000	19,83,600	2,39,400
31 December 2017	24.51,000	21,43,200	3,07,800

PV Ratio =
$$\left[\frac{(₹3,07,800 - ₹2,39,400)}{(₹24,51,000 - ₹22,23,000)}\right] \times 100 = \frac{₹68,400}{₹2,28,000} \times 100 = 30\%$$

(b) Calculation of Fixed Cost

PV Ratio of 30% indicates that Variable Cost is 70% of Sales Calculation of fixed cost is shown in the following table:

	2016 (₹)	2017 (₹)
Sales	22,23,000	24,51,000
Total Cost (given)	19,83,600	21,43,200
Less: Variable Cost (70% of Sales)	15,56,100	17,15,700
Fixed Cost	4,27,500	4,27,500

(c) Calculation of Fixed Cost % on Sales

The calculation is shown in the following table:

	2016 (₹)	2017 (₹)
Sales	22,23,000	24,51,000
Fixed Cost	4,27,500	4,27,500
Fixed Cost as a % of Sales	19.23%	17.44%

(d) Calculation of Break-even Point

Break-even Point (in $\overline{\mathbf{e}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

So, Break-even Point =
$$\frac{₹4,27,500}{30\%}$$
 = ₹14,25,000

(e) Calculation of Margin of Safety

Margin of Safety = Actual Sales – Break-even Sales. Calculation of Margin of Safety is shown in the following table:

		2016	2017
		(₹)	(₹)
Actual Sales		22,23,000	24,51,000
Less: Break-even Sales		14,25,000	14,25,000
Г	Margin of Safety	7,98,000	10,26,000

Problem 34 (Problem on calculation of Break-even Point and Margin of Safety)

S Ltd., a multi-product company, furnishes the following data relating to the year 2017:

	I Half of the year (₹)	II Half of the year (₹)
Sales	45,000	50,000
Total Cost	40,000	43,000

Assuming that there is no change in prices and variable costs and that the fixed costs are incurred equally in the two halfyear periods, calculate for the year 2017:

- (a) Profit-Volume Ratio
- (b) Fixed Expenses
- (c) Break-even Sales and
- (d) Percentage of Margin of Safety to Total Sales

Solution

(a) Calculation of Profit-Volume Ratio

 $PV Ratio = \frac{Difference in Profits}{Difference in Sales} \times 100$

Sales and profits for I half and II half of 2017 are shown in the following table:

Period Ended	Sales (₹)	Total Cost (₹)	Profits (₹)
I Half Year	45,000	40,000	5,000
II Half Year	50,000	43,000	7,000

PV Ratio =
$$\left[\frac{(₹7,000 - ₹5,000)}{(₹50,000 - ₹45,000)}\right] \times 100 = \frac{₹2,000}{₹5,000} \times 100 = 40\%$$

(b) Calculation of Fixed Expenses

PV Ratio of 40% indicates that Variable Cost is 60% of Sales. Calculation of fixed cost is shown in the following table:

		I Half (₹)	II Half (₹)
Sales		45,000	50,000
Total Cost (given)		40,000	43,000
Less: Variable Cost (60% of Sales)		27,000	30,000
	Fixed Cost	13,000	13,000

(c) Calculation of Break-even Sales for 2017

Break-even Sales (in $\overline{\mathfrak{R}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

Fixed Cost for 2017 = ₹13,000 for I Half + ₹13,000 for II Half = ₹26,000. PV Ratio = 40%

So, Break-even Sales (in ₹) for $2017 = \frac{₹26,000}{40\%} = ₹65,000$

(d) Calculation of Margin of Safety and its percentage on Total Sales

Margin of Safety = Actual Sales - Break-even Sales Actual Sales for 2017 = ₹45,000 + ₹50,000 = ₹95,000. Break-even Sales = ₹65.000. Hence, Margin of Safety for 2017 = ₹95,000 - ₹65,000 = ₹30,000. Margin of Safety as a percentage of Total Sales = $\frac{₹30,000}{₹95,000} \times 100 = 31.58\%$

Problem 35 (Problem on calculation of Break-even Point and Profits)

Laila Shoe Company sells five different styles of ladies' chappals with identical purchase costs and selling prices. The company is trying to find out the profitability of opening another store, which will have the following expenses and revenues:

Particulars	Amount (₹)
Selling price per pair	30.00
Variable Cost per pair	19.50
Salesmen's commission	1.50

Annual fixed expenses are:

Particulars	Amount (₹)
Rent	60,000
Salaries	2,00,000
Advertising	80,000
Other fixed expenses	20,000

Required:

- (a) Calculate the annual Break-even Point in units and in value. Also determine the profit or loss if 35,000 pairs of chappals are sold.
- (b) The sales commissions are proposed to be discontinued, but instead a fixed amount of ₹90,000 is to be incurred in fixed salaries. A reduction in selling price of 5% is also proposed. What will be the Break-even Point in units?
- (c) It is proposed to pay the store manager 50 Paisa per pair, as further commission. The selling price is also proposed to be increased by 5%. What would be the Break-even Point in units?
- (d) Refer to the original data. If the store manager were to be paid 30 Paisa commission on each pair of *chappal* sold in excess of the Break-even Point, what would be the store's net profit if 50,000 pair were sold?

Note: Consider each part of the question separately.

Solution

(a) Calculation of Break-even Point and Profits

Selling Price per pair = ₹30 Variable Cost per pair = ₹19.50 + ₹1.50 = ₹21.00

Total Fixed Cost (₹)	
Rent	60,000
Salaries	2,00,000
Advertising	80,000
Other fixed expenses	20,000
	3,60,000

Contribution per unit = ₹30 - ₹21 = ₹9.

Calculation of Break-even Point (in ₹)

Break-even Point (in $\overline{\mathbf{x}}$) = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{\cancel{7}9}{\cancel{7}30} \times 100 = 30\%$$

Break-even Point (in ₹) = $\frac{₹3,60,000}{30\%}$ = ₹12,00,000

Calculation of Break-even Point (in units)

Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{₹3,60,000}{₹9 \text{ per unit}} = 40,000 \text{ units}$

Calculation of Profits for Sale of 35,000 Pairs

The profits are calculated by preparing Statement of Profits

Statement of Profits

(No. of pairs - **35000**)

	Per pair (₹)	Total (₹)
Total Sales	30	10,50,000
Less: Variable Cost	21	7,35,000
Contribution	9	3,15,000
Less: Fixed Cost		3,60,000
Profits		(-)45,000

Sale of 35,000 pairs results in a Loss of ₹45,000.

(b) Calculation of new Break-even Point

New Selling Price per pair = ₹30 – Reduction of 5% = ₹30 - ₹1.50 = ₹28.50New Variable Cost per pair = ₹19.50 (Sales commission discontinued)

New Total Fixed Cost (₹)	
Rent	60,000
Salaries	2,00,000
Advertising	80,000
Salaries	90,000
Other fixed expenses	20,000
	4,50,000

New Contribution per unit = ₹28.50 - ₹19.50 = ₹9Calculation of Break-even Point (in units)

Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{₹4,50,000}}{\text{₹9 per unit}} = 50,000 \text{ units}$

(c) Calculation of New Break-even Point

New Selling Price per pair = $\overline{\mathbf{x}}_{30} + 5\%$ increase = $\overline{\mathbf{x}}_{30} + \overline{\mathbf{x}}_{1.50} = \overline{\mathbf{x}}_{31.50}$ Variable Cost per pair = $\overline{\mathbf{x}}_{19.50} + \overline{\mathbf{x}}_{1.50} + \overline{\mathbf{x}}_{0.50}$ (Store Manager's Commission) = $\overline{\mathbf{x}}_{21.50}$

Total Fixed Cost (₹)	
Rent	60,000
Salaries	2,00,000
Advertising	80,000
Other fixed expenses	20,000
	3,60,000

Contribution per unit = ₹31.50 - ₹21.50 = ₹10.00Calculation of Break-even Point (in units)

Break-even Point (in units) = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{\text{₹3,60,000}}{\text{₹10 per unit}} = 36,000 \text{ units}$

(d) Calculation of Profits for sale of 50,000 pairs when there is an additional commission for sales over and above Break-even Sales

For the original data, break-even units were 40,000. So, the number of pairs sold over and above Break-even Sales is 10,000.

Profits are calculated by preparing Statement of Profits.

Statement of Profits

(No. of Pairs - 50,000)

	Per pair (₹)	Total (₹)
Total Sales	30	15,00,000
Less: Variable Cost	21	10,50,000
		4,50,000
Less: Store Manager's Commission @ ₹0.30 for each pair sold		
over and above Break-even Sales (10,000 Pairs × ₹0.30)		3,000
Contribution		4,47,000
Less: Fixed Cost		3,60,000
Profits		87,000

Problem 36 (Problem on calculation of Break-even Point and Profits, in the event of merger)

There are two similar plants under the same management. The management desires to merge the two plants. The following particulars are available:

Particulars	Factory One	Factory Two
Capacity operation	100%	60%
Sales	₹300 lakh	₹120 lakh
Variable Cost	₹220 lakh	₹90 lakh
Fixed Cost	₹40 lakh	₹20 lakh
Profits	₹40 lakh	₹10 lakh

Find:

- (a) The capacity of the merged plant to be operated for the purpose of break-even; and
- (b) The profitability on working at 75% of the merged capacity.

Solution

(a) Calculation of Break-even Capacity of the merged plant

For calculating the Break-even Sales of the merged entity, the details of the merged plant at 100% capacity are required. The same is calculated and shown in the following table:

(₹	in	lak	h)
()		Tan	11)

	Factory One	Factory Two		Merged Plant
	At 100% Capacity	At 60% Capacity	At 100% Capacity	At 100% Capacity
	(₹)	(₹)	(₹)	(₹)
Sales	300	120	200	500
Variable Cost	220	90	150	370
Fixed Cost	40	20	20	60

Notes:

- i. In case of Factory Two, details are given at 60%. Sales and variable cost vary proportionately with capacity. Fixed cost remains same.
- ii. The sales and costs of the merged plant is obtained by taking the sum of sales and costs of Factory One and Factory Two at 100% capacities.

For merged plant, Contribution = Sales – Variable Cost = ₹500 lakh – ₹370 lakh = ₹130 lakh.

PV Ratio =
$$\frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{₹130 \text{ lakh}}{₹500 \text{ lakh}} \times 100 = 26\%$$

Break-even Sales = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

So, Break-even Sales for merged plant = $\frac{\notin 60 \text{ lakh}}{26\%} = \notin 230.77 \text{ lakh}$

Sales of merged entity at 100% Capacity is ₹500 lakh.

The capacity at which the merged plant must operate to Break-even is

₹230.77 lakh ₹500 lakh ×100 = **46.15%**

(b) Calculation of Profits of the merged plant at 75% capacity of operation Sales of merged entity at 100% Capacity is ₹500 lakh So, at 75% Capacity, the Sales will be (₹500 lakh × 75%) = ₹375 lakh At 100% Capacity, the variable costs of the merged plant are ₹370 lakh

So, Variable Cost Ratio = $\frac{₹370 \text{ lakh}}{₹500 \text{ lakh}} \times 100 = 74\%$

Profits at 75% capacity are calculated by preparing Statement of Profits

Statement of Profits

	₹ in lakh
Sales at 75% Capacity	375.00
Less: Variable Cost (74% of Sales)	277.50
Contribution	97.50
Less: Fixed Cost	60.00
Profits	37.50

 $Profitability = \frac{Profits}{Sales} \times 100$

So, **Profitability at 75% Capacity** = $\frac{₹37.5 \text{ lakh}}{₹375 \text{ lakh}} \times 100 = 10\%$

Problem 37 (Problem on calculation of Break-even Point and Margin of Safety)

Boss Pens Pvt. Ltd. is currently manufacturing and marketing two types of pens under the brand names "Challenge" and "Zenith". The cost break-up and other details for the financial year 2017–18 are as follows:

	Challenge	Zenith
Production and sales (units)	25,000	20,000
Selling price per unit (₹)	6.00	10.00
Variable cost per unit (₹)		
Materials	0.50	0.60
Labour	0.75	0.80
Expenses	0.05	0.10
Factory overhead	0.70	1.00
Selling and distribution overhead	1.00	1.50
Total fixed costs (₹)		
Factory	17,500	20,000
Selling and distribution	25,000	30,000
Administration	10,000	13,000

Required:

- (a) What is the minimum number of pens of each brand to be sold in order to break even?
- (b) What is the Margin of Safety for each brand?
- (c) What is the level of sales required to earn a profit of ₹30,000 for "Challenge" and ₹75,000 for "Zenith" in the financial year 2018–19?
- (d) The company is expecting that material cost is likely to increase in financial year 2018–19 by 100% for both the brands. What is the impact on the existing Break-even Points? By how much should the selling price of each brand be increased for maintaining the previous years' profits level?

Solution

(a) Calculation of Break-even units

Break-even units = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$

The calculation of Break-even Point for both the brands is shown in the following table:

	Challenge	Zenith
Selling price per unit (₹)	6.00	10.00
Variable cost per unit (₹)		
Materials	0.50	0.60
Labour	0.75	0.80
Expenses	0.05	0.10
Factory overhead	0.70	1.00
Selling and distribution overhead	1.00	1.50
	3.00	4.00
		(Contd.)

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Contribution per unit	3.00	6.00
Total fixed costs (₹)		
Factory	17,500	20,000
Selling and distribution	25,000	30,000
Administration	10,000	13,000
	52,500	63,000
	₹52,500	₹63,000
Break-even units = Fixed Cost/Contribution per unit	₹3	₹6
	= 17,500 Pens	= 10,500 Pens

(b) Calculation of Margin of Safety

Margin of Safety = Actual Sales – Break-even Sales

Margin of Safety for the two products is shown in the following table

	Challenge	Zenith
Actual Production and Sales (units)	25,000	20,000
Less: Break-even Sales (units)	17,500	10,500
Margin of Safety	7,500 Pens	9,500 Pens

(c) Calculation of Sales for desired Profits

The problem asks for calculation of Sales for the next financial year. It is assumed that sales and cost details remain the same as the current financial year, for next financial year also.

Required Sales (units) for earning desired Profits =	Desired Profits + Fixed Costs
	Contribution per unit

Calculation of required sales is shown in the following table:

	Challenge (₹)	Zenith (₹)
Desired Profits	30,000	75,000
Add: Fixed Costs	52,500	63,000
Desired Contribution	82,500	1,38,000
Contribution per unit	3.00	6.00
Required Sales (units)	₹82,500 ₹3 per unit	₹1,38,000 ₹6 per unit
	= 27,500 units	= 23,000 units

Calculation of Break-even Point and Selling Price per unit for desired profits for next financial year, when material cost increases by 100%.

(i) Calculation of Break-even Point

Break-even units =
$$\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$$

	Challenge	Zenith
Selling price per unit (₹)	6.00	10.00
Variable cost ner unit (₹)		
Materials	1.00	1.20
Labour	0.75	0.80
Expenses	0.05	0.10
Factory overhead	0.70	1.00
Selling and distribution overhead	1.00	1.50
	3.50	4.60
Contribution per unit	2.50	5.40
Total fixed costs (₹)	17,500	20,000
Factory	25,000	30,000
Selling and distribution	10,000	13,000
Administration	52,500	63,000
Break-even units = Fixed Cost/Contribution per unit	₹52,500 ₹2.50	₹63,000 ₹5.40
	= 21,000 Pens	= 11,667 Pens

The calculation of Break-even Point for both the brands is shown in the following table:

(ii) Calculation of Selling Price for 2018–19 for maintaining same level of profits of 2017–18 For this purpose, the profits for 2017–18 must be first ascertained. It is calculated by preparing Statement of Profits.

Statement of Profits

	Challenge (25,000 units) (₹)	Zenith (20,000 Units) (₹)
Sales (No. of units × Respective Selling Price per unit)	1,50,000	2,00,000
Less: Variable Cost (No. of Units × Variable Cost per unit)	75,000	80,000
Contribution	75,000	1,20,000
Less: Fixed Costs	52,500	63,000
Profits	22,500	57,000

Required Contribution for earning desired profits = Desired Profits + Fixed Cost

Required Contribution per unit = <u>Total Required Contribution</u>

No. of units

Required Selling Price = Required Contribution per unit + Variable Cost per unit

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Calculation of the required selling price is shown in the following table:

	Challenge (25,000 units) (₹)	Zenith (20,000 Units) (₹)
Desired Profits	22,500	57,000
Add: Fixed Cost	52,500	63,000
Required Contribution	75,000	1,20,000
Required Contribution per unit =		
Required Contribution/Number of units	3.00	6.00
Add: Variable cost per unit	3.50	4.60
Required Selling Price per unit	6.50	10.60

Note: The increase in selling price is same as the increase in the variable cost.

Problem 38 (Problem on Composite PV Ratio and Composite BEP)

Following information is provided to you

Product	Sales Revenue (₹)	Variable Cost (₹)
Х	20,000	10,000
Y	40,000	14,000
Z	60,000	36,000

Fixed Cost: ₹50,000

You are required to compute:

- (a) Composite PV Ratio
- (b) Composite BEP

Solution

(a) Calculation of Composite PV Ratio

Composite PV Ratio = $\frac{\text{Total Contribution}}{\text{Total Sales}} \times 100$

Total Contribution is calculated in the following table:

Product	Sales Revenue (₹)	Variable Cost (₹)	Contribution (₹)
X	20,000	10,000	10,000
Y	40,000	14,000	26,000
Z	60,000	36,000	24,000
Total	1,20,000		60,000

So, Composite PV Ratio = $\frac{\overline{\xi}60,000}{\overline{\xi}1,20,000} \times 100 = 50\%$

(b) Calculation of Composite Break-even Point

Composite Break-even Point = $\frac{\text{Total Fixed Cost}}{\text{Composite PV Ratio}} = \frac{\text{₹50,000}}{50\%} = \text{₹1,00,000}$

Problem 39 (Problem on calculation of Break-even Point, required sales for earning desired profits and required sales when operations are stopped)

SSMR Ltd. has invested ₹20.00.000 in a business. The desired return on investment is 15%. From the analysis of recent cost figures, it is found that the variable cost is 60% and fixed cost is ₹8,00,000. Show workings to answer the following questions:

- (a) What sales volume should be achieved to break even?
- (b) What sales volume should be achieved to get 15% return on investment?
- (c) It is estimated that even if the business operations were stopped, an amount of ₹2,50,000 would be incurred as expenses. What sales should be maintained to recover such expenses?

Solution

(a) Calculation of Break-even Sales

Break-even Point $(\overline{\mathbf{x}}) = \frac{\text{Fixed Cost}}{\text{PV Ratio}}$

Fixed Cost (given) = ₹8,00,000 Variable Cost Ratio (given) = 60%PV Ratio = 100 - Variable Cost Ratio = 100 - 60 = 40%

So, Break-even Sales = $\frac{₹8,00,000}{40\%}$ = ₹20,00,000

(b) Calculation of Sales for earning desired profits

Required Sales for earning desired profits = $\frac{\text{(Desired Profits + Fixed Cost)}}{\text{PV Ratio}}$

Desired Profits = 15% on investment = 15% of ₹20.00.000 = ₹3.00.000

Fixed Cost = ₹8.00.000

PV Ratio = 40%

So, Sales required for earning desired profits = $\frac{(₹3,00,000 + ₹8,00,000)}{40\%} = ₹27,50,000$

(c) Calculation of Sales required for meeting cost when business operations are stopped

When business operations are stopped, an amount of ₹2,50,000 is incurred as expenditure. Hence, enough revenue must be generated to meet the expenditure and avoid losses. So, the sales that must be achieved to avoid losses when business operations are stopped can be calculated by using the formula 'Fixed Cost/PV Ratio' Fixed Cost in this case = ₹2,50,000 PV Ratio = 40%

Hence, Required Sales = $\frac{\overline{2},50,000}{40\%} = \overline{6},25,000.$

Problem 40 (Problem on Point of Indifference)

Two Firms, VRK & Co. and RKS & Co., sell the same type of product in the same market. Their budgeted Profit and Loss Account for the year ending 31 March 2018 are as follows:

	VRK & Co.	RKS & Co.
Sales	₹5,00,000	₹6,00,000
Variable costs	₹4,00,000	₹4,00,000
Fixed costs	₹30,000	₹70,000
Profits	₹70,000	₹1,30,000

Required:

- (a) Calculate at which sales volume both the firms will earn the same profit.
- (b) State which firm is likely to earn greater profits in condition of:
 - Heavy demand for the product
 - Low demand for the product

Solution

(a) Calculation of Level of Sales at which both the firms will earn same profits

The level of sales at which two different firms earn same profits is called the Point of Indifference. Point of Indifference can be calculated using the following formula:

Difference in Fixed Cost

Difference in PV Ratio

Calculation of the required information is shown in the following table:

	VRK & Co. (₹)	RKS & Co. (₹)
Sales	5,00,000	6,00,000
Less: Variable Cost	4,00,000	4,00,000
Contribution	1,00,000	2,00,000
PV Ratio = (Contribution/Sales) \times 100	20%	$33\frac{1}{3}\%$ (or $\frac{1}{3}$)
Variable Cost Ratio (100 – PV Ratio)	80%	$66\frac{2}{3}\%$ (or $\frac{2}{3}$)
Fixed Costs	30,000	70,000
Difference in Fixed Costs	₹40,	000
Difference in PV Ratio	$13\frac{1}{3}\%$	
So, Indifference Point is	₹40,000 13 ¹ / ₃ % =₹ 3,00,000	

Verification

Statement of Profits

		VRK & Co.	RKS & Co.
Sales		3,00,000	3,00,000
<i>Less</i> : Variable Cost (Sales × Variable Cost Ratio)		2,40,000	2,00,000
	Contribution	60,000	1,00,000
Less: Fixed Cost		30,000	70,000
	Profits	30,000	30,000

(b) Ascertainment of Firms earning greater profits under different demand conditions

For this purpose, it is essential to understand the meaning of the terms 'high demand' and 'low demand.' When the actual demand/sales is above the Point of Indifference, it is a situation of 'high demand', and When the actual demand/sales is below the Point of Indifference, it is a situation of 'low demand'. For understanding the implications in both cases, let us assume two situations. Situation One: Let Actual Demand (or Sales) be ₹2,40,000 (i.e., Low Demand) Situation Two: Let Actual Demand (or Sales) be ₹3,60,000 (i.e., High Demand) Let us calculate profits for both the firms under both the situations, by preparing Statement of Profits

	VRK & Co.		RKS & Co.	
	Situation One	Situation Two	Situation One	Situation Two
	()	()	()	()
Sales	2,40,000	3,60,000	2,40,000	3,60,000
Less: Variable Cost				
$(Sales \times Variable Cost Ratio)$	1,92,000	2,88,000	1,60,000	2,40,000
Contribution	48,000	72,000	80,000	1,20,000
Less: Fixed Cost	30,000	30,000	70,000	70,000
Profit	18,000	42,000	10,000	50,000

Statement of Profits

Observations

- 1. In situations of low demand (i.e., when actual sales is lower than the Point of Indifference), VRK & Co. is earning higher profits.
- 2. In Situation of high demand (i.e., when actual sales is greater than point of indifference), RKS & Co. is earning higher profits.
- 3. This can be generalised into the following:

In situations of Low Demand, firms having *lower fixed costs* will earn greater profits, and In situations of High Demand, firms having a *higher PV Ratio* will earn greater profits.

Problem 41 (Problem on Break-even Point, Margin of Safety and Point of Indifference)

VRK Ltd. and RKS Ltd. produce and sell the same type of product in the same market. The forecasted P and L Statement is as follows:

Particulars	VRK Ltd (₹)		RKS I	Ltd (₹)
Sales		3,00,000		3,00,000
Less: Variable cost	2,00,000		2,25,000	
Fixed cost	50,000	2,50,000	25,000	2,50,000
Profit		50,000		50,000

You are required to calculate:

- (a) PV Ratio, Break-even Point and Margin of Safety for each company.
- (b) State the volume at which each business will earn a profit of ₹80,000.
- (c) Explain with reasons, which company is likely to earn a greater profit in the condition of
 - Heavy demand for the product and
 - Low demand for the product

Solution

(a) Calculation of PV Ratio, Break-even Point and Margin of Safety

For obtaining the information required for the calculations, the data given in the problem is presented in the following format:

	VRK Ltd (₹)	RKS Ltd (₹)
Sales	3,00,000	3,00,000
Less: Variable Cost	2,00,000	2,25,000
Contribution	1,00,000	75,000
Less: Fixed Cost	50,000	25,000
Profits	50,000	50,000
PV Ratio = (Contribution/Sales) \times 100	$33\frac{1}{3}\%$ (or $\frac{1}{3}$)	25%
Variable Cost Ratio (100 – PV Ratio)	66.67% (or $\frac{2}{3}$)	75%
	₹50,000	₹25,000
Break-even Sales (₹) = Fixed Cost/PV Ratio	33.33%	25%
	=₹1,50,000	=₹1,00,000
Mancin of Safety - Astual Salas - Drask avan Salas	₹3,00,000 - ₹1,50,000	₹3,00,000 - ₹1,00,000
Margin of Safety – Actual Safes – Break-even Safes	=₹1,50,000	=₹2,00,000

Statement of Profits

(b) Calculation of Sales for earning profits of ₹80,000

Required Sales = $\frac{\text{(Desired Profits + Fixed Cost)}}{\text{PV Ratio}}$ **Required Contribution** or PV Ratio

The calculations for the two companies are shown in the following table:

	VRK Ltd (₹)	RKS Ltd (₹)
Desired Profits	80,000	80,000
Fixed Cost	50,000	25,000
Required Contribution	1,30,000	1,05,000
PV Ratio	$33\frac{1}{3}\%$	25%
Required Sales = Required Contribution/PV Ratio	₹1,30,000 33.33%	₹1,05,000 25%
	=₹3,90,000	=₹4,20,000

(c) Ascertainment of Firms earning greater profits under different demand conditions

It can be noted that the Sales and Profits of both the companies are same. So, the Point of Indifference is ₹3,00,000.

In case of heavy demand (i.e., when actual demand is more than the Point of Indifference), companies having a higher PV Ratio will earn greater profits. In this case, VRK Ltd., having a higher PV Ratio, will earn greater profits in situations of heavy demand.

In case of low demand (i.e., when actual demand is *less* than the Point of Indifference), companies having lower fixed costs will earn greater profits. In this case, RKS Ltd., having lower fixed costs, will earn greater profits in situations of low demand.

Problem 42 (Problem on Break-even Point and Point of Indifference)

A company wants to buy a new machine to replace one, which is having a frequent breakdown. It received offers for two models: M-1 and M-2. Further details regarding these models are given as follows:

	M-1	M-2
Installed capacity (units)	10,000	10,000
Fixed overheads per annum (₹)	2,40,000	1,00,000
Estimated profit at the above capacity (₹)	1,60,000	1,00,000

The product manufactured using this type of machine (M-1 and M-2) is sold at ₹100 per unit.

You are required to determine:

- (a) break-even level of sales for each model;
- (b) the level of sales at which both the models will earn the same profit; and
- (c) the model suitable for different levels of demand for this product.

Solution

(a) Calculation of Break-even Sales

Break-even Sales = $\frac{\text{Fixed Cost}}{\text{PV Ratio}}$

Calculation of Break-even Sales for both the machines is shown in the following table:

	Machine M-1	Machine M-2
Installed Capacity	10,000 units	10,000 units
Selling Price per unit	₹100	₹100
Sales (in ₹)	₹10,00,000	₹10,00,000
Estimated Profits	1,60,000	1,00,000
Fixed Overheads	2,40,000	1,00,000
Contribution for Installed Capacity	4,00,000	2,00,000
PV Ratio = (Contribution/Sales) \times 100	40%	20%
Variable Cost Ratio = 100 – PV Ratio	60%	80%
Break-even Sales = Fixed Cost/PV Ratio	<u>₹2,40,000</u> 40% = ₹6,00,000	₹ <u>1,00,000</u> 20% =₹ 5,00,000
Break-even Sales (in units) = Break-even Sales (in ₹)/Selling Price per unit	<u>₹6,00,000</u> ₹100 = 6,000 units	₹5,00,000 ₹100 = 5,000 units

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(b) Ascertainment of the level of sales at which both models will earn same profit

The level of sales at which both models will earn same profits is called 'Point of Indifference'.

Point of Indifference = $\frac{\text{Difference in Fixed Costs}}{\text{Difference in PV Ratio}} = \frac{(\overline{2}, 40, 000 - \overline{2}, 00, 000)}{(40\% - 20\%)} = \frac{\overline{2}, 40, 000}{20\%} = \overline{2}, 00, 000$

Verification

Statement of Profits

	Machine M-1	Machine M-2
Sales	7,00,000	7,00,000
Less: Variable Cost (Sales × Variable Cost Ratio)	4,20,000	5,60,000
Contribution	2,80,000	1,40,000
Less: Fixed Cost	2,40,000	1,00,000
Profits	40,000	40,000

(c) Ascertainment of suitable model for different levels of demand

- In situations of high demand (i.e., when actual demand is more than Indifference Point of ₹7,00,000), the machine having the higher PV ratio will earn greater profits. Hence, Machine M-1, which has a higher PV ratio, will be the suitable model in situations of high demand.
- In situations of low demand (i.e., when actual demand is less than Indifference Point of ₹7,00,000), the machine having a lower fixed cost will earn greater profits. Hence, Machine M-2, which has a lower fixed cost, will be the suitable model in situations of low demand.

SUMMARY

- For ascertaining the cost of a product manufactured, particularly for absorbing overheads and for ascertaining the profits, two methods are used in practice viz., Absorption Costing and Marginal Costing.
- Absorption Costing is a procedure of cost recognition, wherein costs are classified on the basis of functions. It is a principle whereby, fixed as well as variable costs are allocated to the cost units and total overheads are absorbed according to the activity level. Under this method, fixed costs are treated as product costs and are absorbed on the basis of pre-determined recovery rates.
- Marginal Costing is the ascertainment, by differentiating between fixed costs and variable costs, of marginal costs and of the effect of profit on changes in the value of type and output.
- Variable Cost refers to the cost, which varies proportionately with production or output. It is the cost wherein the total amount varies proportionately with production, but per-unit *cost* remains same at all levels of production.
- Fixed Cost refers to the cost which remains constant at all levels of production. It is the cost wherein the total amount remains same at different levels of production, but per-unit cost varies inversely with production.
- Semi-variable Cost refers to the cost in which one portion varies proportionately with production or output and another portion remains constant at all levels of production.
- Marginal Cost refers to the amount at any given volume of output, by which aggregate costs are changed if the volume of output is increased or decreased by one unit.
- Marginal Cost Equation: Sales Variable Cost = Contribution = Fixed Cost + Profits
- Break-even Analysis refers to a system of determination of the level of activity where total cost equal total sales (i.e., the level of activity at which there is no profit or no loss). A broader meaning of Break-even Analysis refers to the determination of probable profit at any level of activity.
- Scope of Break-even Analysis includes Calculating Profit–Volume Ratio (PV Ratio), determining Break-even Point, ascertaining Margin of Safety, identifying the Angle of Incidence, calculating profits at a given level of production, calculating the number of units to be sold for earning desired profits, calculating selling price for a given Break-even Point, and calculation of Point of Indifference.

SNAPSHOT OF FORMULAE **Calculation of PV Ratio** Total Contribution ×100 Contribution per unit $\frac{1}{\text{Selling Price per unit}} \times 100$ or Total Sales Change in Profits × 100 Change in Contribution $\times 100$ or or Change in Sales Change in Sales **Calculation of Break-even Point** Break-even Sales $(\bar{\mathbf{x}}) = \frac{(\text{Fixed Cost} \times \text{Sales})}{Contribution}$ Fixed Cost or Contribution PV Ratio Break-even Sales (₹) Fixed Cost Break-even Sales (units) = or Contribution per unit Selling Price per unit Cash Break-even Sales = $\frac{\text{Cash Fixed Cost}}{\frac{1}{2}}$ Cash Fixed Cost or PV Ratio Contribution per unit **Calculation of Margin of Safety** Margin of Safety $(\overline{\mathbf{x}}) = \frac{\text{Total Profits}}{\text{PV Ratio}}$ or Total Sales (₹) – Break-even Sales (₹) Margin of Safety (units) = $\frac{\text{Total Profits}}{\text{Contribution per unit}}$ Total Sales (units) – Break-even Sales (units) or **Calculation of Sales for earning Desired Profits** Sales (in ₹) for earning Desired Profits = Desired Profits + Fixed Cost PV Ratio Sales (in $\overline{\mathbf{x}}$) for earning Desired Profits = Break-even Sales (in $\overline{\mathbf{x}}$) + $\left(\frac{\text{Desired Profits}}{\text{PV Ratio}}\right)$ Desired Profits + Fixed Costs Sales (in units) for earning Desired Profits = Contribution per unit Desired Profits Sales (in units) for earning Desired Profits = Break-even Sales (in units) + Contribution per unit Calculation of Selling Price for given Break-even Units Fixed Cost Required Selling Price per unit = -+ Variable Cost per unit Given Break-even units **Calculation of Point of Indifference** Point of Indifference = $\frac{\text{Difference in Fixed Costs}}{\text{Costs}}$ Difference in PV Ratio

Section B Type Questions

Problem 1

Ascertain total contribution, contribution per unit, total profit and profit per unit from the following particulars:

Cost of material per unit:	₹10
Cost of labour per unit:	₹6
Cost of overhead per unit:	₹4
Output:	10,000 units
40% of overheads are variable	
Selling price per unit:	₹28

[Ans: ₹1,04,000; ₹10.40; ₹80,000 and ₹8]

Problem 2

Ascertain the amount of contribution and profit from the following:

₹2,00,000
₹1,60,000
₹60,000;
₹1,00,000
5,000 units
4,500 units at ₹200 per unit

[Ans: ₹4,86,000 and ₹4,26,000]

Problem 3

4000 units of a product are sold at ₹10 per unit. Fixed overhead is ₹8,000 per month. Variable cost is ₹6 per unit. There is a proposal to reduce the price by 10%. Calculate the present and new P/V ratio. Also, calculate how many units must be sold to earn the present total profit. [Ans: 40%, 33.33% and 5,333 units]

Problem 4

Fixed expenses:	₹1,80,000
Variable cost per unit:	₹9
Selling price per unit:	₹12

Find out:

- (a) P/V ratio
- (b) Break-even Sales with the help of PV ratio
- (c) Sales required to earn a profit of ₹9,00,000

[Ans: (a) 25%, (b) ₹7,20,000 and (c) ₹43,20,000]

Problem 5

The fixed cost amounts to ₹1,00,000 and the portion of variable cost to sales is given to be 2/3. If 100% capacity sales is ₹6,00,000 Find out the BEP and the percentage of sales when it occurred. Also determine the profit at 80% capacity.

[Ans: ₹3,00,000, 50% and ₹60,000]

Section C Type Questions

Problem 1

A company producing a single article sells it at $\overline{20}$ each. The marginal cost of production is $\overline{12}$ each and the fixed costs are $\overline{9}$ per quarter. You are required to calculate the following, for the year:

- (a) PV Ratio
- (b) Break-even Sales in value
- (c) Break-even Sales in units
- (d) Sales required to earn a profit of ₹12,000
- (e) Profit at sales of ₹2,00,000
- (f) Margin of Safety in case of (d) and (e)

[Ans: (a) 40%, (b) ₹90,000 (c) 4500 units, (d) ₹1,20,000, (e) ₹44,000 and (f) ₹30,000 and ₹1,10,000]

Problem 2

A company produces a single product, which sells at $\overline{20}$ per unit. Variable cost is $\overline{15}$ per unit and fixed overhead for the year is $\overline{6,30,000}$. Calculate:

- (a) Sales value needed to earn a profit of 10% on sales
- (b) Sales price per unit to bring Break-even Point down to 1,20,000 units
- (c) Margin of safety sales if profit is ₹60,000

[Ans: (a) ₹42,00,00, (b) ₹20.25 per unit and (c) ₹2,40,000 or 12,000 units]

Problem 3

MNP Ltd sold 2,75,000 units of its product at ₹37.50 per unit. Variable costs are ₹17.50 per unit (manufacturing costs of ₹14 and selling costs of ₹3.50 per unit). Fixed costs are incurred uniformly throughout the year and amount to ₹35,00,000 (including depreciation of ₹15,00,000). There are no beginning or ending inventories. Required:

- (a) Estimated Break-even Sales quantity and cash Break-even Sales quantity.
- (b) Estimate the PV Ratio.
- (c) Estimate the number of units that must be sold to earn an income (EBIT) of ₹2,50,000.
- (d) Estimate the sales level to achieve an after-tax income of ₹2,50,000. Assume 40% corporate income tax rate.

[Ans: (a) 1,75,000 units and 1,00,000 units (b) 53.33% (c) 1,87,500 units and (d) 1,95,833 units]

Problem 4

Fill in the missing information (represented by Alphabets) for the following five companies:

	APOORVA	BINDU	CHAITRA	DEEPA	ESHWARI
Selling price per unit (₹)	Α	50	20	G	30
Variable cost as a percentage of selling price	60	С	75	75	Ι
Number of units sold	10,000	4,000	Е	6,000	5,000
Marginal Contribution (₹)	20,000	80,000	F	25,000	50,000
Fixed Costs (₹)	12,000	D	1,20,000	10,000	J
Profit/Loss (₹)	В	20,000	30,000	Н	15,000

[Ans: A – ₹5, B – ₹8,000, C – 60%, D – ₹60,000, E – 30,000 units, F – ₹1,50,000, G – ₹16.67, H – ₹15,000, I – 66.67% and J – ₹35,000]

Problem 5

Madhav & Co. sells five different types of ball pens with identical purchase cost and selling prices. The company is trying to find out possibility of opening another store, which will have the following expenses and revenue:

Selling price:	₹30 .00per pen
Variable cost:	₹19.50 per pen
Salesmen commission:	₹ 1.50 per pen
Annual Fixed expenses were	
Rent:	₹ 60,000
Salaries:	₹2,00,000
Advertising:	₹ 80,000
Other fixed expenses:	₹ 20,000

Required:

- (a) Calculate the annual Break-even Point in units and in value. Also determine the profit or loss if 35,000 ball pens are sold.
- (b) The sales commission is proposed to be discontinued, but instead a fixed amount of ₹90,000 is to be incurred as fixed salaries. A reduction in selling price of 5% is also proposed. What will be the Break-even Point in units?
- (c) Is it proposed to pay ₹0.50 per ball pen as further commission? The selling price is also proposed to be increased by 5%. What will be the Break-even Point in units?
- (d) Refer to the original data. If the store manager were to be paid ₹0.30 commission on each ball pen sold in excess of Break-even Point, what would be the store's net profit if 50,000 ball pens were sold?

(Note: Consider each part of the question separately).

[Ans: (a) 40,000 units, ₹12,00,000 and ₹45,000 (b) 50,000 units (c) 36,000 units and (d) ₹87,000]
<u>chapter</u> 3

Standard Costing

CHAPTER OUTLINE

- 3.1 Introduction
- 3.2 Limitations of Historical Costing
- 3.3 Standard Cost
- 3.4 Standard Costing
- 3.5 Preliminary Steps in Installation of Standard Costing System
 - 3.5.1 Establishment of Responsibility Centres and Cost Centres
 - 3.5.2 Classification of Accounts
 - 3.5.3 Selection of Standards
 - 3.5.4 Setting of Standards
- 3.6 Advantages of Standard Costing
- 3.7 Limitations of Standard Costing
- 3.8 Scope of Standard Costing
- 3.9 Variance and Variance Analysis

3.9.1 Types of Variances

- 3.10 Material Variances
- 3.11 Labour Variances
- 3.12 Overhead Variances
- **Problems on Variance Analysis**

Summary

Snapshot of Formulae

Exercises

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3.1 INTRODUCTION

On the basis of the time period for which cost data is available or ascertainable, cost ascertainment can be made using two types of systems, viz.,

- 1. Historical Costing
- 2. Standard Costing

Historical Costing is a system of costing, wherein the actual costs are ascertained after they are incurred, whereas Standard Costing is a system of costing, which involves pre-determination of costs for each product or service.

3.2 LIMITATIONS OF HISTORICAL COSTING

Following are some of the limitations of adopting Historical Costing System:

- 1. Historical costs can be known only after the production of the product or rendering of services, or after the completion of a given period of time. On account of delay in availability of cost information, it is not helpful for cost control. It just aids post-mortem analysis.
- 2. Historical costs are very expensive to compute. The larger the activities involved, the higher the documentation and clerical labour involved and as a result, the ascertaining cost will be high.
- 3. Historical costs vary from period to period and hence do not form an appropriate basis for decisionmaking.
- 4. Historical costing indicates only the actual cost. Only actual cost is not sufficient for measuring efficiency. Hence, it is not helpful in measuring efficiency of the system or product or service.

These limitations have necessitated the adoption of Standard Costing.

THEORY QUESTIONS

Section A Type Questions

1. What is Historical Costing? State any two limitations of historical costing system.

Section B Type Questions

1. Explain the need for introduction of a standard costing system, highlighting the limitations of historical costing.

3.3 STANDARD COST

Standard Cost, according to Chartered Institute of Management Accountants (CIMA), London, "is the predetermined cost based on technical estimates for materials, labour and overhead for a selected period of time for a prescribed set of working conditions".

Standard Cost is a pre-determined cost, which determines what each product or service should cost under given circumstances. It is the pre-determined operating cost calculated from the management's standards of efficient operation and the relevant necessary expenditure.

In short, Standard Cost is a pre-determined cost computed before the commencement of production.

Standard Cost is not the same as Estimated Cost. Estimated Cost is ascertainment of what the cost might be for a product or service. Standard Cost is the ascertainment of what the cost should be.

THEORY QUESTIONS

Section A Type Questions

- 1. What is Standard Cost?
- 2. Define Standard Cost.
- 3. Differentiate between Estimated Cost and Standard Cost.

3.4 STANDARD COSTING

According to CIMA, London, "Standard Costing is the technique or system of preparation of Standard Costs and applying them to measure the variations from actual costs and analysing the courses of variations with a view to maintain maximum efficiency in production".

Standard Costing is the technique of cost accounting, which compares the standard cost of each product or service with the actual costs, to determine the efficiency of the operations so that any remedial action may be taken immediately.

Standard Costing involves:

- 1. Setting of Standard Costs
- 2. Ascertainment of Actual Costs
- 3. Comparison of Standard Costs and Actual Costs and identification of Variance
- 4. Carrying out Variance Analysis, and
- 5. Reporting the analysis result to the Management, for taking corrective actions and making appropriate decisions.

THEORY QUESTIONS

Section A Type Questions

- 1. Define Standard Costing.
- 2. List the components of Standard Costing.

3.5 PRELIMINARY STEPS IN INSTALLATION OF STANDARD COSTING SYSTEM

Installation of a standard costing system involves the following steps:

- 1. Establishment of Responsibility Centres and Cost Centres
- 2. Classification of accounts
- 3. Selection of standards
- 4. Setting of standards

Each step is explained next in detail.

3.5.1 Establishment of Responsibility Centres and Cost Centres

The first step in installing a standard costing system is to establish well-defined Cost Centres and Responsibility Centres. Cost Centre is a location, a person, an item of equipment or a group of these, for which the cost may be ascertained and used for the purpose of cost control. It refers to a section of the business to which costs can be charged. A Responsibility Centre is an activity centre of a business organisation entrusted with a special task.

Well-defined Cost and Responsibility Centres help in the estimation of standard cost and in fixing responsibilities in the event of variance.

3.5.2 Classification of Accounts

The next step in installation of a standard costing system is to classify and codify various heads of expenses. This is for enabling speedy collection and analysis of cost data. The classification may be on the basis of functions, revenue items or assets and liability items. Coding based on elements of cost will be helpful in carrying out variance analysis.

3.5.3 Selection of Standards

For enabling effective adoption of standard costing, selecting the appropriate form of standard is a requirement. The standards that can be set are classified into different types.

- On the basis of the nature of operating conditions, standards are of two types viz., Ideal Standards and Normal Standards.
- On the basis of the time period to which the standards relate to, they are of two types viz., Basic Standards and Current Standards.
- On the basis of the type of data used for setting standards, they are classified into Physical (i.e., Quantity or Time) Standards and Monetary (i.e., Price or Rate) Standards.

Each of these types of standards are explained as follows.

1. Ideal Standards

Ideal Standards represent the level of performance attainable with the 'best' or 'ideal set-up' i.e., best quality materials at favourable prices, highly skilled labour, best equipment and layout, etc. Ideal standards focus on the maximum efficiency in utilisation of resources i.e., maximum output with minimum cost. These standards are not generally attainable and hence cannot be taken seriously.

2. Normal Standards

Normal Standards represent the level of performance attainable under normal operating conditions i.e., under conditions of normal efficiency, normal sales, normal production and volume, etc. Normal standards focus on the practical attainable efficiency, after considering normal imperfections i.e., optimisation of cost per unit. These standards are attainable with reasonable effort and hence constitute a good benchmark for control.

3. Basic Standards (or Bogey Standards)

Basic Standards reflect the costs that would have been incurred in a certain past period (i.e., the base period). These standards are used for items or costs, which are likely to remain constant over a long period. They are set on long-term basis and are not revised regularly. These standards relate to a base year, which is chosen for comparison purposes. Basic Standards are suitable only to businesses having a small range of products and long production runs.

4. Current Standards

Current Standards reflect the management's anticipation of what actual costs will be for the current period. These standards are used for items or costs that undergo change from one period to another. Current Standards get revised periodically. They are set on short-term basis. They are based on costs, which the business will incur if the anticipated prices are paid for the goods and services and the usage corresponds to the requirement for producing the planned output. All types of businesses use them for variance analysis and decision-making.

5. Physical Standards

Physical Standards refer to expression of standards in units or hours. These are standards relating to material consumption quantity, labour processing time, etc. These standards are also called Non-monetary Standards. Physical Standards are constant over a long period of time, unless there is a significant change in production technology, methods of work, etc.

6. Monetary Standards

Monetary standards are those which relate to monetary factors of cost i.e., Material Prices, Wage Rates, Overhead Expenditure, etc. These standards are set either on the basis of actual average or mean price expected to prevail during the coming period, or normal prices expected to prevail during a cycle of seasons. That is, these standards may be based on expected prices over short term or long term.

3.5.4 Setting of Standards

Once the type of standard to be set is decided upon, the last stage in implementation of a standard costing system is 'actual setting of standards'. For effective setting, comparison and analysis, standards are set for each element of cost. The standards set are of the following types:

- 1. Material Cost Standards
- 2. Labour Cost Standards
- 3. Overhead Cost Standards
 - a. Fixed Overhead Cost Standards
 - b. Variable Overhead Cost Standards

THEORY QUESTIONS

Section A Type Questions

- 1. List the preliminary steps involved in establishing Standard Costing.
- 2. State the different types of standards under different bases.
- 3. What are Ideal Standards?
- 4. What are Normal Standards?
- 5. What are Basic Standards?
- 6. Explain the meaning of Current Standards.
- 7. What are Physical Standards? Give examples.
- 8. What are Monetary Standards? Give examples.
- 9. State the popular classification of standards for setting of standards.

Section B Type Questions

1. What is Standard Costing? Briefly explain the steps involved in installation of a costing system.

Section C Type Questions

1. What is Standard Costing? Explain the need for standard costing and the steps involved in its installation.

3.6 ADVANTAGES OF STANDARD COSTING

Following are the advantages of installing a system of Standard Costing:

- Standard Costing can be used in formulating production and price policies in advance.
- Standard Costs provide basis for incentive schemes to employees, particularly the direct labour force.
- Standard Costing provides a common base or denominator for comparison between one period and another.
- Standard Costing provides a stable Product Cost per unit.

- Standard Costing helps in business planning and budgeting.
- The system enables effective delegation of authority and responsibility.
- It provides faster reporting of operating data.
- The cost of accounting can be minimised with the implementation of this system.
- It makes the process of cost audit and cost control, simple and effective.
- It brings a sense of 'cost consciousness' in the entire organisation.

THEORY QUESTIONS

Section A Type Questions

1. State any four advantages of Standard Costing.

Section B Type Questions

1. What is Standard Costing? Briefly explain the advantages of a standard costing system.

3.7 LIMITATIONS OF STANDARD COSTING

While Standard Costing is of immense benefit for a business entity, it is important to recognise its limitations. Following are the limitations of Standard Costing:

- 1. Standard Costing needs technically skilled and well-trained staff. Organisations must spend a huge amount on training employees and setting-up the requisite systems. On account of this, installation of a Standard Costing System becomes an expensive affair.
- 2. In the present dynamic business environment, the standards set may not hold good for long term. Revising standards frequently may lead to more confusion and may defeat the purpose of Standard Costing.
- 3. This system may not be helpful in small organisations and entities, which deal with non-standardised products.

Despite these limitations, the benefits from the system are immense and outweigh the drawbacks.

THEORY QUESTIONS

Section A Type Questions

1. List out the limitations of a standard costing system.

Section B Type Questions

1. What is Standard Costing? Explain with examples, the limitations of a standard costing system.

Section C Type Questions

1. What is Standard Costing? Explain the need for it, highlighting its advantages and limitations.

3.8 SCOPE OF STANDARD COSTING

Standard Costing involves:

- 1. Setting of Standard Costs
- 2. Ascertainment of Actual Costs
- 3. Comparison of Standard Costs and Actual Costs and identification of Variance
- 4. Carrying out Variance Analysis, and
- 5. Reporting the analysis results to the Management, for taking corrective actions and making appropriate decisions.

This chapter deals with calculation and analysis of Variances.

3.9 VARIANCE AND VARIANCE ANALYSIS

Variance refers to the difference between the standard and actual values whereas variance analysis refers to the decomposition of variance into different components, for identifying the reason for variance.

For understanding the calculation and decomposition of variances, it is necessary to understand the different types of variances.

3.9.1 Types of Variances

Variances are of the following types:

- On the basis of the type of cost: Material Cost Variance, Labour Cost Variance and Overhead Cost Variance
- On the basis of impact: Favourable Variance and Adverse Variance
- On the basis of controllability: Controllable Variance and Uncontrollable Variance
- On the basis of reason or cause for variance: Efficiency Variance, Price Variance and Volume Variance

A detailed explanation of each type of variance is given as follows:

- 1. **Material Cost Variance** refers to the difference between the standard material cost and the actual material cost incurred.
- 2. Labour Cost Variance refers to the difference between the standard labour cost and the actual labour cost incurred.
- 3. **Overhead Cost Variance** refers to the difference between the standard overhead cost and the actual overhead cost incurred. Overhead Cost Variance is of two types viz., Fixed Overhead Cost Variance and Variable Overhead Cost Variance.
- 4. **Favourable Variance** refers to the situation where the actual cost incurred is less than the standard cost. These variances have a positive impact on the profits of the entity.
- 5. Unfavourable or Adverse Variance refers to the situation where the actual cost incurred is more than the standard cost. These variances have a negative impact on the profits of the entity.
- 6. **Controllable Variances** are those for which reasons can be identified and the department heads can take corrective for controlling them.
- 7. Uncontrollable Variances are those, which are beyond control and need to be tolerated.
- 8. Efficiency Variances are those, which arise on account of efficient or inefficient se of material or labour time.
- 9. **Price Variances** are those, which arise on account of change in the price of material inputs or the rate of labour.
- 10. Volume Variances are those, which arise on account of difference in the actual level of activity and the level of activity for which the standards were set.

Classifying variances on the basis of elements of cost and impact is most appropriate and ideal. Hence, the discussion in this chapter covers:

- Material related variances
- Labour related variances
- Overhead related variances

THEORY QUESTIONS

Section A Type Questions

- 1. What is Variance?
- 2. What is Variance Analysis?
- 3. List the different types of variances.
- 4. What is Material Cost Variance?
- 5. What is Labour Cost Variance?
- 6. What is Overhead Cost Variance?
- 7. When is a variance called Favourable Variance?
- 8. What is an Adverse Variance?
- 9. What are Controllable Variances?
- 10. What are Uncontrollable Variances?
- 11. Explain the meaning of Efficiency Variances?
- 12. What are Price Variances?
- 13. What do you mean by Volume Variances?

Section B Type Questions

1. What is Variance Analysis? Explain the different types of variances on the basis of types of cost and impact. Section C Type Questions

1. What is Variance? Explain the meaning of Variance Analysis? State the different types of variances, providing adequate examples.

3.10 MATERIAL VARIANCES

Material Variances are those, which help in measuring the variance in material cost and in identifying the reasons for the variance. The following chart summarises the different types of material variances and their inter-relationships.



From the given chart, it can be stated that any variance in Material Cost is either on account of Material Price Variance or Material Usage Variance or both. Material Usage Variance may be caused because of Material Mix Variance or Material Yield Variance or both. The meaning and formulae for calculation of each of these variances are given in the following table:

Name of the Variance Meaning		Formula	
Material Cost Variance	Material Cost Variance is the difference between the standard cost of materials used and the actual cost of material.	(Standard Quantity of Material for Actual Production × Standard Price) – (Actual Quantity of Material × Actual Price) Or (Standard Material Cost for Actual Production – Actual Material Cost) <i>Note:</i> The Standard Quantity of material must be taken for Actual Production	
Material Price Variance	Material Price Variance refers to the difference in the material cost on account of difference in the actual purchase price of the material and the standard price set.	(Standard Price – Actual Price) × Actual Quantity of Material <i>Note:</i> The Standard Price for Actual Quantity of material must be taken for calculating this variance.	
Material Usage Variance	Material Usage Variance refers to the difference in material cost on account of difference in the actual quantity of material consumed or used and the standard quantity set.	(Standard Quantity for Actual Production – Actual Quantity used) × Standard Price <i>Note:</i> The Standard Quantity of material must be taken for Actual Production.	
Material Mix Variance	Material Mix Variance arises where there are two or more types of raw material used in production of the same product. Material Mix Variance refers to the difference in material consumption on account of difference in the standard proportion of material and the actual proportion in which the material was used	(Revised Standard Quantity – Actual Quantity) × Standard Price <i>Note:</i> Revised Standard Quantity refers to the Actual Quantity consumed, calculated in terms of standard proportion.	
Material Yield Variance	Material Yield Variance refers to the difference in material consumption on account of difference in the standard yield (or output) and the actual yield (or output).	When only one material is used in production (Actual Yield – Standard Yield) × Standard Material Cost per unit of yield Notes: Standard Yield = Actual Quantity of material consumed Standard Quantity of material per unit of output Standard Material Cost per unit of yield = (Standard Quantity per unit of output × Standard Price per unit of material) When more than one material is used in production (Standard Quantity for Actual Production – Revised Standard Quantity) × Standard Price per unit of material	

Notes:

- 1. Material Mix Variance + Material Yield Variance = Material Usage Variance.
- 2. Material Price Variance + Material Usage Variance = Material Cost Variance.

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- 3. When the variance is positive, it is called as Favourable Variance, which is denoted by (F).
- 4. When the variance is negative it is called Adverse Variance, which is denoted by (A).
- 5. Inputs required for calculating material variances are:
 - Standard Quantity of material for actual production
 - Actual Quantity of material used or consumed
 - Revised Standard Quantity (in case two or more types of materials are used)
 - Standard Price per unit of material
 - Actual Price per unit of material
 - Standard Yield (if required)
 - Standard Cost per unit of yield

THEORY QUESTIONS

Section A Type Questions

- 1. List the different Material Variances.
- 2. What is Material Cost Variance? How is it measured?
- 3. State the reasons for Material Cost Variance.
- 4. How can Material Price Variance be measured?
- 5. What is Material Usage Variance? State the formula for its measurement.
- 6. What are the reasons for Material Usage Variance?
- 7. What is Revised Standard Quantity?
- 8. How can Material Mix Variance be measured? When is this variance applicable?
- 9. What is Material Yield Variance?
- 10. State the formulae for measuring Material Yield Variance.
- 11. What is Standard Yield? How can it be ascertained?

Section B Type Questions

1. Explain in detail, the various material variances, highlighting the reasons for each variance.

Section C Type Questions

1. What is Variance Analysis? Explain in detail, the different material variances and the inter-relationships among the variances.

3.11 LABOUR VARIANCES

Labour Variances are those, which help in measuring the variance in labour cost and in identifying the reasons for the variance. The following chart summarises the different types of labour variances and their inter-relationships.



From the given chart, it can be stated that any variance in Labour Cost is either on account of Labour Rate Variance or Labour Efficiency Variance or both. Labour Efficiency Variance may be caused because of Labour Mix Variance or Idle-Time Variance or Labour Yield Variance, or any combination of them or all of them. The meaning and formulae for the calculation of each of these variances are given in the following table:

Name of the Variance Meaning		Formula
Labour Cost Variance	Labour Cost Variance is the difference between the standard cost of labour and the actual labour cost.	(Standard Time for Actual Production × Standard Rate) – (Actual Time × Actual Price) Or (Standard Labour Cost for Actual Production – Actual Labour Cost) <i>Note:</i> The standard time must be taken for actual production.
Labour Rate Variance	Labour Rate variance refers to the difference in labour cost on account of difference in the actual rate at which the labour is paid and the standard rate set.	(Standard Rate – Actual Rate) × Actual time taken
Labour Efficiency Variance	Labour Efficiency Variance refers to the difference in labour cost on account of difference in actual time for production and the standard time set.	(Standard Time for Actual Production – Actual time) × Standard Rate <i>Note:</i> The standard time must be taken for actual production.
Labour Mix Variance (Gang Composition Variance)	Labour Mix Variance arises where there are two or more categories of labour used in production of the same product (like skilled, semi-skilled, unskilled, or men, women, children, etc.). Labour Mix Variance refers to the difference in time taken on account of difference in standard proportion of labour force and actual proportion in which labour was used.	(Revised Standard Time – Actual Time) × Standard Rate Note: Revised Standard Time refers to the Actual Time taken, calculated in terms of standard proportion. Revised Standard Time = (Total of Effective Actual Time taken by all category of workers/Total of Standard Time for all category of workers) × Standard Time for each category of worker Note: Effective Actual Time = Actual Time paid for – Idle Time.
Idle-Time Variance	Idle-Time Variance refers to the difference in labour efficiency on account of unproductive hours. Unproductive hours refer to the time for which payment has been made, but no production activity is carried out.	(Actual Idle Time × Standard Rate) Or (Actual Time Paid for – Actual Time worked) × Standard Rate

Name of the Variance	Meaning	Formula
		When only one category of labour is used in production
		(Actual Yield – Standard Yield) × Standard Labour Cost per unit of yield
		Notes:
Labour Yield Variance or Labour Sub-efficiency	Labour Yield Variance refers to the difference in labour efficiency on account	Standard Yield = Actual Effective Time taken/Standard Time per unit of output
Variance	of difference in the standard yield (or output) and the actual yield (or output).	Standard Labour Cost per unit of yield = (Standard Time per unit of output × Standard Rate per time unit)
		When more than one category of labour is used in production
		(Standard Time for Actual Production – Revised Standard Time) × Standard Rate

Notes:

- 1. Labour Efficiency Variance = Labour Mix Variance + Idle-Time Variance + Labour Yield Variance.
- 2. Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.
- 3. When the variance is positive, it is called as Favourable Variance, which is denoted by (F).
- 4. When the variance is negative, it is called Adverse Variance, which is denoted by (A).
- 5. Idle-Time Variance is always an Adverse Variance.
- 6. Inputs required for calculating labour variances are:
 - Standard Time required for Actual Production
 - Actual Time taken (or Actual Time paid for)
 - Idle Time
 - Effective Actual Time (i.e., Actual Time worked)
 - Revised Standard Time (in case two or more categories of labour are used)
 - Standard Rate per unit of time (i.e., per hour, per day, etc.)
 - Actual Rate per unit of time

THEORY QUESTIONS

Section A Type Questions

- 1. List the different Labour Variances.
- 2. What is Labour Cost Variance? How is it measured?
- 3. State the reasons for Labour Cost Variance.
- 4. How can Labour Rate Variance be measured?
- 5. What is Labour Efficiency Variance? State the formula for its measurement.
- 6. What are the reasons for Labour Efficiency Variance?
- 7. What is Revised Standard Time?
- 8. What is Effective Actual Time?
- 9. How can Labour Mix (or Gang Composition) Variance be measured? When is this variance applicable?
- 10. What is Labour Yield Variance?

- 11. State the formulae for measuring Labour Yield Variance.
- 12. What is Standard Yield? How can it be ascertained?
- 13. What is Idle Time? How can Idle-Time Variance be measured?

Section B Type Questions

1. Explain in detail the various Labour Variances, highlighting the reasons for each variance.

Section C Type Questions

1. What is Variance Analysis? Explain in detail the different material and labour variances and the interrelationships among the variances.

3.12 OVERHEAD VARIANCES

Overhead Variances are those, which help in measuring the variances in overhead cost (i.e., indirect cost) and in identifying the reasons for the variance. The following chart summarises the different types of material variances and their inter-relationships.



The given chart indicates that Overhead Cost Variance may be caused either by variance in Variable Overhead Cost or Fixed Overhead Cost or both. Variable Overhead Cost may be on account of Expenditure Variance of Efficiency Variance or both. Fixed Overhead Cost Variance also can either be on account of Expenditure Variance or Volume Variance or both. The Volume Variance could be either because of Efficiency Variance or Capacity Variance or any combination of these variances or all these variances.

The meaning and calculation of each of these variances is explained in the following table:

Name of the Variance	Meaning	Formula	
Overhead Cost Variance	It refers to the difference in the standard overhead cost set and the actual overhead	(Total Standard Overhead Cost for Actual Production) – (Actual Total Overheads)	
	cost meureu.	<i>Note:</i> Total Overheads include both fixed and variable overheads.	
Variable Overhead Cost Variance	It refers to the difference in the standard variable overhead cost and the actual variable overhead cost incurred	(Standard Variable Overhead Cost for Actual Production) – (Actual Variable Overheads)	
Variable Overhead Expenditure Variance	It refers to the difference in variable overhead cost on account of rate of the factor based on which the cost is absorbed. <i>Note:</i> The variable overhead cost may be absorbed on the basis of material usage or labour time or any other factor. Unless otherwise specified, labour hours are considered as the basis for absorbing overheads.	(Standard Variable Overhead Rate – Actual Variable Overhead Rate) × Actual Hours worked Or (Standard Variable Overhead Rate – Actual Variable Overhead Rate) × Actual Quantity used	
Variable Overhead Efficiency Variance	riable Overhead iciency Variance iciency Variance in the usage of resources (i.e., material or time). (Standard T - Actual T Overhead in the usage of resources (i.e., material or time). (Standard T - Actual T Overhead (Standard T - Actual T (Standard T - Actual T - (Standard T - Actual - Actual - Actual T - Actual - Act		
Fixed Overhead Cost Variance	It refers to the difference in standard fixed overhead cost and the actual fixed overhead cost incurred.	Absorbed Fixed Overhead Cost – Actual Fixed Overhead Cost	
Fixed Overhead Expenditure Variance	It refers to the difference in fixed overhead cost on account of rate of the factor based on which the cost is absorbed. <i>Note:</i> The fixed overhead cost may be absorbed on the basis of material usage or labour time or any other factor. Unless otherwise specified, labour hours are considered as the basis for absorbing overheads.	Budgeted Fixed Overhead Cost – Actual Fixed Overhead Cost	
Fixed Overhead Volume Variance	It refers to the difference in fixed overhead cost on account of the difference in budgeted and actual overhead costs.	Absorbed Fixed Overhead Cost – Budgeted Fixed Overhead Cost	
Fixed Overhead Efficiency Variance	It is the variance, which measures the difference between the standard overhead cost and the absorbed overhead cost.	Standard Fixed Overheads for Actual Output – Actual Fixed Overhead Cost	

Name of the Variance	Meaning	Formula
Fixed Overhead Capacity Variance	It is the variance, which measures the difference between the standard overhead cost and the budgeted overhead cost.	Absorbed Fixed Overhead Cost – Standard Fixed Overheads for Actual Output
Fixed Overhead Calendar Variance	It is the variance, which measures the difference between the actual overhead cost and the budgeted overhead cost.	Actual Fixed Overhead Cost – Budgeted Fixed Overhead Cost

Notes:

- 1. Fixed Overhead Efficiency Variance + Fixed Overhead Capacity Variance + Fixed Overhead Calendar Variance = Fixed Overhead Volume Variance.
- 2. Fixed Overhead Expenditure Variance + Fixed Overhead Volume Variance = Fixed Overhead Cost Variance.
- 3. Variable Overhead Expenditure Variance + Variable Overhead Efficiency Variance = Variable Overhead Cost Variance.
- 4. Variable Overhead Cost Variance + Fixed Overhead Cost Variance = Total Overhead Cost Variance.
- 5. When the variance is positive, it is called as Favourable Variance, which is denoted by (F).
- 6. When the variance is negative, it is called Adverse Variance, which is denoted by (A).
- 7. Inputs required for calculating overhead variances are:
 - Budgeted Overheads (fixed and variable)
 - Standard Overheads for Actual Output or Actual Time (fixed and variable)
 - Actual Overheads (fixed and variable)
 - Absorbed Overheads (fixed and variable)

THEORY QUESTIONS

Section A Type Questions

- 1. List the different Overhead Variances.
- 2. What is Overhead Cost Variance? How can it be measured?
- 3. Explain the meaning of Variable Overhead Cost Variance. What are the reasons for this variance?
- 4. What is Variable Overhead Efficiency Variance? How is it measured?
- 5. What is Variable Overhead Expenditure Variance? State the formula for its measurement.
- 6. List the different fixed overhead variances.
- 7. Present, in a chart, the inter-relationships between different fixed overhead variances.
- 8. How can Fixed Overhead Cost Variance be measured?
- 9. List out the reasons for Fixed Overhead Cost Variance.
- 10. What is Fixed Overhead Volume Variance? How is it measured?
- 11. What is Fixed Overhead Expenditure Variance? State the formula for its measurement.
- 12. State the formula for measurement of Fixed Overhead Efficiency Variance.
- 13. What is Fixed Overhead Capacity Variance? How can it be measured?
- 14. Give the meaning of Fixed Overhead Calendar Variance. State the formula for its measurement.

Section B Type Questions

1. Explain, in detail, the various Variable Overhead Variances, highlighting the reasons for each variance.

2. Explain, in detail, the various Fixed Overhead Variances, highlighting the reasons for each variance.

Section C Type Questions

- 1. What is Variance Analysis? Explain in detail, the different overhead variances and the inter-relationships among the variances.
- 2. Explain briefly the various material, labour and overhead variances.

This chapter demonstrates calculation of only Material and Labour Variances.

PROBLEMS ON VARIANCE ANALYSIS

Problems on Computation of Material Variances

Problem 1 (Problem on calculation of Material Variances)

A furniture company uses Formica for tables. It provides the following data:

Standard quantity of Formica per table:	4 sq. ft.
Standard price per square foot of Formica:	₹5
Actual production of tables:	1000
Actual quantity of Formica used:	4300 sq. ft.
Actual purchase price per square feet:	₹5.50

Calculate:

- (a) Material Cost Variance
- (b) Material Price Variance
- (c) Material Usage Variance
- (d) Material Yield Variance

Solution

Ascertainment of Inputs

1	Standard Quantity required for Actual Production	1000 tables × 4 sq. ft. per table = 4000 sq. ft.
2	Actual Quantity of material used	4300 sq. ft.
3	Standard Price	₹5 per sq. ft.
4	Actual Price	₹5.50 per sq. ft.
5	Standard Material Cost for Actual Production (1×3)	4000 sq. ft. × ₹5 per sq. ft. = ₹ 20,000
6	Actual Material Cost (2×4)	4300 sq. ft. ×₹5.50 sq. ft. = ₹ 23,650
7	Standard Yield = Actual Quantity of material used/Standard Quantity of material per unit of output	4300 sq. ft./4 sq. ft. = 1075 tables
8	Actual Yield	1000 tables
9	Standard Cost of material per unit of output	4 sq. ft. ×₹5 per sq. ft. = ₹ 20

Calculation of Variances

Material Cost Variance =	
Standard Material Cost for Actual Production – Actual Material Cost	₹20,000 – ₹23,650 = ₹ 3,650 (A)
(Item 5 – Item 6)	
Material Price Variance =	
(Standard Price per unit of material – Actual Price per unit of material) × Actual Quantity of material used	(₹5 – ₹5.50) × 4300 = ₹ 2,150 (A)
$(\text{Item } 3 - \text{Item } 4) \times \text{Item } 2$	

(Contd.)

Material Usage Variance = (Standard Quantity for Actual Production – Actual Quantity used) × Standard Price per unit of material (Item 1 – Item 2) × Item 3	(4000 sq. ft. – 4300 sq. ft.) ×₹5 = ₹1500 (A)
Material Yield Variance = (Actual Yield – Standard Yield) × Standard Cost per unit of yield (Item 8 – Item 7) × Item 9	(1000 tables – 1075 tables) × ₹20 per table = ₹ 1,500 (A)

Notes:

- 1. Since only one material is used in production, Material Mix Variance cannot be calculated.
- 2. Since, Material Mix Variance cannot be calculated, Material Usage Variance should be equal to the Material Yield Variance.
- 3. Since only one raw material is used in production, the formula given for calculating Material Yield Variance is used.
- 4. (F) indicates Favourable Variance and (A) indicates Adverse Variance
- 5. Check: Material Cost Variance = Material Price Variance + Material Usage Variance

Problem 2 (Problem on calculation of Material Variances)

From the following particulars calculate material variances:

Quantity of material purchased:	3000 units
Value of materials purchased:	₹9,000
Standard quantity of material required per ton of finished product:	25 units
Standard rate of material:	₹2 per unit
Opening stock of material:	Nil
Closing stock of material:	500 units
Finished production during the period:	80 tons

Solution

Ascertainment of Inputs

1	Standard Quantity required for Actual Production	$25 \text{ units} \times 80 \text{ tons} = 2000 \text{ units}$
2	Actual Quantity of material used	Opening Stock of raw material + Raw material purchased – Closing Stock of raw material
		= Nil + 3000 units – 500 units = 2500 units
3	Standard Price	₹2 per unit
4	Actual Price	₹9,000/3000 units = ₹ 3 per unit
5	Standard Material Cost for Actual Production (1×3)	2000 Units × ₹2 per unit = ₹ 4,000
6	Actual Material Cost (2×4)	2500 units × ₹3 per unit = ₹ 7,500
7	Standard Yield = Actual Quantity of material used/Standard Quantity of material per unit of output	2500 units/ 25 units = 100 tons
8	Actual Yield	80 tons
9	Standard Cost of material per unit of output	25 units × ₹2 per unit = ₹ 50

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Calculation of Variances

Material Cost Variance = Standard Material Cost for Actual Production – Actual Material Cost (Item 5 – Item 6)	₹4,000 – ₹7,500 = ₹3,500 (A)
Material Price Variance = (Standard Price per unit of material – Actual Price per unit of material) × Actual Quantity of Material used (Item 3 – Item 4) × Item 2	(₹2 – ₹3) × 2500 = ₹ 2,500 (A)
Material Usage Variance = (Standard Quantity for Actual Production – Actual Quantity used) × Standard Price per unit of material (Item 1 – Item 2) × Item 3	(2000 units – 2500 units) × ₹2 = ₹1000 (A)
Material Yield Variance = (Actual Yield – Standard Yield) × Standard Cost per unit of yield (Item 8 – Item 7) × Item 9	(80 tons – 100 tons) × ₹50 per ton = ₹1,000 (A)

Notes:

- 1. Since only one material is used in production, Material Mix Variance cannot be calculated.
- 2. Since Material Mix Variance cannot be calculated, Material Usage Variance should be equal to Material Yield Variance.
- 3. Since only one raw material is used in production, the formula given for calculating Material Yield Variance is used.
- 4. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 5. Check: Material Cost Variance = Material Price Variance + Material Usage Variance.

Problem 3 (Problem on calculation of Material Variances)

Given that the cost standard for material consumption as 40 kg @ ₹10 per kg, compute the possible material variances, when the actual are:

- (a) 48 kg @ ₹10 per kg
- (b) 40 kg @ ₹12 per kg
- (c) 48 kg @ ₹12 per kg
- (d) 36 kg for a total cost of ₹360

Solution

Details of output (i.e., actual production) are not available. Hence, it is assumed that the standard and actual details are for the same volume of output.

		Case (a)	Case (b)	Case (c)	Case (d)
1	Standard Quantity required for Actual Production	40 kg	40 kg	40 kg	40 kg
2	Actual Quantity of material used	48 kg	40 kg	48 kg	36 kg
3	Standard Price	₹10 per kg	₹10 per kg	₹10 per kg	₹10 per kg
4	Actual Price	₹10 per kg	₹12 per kg	₹12 per kg	₹360/36 kg = ₹10 per kg
5	Standard Material Cost for Actual Production (1×3)	₹400	₹400	₹400	₹400
6	Actual Material Cost (2×4)	₹480	₹480	₹576	₹360

Ascertainment of Inputs

	Case (a)	Case (b)	Case (c)	Case (d)
Material Cost Variance =				
Standard Material Cost for Actual Production – Actual Material Cost	₹80 (A)	₹80 (A)	₹176 (A)	₹ 40 (F)
(Item 5 – Item 6)				
Material Price Variance = (Standard Price per unit of material – Actual Price per unit of material) × Actual Quantity of Material used (Item 3 – Item 4) × Item 2	Nil	₹80 (A)	₹96 (A)	Nil
Material Usage Variance =				
(Standard Quantity for Actual Production – Actual Quantity used) × Standard Price per unit of material	₹80 (A)	Nil	₹80 (A)	₹ 40 (F)
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 3$				

Calculation of Variances

Notes:

- 1. Since details of actual output are not given, Material Yield Variance cannot be calculated.
- 2. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 3. Check: Material Cost Variance = Material Price Variance + Material Usage Variance.

Problem 4 (Problem on calculation of Material Variances)

From the following data, calculate all possible material variances for each raw material.

Standard

Raw Material X - 40 units @ ₹50 per unit

Raw Material Y - 60 units @ ₹40 per unit

100 units

Actual

Raw Material X − 50 units @ ₹50 per unit

Raw Material Y - 60 units @ ₹45 per unit

110 units

Solution

Since the details of output are not provided, it is assumed that the standard and actual details are for the same volume of output.

		Raw Material X	Raw Material Y
1	Standard Quantity required for Actual Production	40 units	60 units
2	Actual Quantity of material used	50 units	60 units
3	Standard Price	₹50 per unit	₹40 per unit
4	Actual Price	₹50 per unit	₹45 per unit
5	Standard Material Cost for Actual Production (1×3)	₹2000	₹2400
6	Actual Material Cost (2×4)	₹2500	₹2700

Ascertainment of Inputs

(Contd.)

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		Raw Material X	Raw Material Y
7	Revised Standard Quantity = (Total of Actual Input Quantity of all raw materials/ Total of Standard Input Quantity of all raw materials) × Standard Quantity of each raw material	$(110/100) \times 40 = 44$ units	(110/100) × 60 = 66 units

Calculation of Variances

	Raw Material X	Raw Material Y	Total
Material Cost Variance = Standard Material Cost for Actual Production – Actual material Cost (Item 5 – Item 6)	₹500 (A)	₹300 (A)	₹800 (A)
Material Price Variance =			
(Standard Price per unit of material – Actual Price per unit of material) × Actual Quantity of Material used	Nil	₹300 (A)	₹300 (A)
$(\text{Item } 3 - \text{Item } 4) \times \text{Item } 2$			
Material Usage Variance =			
(Standard Quantity for Actual Production – Actual Quantity used) × Standard Price per unit of material	₹500 (A)	Nil	₹500 (A)
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 3$			
Material Mix Variance =			
(Revised Standard Quantity – Actual Quantity) × Standard Price	₹300 (A)	₹240 (A)	₹540 (A)
$(\text{Item 7} - \text{Item 2}) \times \text{Item 3}$			
Material Yield Variance =			
(Standard Quantity for Actual Production – Revised Standard Quantity) × Standard Price	₹200 (A)	₹240 (F)	₹40 (F)
$(\text{Item } 1 - \text{Item } 7) \times \text{Item } 3$			

Notes:

- 1. Since more than one material is used for production, the formula given for Material Yield Variance is used.
- 2. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 3. Check: Material Cost Variance = Material Price Variance + Material Usage Variance.
- 4. Check: Material Usage Variance = Material Mix Variance + Material Yield Variance.

Problem 5 (Problem on calculation of Material Variances)

From the following information, calculate all the material variances.

Matarial	Standard Mix		Actual Mix			
Materiai	Quantity (kg)	Price (₹ per kg)	Amount (₹)	Quantity (kg)	Price (₹ per kg)	Amount (₹)
Х	120	25	3000	122	28	3416
Y	80	50	4000	98	47	4606
	200	-	7000	220	-	8022
	60	Std. Loss	-	52	Act. Loss	-
	140	Std. Yield	7000	168	Act. Yield	8022

Solution

Ascertainment of Inputs

		Raw Material X	Raw Material Y
1	Standard Quantity required for Actual Production (Standard Quantity for each raw material/Standard Output) × Actual Output	(120/140) × 168 = 144 kg	(80/140) × 168 = 96 kg
2	Actual Quantity of material used	122 kg	98 kg
3	Standard Price	₹25 per kg	₹50 per kg
4	Actual Price	₹28 per Kg	₹47 per kg
5	Standard Material Cost for Actual Production (1×3)	₹3600	₹4800
6	Actual Material Cost (2×4)	₹3416	₹4606
7	Revised Standard Quantity = (Total of Actual Input Quantity of all raw materials/Total of Standard Input Quantity of all raw materials) × Standard Quantity of each raw material	$\frac{220}{200} \times 120$ $= 132 \text{ kg}$	$\frac{220}{200} \times 80$ $= 88 \text{ kg}$

Calculation of Variances

	Raw Material X	Raw Material Y	Total
Material Cost Variance =			
Standard Material Cost for Actual Production – Actual Material	₹184 (F)	₹194 (F)	₹378 (F)
Cost			(0,0(1)
(Item 5 - Item 6)			
Material Price Variance =			
(Standard Price per unit of material - Actual Price per unit of	₹366 (A)	₹294 (F)	₹72 (A)
material) × Actual Quantity of Material used		(1)	
$(\text{Item } 3 - \text{Item } 4) \times \text{Item } 2$			
Material Usage Variance =			
(Standard Quantity for Actual Production – Actual Quantity used)	₹550 (F)	₹100 (A)	₹450 (F)
× Standard Price per unit of material	(350 (1)	(100 (11)	(450 (1)
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 3$			
Material Mix Variance =			
(Revised Standard Quantity – Actual Quantity) × Standard Price	₹250 (F)	₹500 (A)	₹250 (A)
$(\text{Item 7} - \text{Item 2}) \times \text{Item 3}$			
Material Yield Variance =			
(Standard Quantity for Actual Production - Revised Standard	₹300 (F)	₹400 (F)	₹700 (F)
Quantity) \times Standard Price			.,
$(\text{Item } 1 - \text{Item } 7) \times \text{Item } 3$			

Notes:

- 1. Since more than one material is used for production, the formula given for Material Yield Variance is used.
- 2. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 3. Check: Material Cost Variance = Material Price Variance + Material Usage Variance.
- 4. Check: Material Usage Variance = Material Mix Variance + Material Yield Variance.

Problem 6 (Problem on calculation of Material Variances)

Given the following information, calculate the material variances.

		Standard		Actual			
Material	Quantity (kg)	Rate per kg	Amount (₹)	Quantity (kg)	Rate per kg	Amount (₹)	
A	200	5	1000	200	5	1000	
В	500	3	1500	500	3	1500	
	700	-	2500	700	-	2500	
	75	Std. Loss	-	100	Act. Loss	-	
	625	Std. output	2500	600	Act. output	2500	

Solution

Ascertainment of Inputs

		Raw Material A	Raw Material B
1	Standard Quantity required for Actual Production (Standard Quantity for each raw material/Standard Output) × Actual Output	$\frac{200}{625} \times 600$ $= 192 \text{ kg}$	$\frac{500}{625} \times 600$ $= 480 \text{ kg}$
2	Actual Quantity of Material used	200 kg	500 kg
3	Standard Price	₹5 per kg	₹3 per kg
4	Actual Price	₹5 per kg	₹3 per kg
5	Standard Material Cost for Actual Production (1×3)	₹960	₹1440
6	Actual Material Cost (2×4)	₹1000	₹1500
7	Revised Standard Quantity = (Total of Actual Input Quantity of all raw materials/Total of Standard Input Quantity of all raw materials) × Standard Quantity of each raw material	$\frac{700}{700} \times 200$ = 200 kg	$\frac{700}{700} \times 500$ $= 500 \text{ kg}$

Calculation of Variances

	Raw Material A	Raw Material B	Total
Material Cost Variance =			
Standard Material Cost for Actual Production – Actual Material Cost	₹40 (A)	₹60 (A)	₹100 (A)
(Item 5 – Item 6)			
Material Price Variance =			
(Standard Price per unit of material – Actual Price per unit of material) × Actual Quantity of Material used	Nil	Nil	Nil
$(\text{Item } 3 - \text{Item } 4) \times \text{Item } 2$			
Material Usage Variance =			
(Standard Quantity for Actual Production – Actual Quantity used) × Standard Price per unit of material	₹40 (A)	₹60 (A)	₹100 (A)
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 3$			

(Contd.)

	Raw Material A	Raw Material B	Total
Material Mix Variance =			
(Revised Standard Quantity – Actual Quantity) \times Standard Price	Nil	Nil	Nil
$(\text{Item 7} - \text{Item 2}) \times \text{Item 3}$			
Material Yield Variance =			
(Standard Quantity for Actual Production – Revised Standard Quantity) × Standard Price	₹40 (A)	₹60 (A)	₹100 (A)
$(\text{Item } 1 - \text{Item } 7) \times \text{Item } 3$			

Notes:

- 1. Since more than one material is used for production, the formula given for Material Yield Variance is used.
- 2. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 3. Check: Material Cost Variance = Material Price Variance + Material Usage Variance.
- 4. Check: Material Usage Variance = Material Mix Variance + Material Yield Variance.

Problem 7 (Problem on calculation of Material Variances)

Given the following data, compute the material variances.

Matarial	Standard			Actual		
Wateria	Quantity (kg)	Rate per kg	Amount (₹)	Quantity (kg)	Rate per kg	Amount (₹)
Α	500	6.00	3000	400	6.00	2400
В	400	3.75	1500	500	3.60	1800
C	300	3.00	900	400	2.80	1120
	1200	-	5400	1300	-	5320
	120	Std. Loss	-	220	Act. Loss	
	1080	Std. output	5400	1080	Act. output	5320

Solution

Ascertainment of Inputs

		Material A	Material B	Material C
1	Standard Quantity required for Actual Production (Standard Quantity for each raw material/ Standard Output) × Actual Output	$\frac{1080}{1080} \times 500$ $= 500 \text{ kg}$	$\frac{1080}{1080} \times 400$ $= 400 \text{ kg}$	$\frac{1080}{1080} \times 300$ $= 300 \text{ kg}$
2	Actual Quantity of material used	400 kg	500 kg	400 kg
3	Standard Price	₹6 per kg	₹3.75 per kg	₹3 per kg
4	Actual Price	₹6 per kg	₹3.60 per kg	₹2.80 per kg
5	Standard Material Cost for Actual Production (1×3)	₹3000	₹1500	₹900
6	Actual Material Cost (2×4)	₹2400	₹1800	₹1120
7	Revised Standard Quantity = (Total of Actual Input Quantity of all raw materials/Total of Standard Input Quantity of all raw materials) × Standard Quantity of each raw material	$\frac{1300}{1200} \times 500$ = 541.67 kg	$\frac{1300}{1200} \times 400$ = 433.33 kg	$\frac{1300}{1200} \times 300$ $= 325 \text{ kg}$

Calculation of Variances

	Material A	Material B	Material C	Total
Material Cost Variance = Standard Material Cost for Actual Production – Actual Material Cost (Item 5 – Item 6)	₹600 (F)	₹300 (A)	₹220 (A)	₹80 (F)
Material Price Variance = (Standard Price per unit of material – Actual Price per unit of material) × Actual Quantity of Material used (Item 3 – Item 4) × Item 2	Nil	₹75 (F)	₹80 (F)	₹155 (F)
Material Usage Variance = (Standard Quantity for Actual Production – Actual Quantity used) × Standard Price per unit of material (Item 1 – Item 2) × Item 3	₹600 (F)	₹375 (A)	₹300 (A)	₹75 (A)
Material Mix Variance = (Revised Standard Quantity – Actual Quantity) × Standard Price (Item 7 – Item 2) × Item 3	₹850 (F)	₹250 (A)	₹225 (A)	₹375 (F)
Material Yield Variance = (Standard Quantity for Actual Production – Revised Standard Quantity) × Standard Price (Item 1 – Item 7) × Item 3	₹250 (A)	₹125 (A)	₹75 (A)	₹450 (A)

Notes:

- 1. Since more than one material is used for production, the formula given for Material Yield Variance is used.
- 2. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 3. Check: Material Cost Variance = Material Price Variance + Material Usage Variance.
- 4. Check: Material Usage Variance = Material Mix Variance + Material Yield Variance.

Problem 8 (Problem on calculation of Material Variances)

From the following data, compute the material cost, price, usage, mix and revised usage variances:

		Standard			Actual	
Material	Tons	Rate (₹)	Amount (₹)	Tons	Rate (₹)	Amount (₹)
Α	4	1	4	2	3.50	7
В	2	2	4	1	2	2
C	2	4	8	3	3	9
	8		16	6		18

Solution

It is assumed that the Standard and Actual details given in the problem is for the same units of output.

Ascertainment of Inputs

		Material A	Material B	Material C
1	Standard Quantity required for Actual Production (Standard Quantity for each raw material/Standard Output) × Actual Output	4 tons	2 tons	2 tons
2	Actual Quantity of material used	2 tons	1 ton	3 ton
3	Standard Price	₹1 per ton	₹2 per ton	₹4 per ton
4	Actual Price	₹3.50 per ton	₹2 per ton	₹3 per ton
5	Standard Material Cost for Actual Production (1×3)	₹4	₹4	₹8
6	Actual Material Cost (2×4)	₹7	₹2	₹9
7	Revised Standard Quantity = (Total of Actual Input Quantity of all raw materials/Total of Standard Input Quantity of all raw materials) × Standard Quantity of each raw material	$\frac{6}{8} \times 4$ $= 3 \text{ tons}$	$\frac{6}{8} \times 2$ $= 1.5 \text{ tons}$	$\frac{6}{8} \times 2$ $= 1.5 \text{ tons}$

Calculation of Variances

	Material A	Material B	Material C	Total
Material Cost Variance = Standard Material Cost for Actual Production – Actual Material Cost (Item 5 – Item 6)	₹3 (A)	₹2 (F)	₹1 (A)	₹2 (A)
Material Price Variance =				
(Standard Price per unit of material – Actual Price per unit of material) × Actual Quantity of Material used	₹5 (A)	Nil	₹3 (F)	₹2 (A)
$(\text{Item } 3 - \text{Item } 4) \times \text{Item } 2$				
Material Usage Variance =				
(Standard Quantity for Actual Production – Actual Quantity used) × Standard Price per unit of material	₹2 (F)	₹2 (F)	₹4 (A)	Nil
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 3$				
Material Mix Variance =				
(Revised Standard Quantity – Actual Quantity) × Standard Price	₹ 1 (F)	₹1 (F)	₹6 (A)	₹4 (A)
$(\text{Item 7} - \text{Item 2}) \times \text{Item 3}$				
Material Yield Variance =(Standard Quantity for Actual Production – Revised Standard Quantity) × Standard Price (Item 1 – Item 7) × Item 3	₹1 (F)	₹1 (F)	₹2 (F)	₹4 (F)

Notes:

- 1. Since more than one material is used for production, the formula given for Material Yield Variance is used.
- 2. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 3. Check: Material Cost Variance = Material Price Variance + Material Usage Variance.
- 4. Check: Material Usage Variance = Material Mix Variance + Material Yield Variance.

Problem 9 (Problem on calculation of Material Variances)

The standard mix required to produce one unit of a product is given as follows:

Material A:	60 units @ ₹15 each – ₹900.
Material B:	80 units @ ₹20 each – ₹1600.
Material C:	100 units @ ₹25 each – ₹2500.

During the month of September 2017, 10 units were actually produced and the actual data is as follows:

Material A:	640 units @ ₹17.50 each – ₹11200.
Material B:	950 units @ ₹18.00 each – ₹17100.
Material C:	870 units @ ₹27.50 each – ₹23925.

Calculate material variances.

Solution

		Material A	Material B	Material C
1	Standard Quantity required for Actual Production	$60 \text{ units} \times 10$	80 units \times 10	100 units × 10
	(Standard Quantity for each raw material per unit of output × Actual output)	= 600 units	= 800 units	= 1000 units
2	Actual Quantity of material used	640	950	870
3	Standard Price	₹15 per unit	₹20 per unit	₹25 per unit
4	Actual Price	₹17.50 per unit	₹18 per unit	₹27.50 per unit
5	Standard Material Cost for Actual Production (1×3)	₹9000	₹16000	₹25000
6	Actual Material Cost (2×4)	₹11200	₹17100	₹23925
7	Revised Standard Quantity = (Total of Actual Input Quantity of all raw materials/Total of Standard Input Quantity of all raw Materials) × Standard Quantity of each raw Material Total Actual Input Quantity = 640 + 950 + 870 = 2460 units Total Standard Input Quantity =	$\frac{2460}{2400} \times 600 \text{ units}$ $= 615 \text{ units}$	$\frac{2460}{2400} \times 800 \text{ units}$ $= 820 \text{ units}$	$\frac{2460}{2400} \times 1000 \text{ units}$ = 1025 units
	600 + 800 + 1000 = 2400 units			

Ascertainment of Inputs

Calculation of Variances

	Material A	Material B	Material C	Total
Material Cost Variance = Standard Material Cost for Actual Production – Actual Material Cost (Item 5 – Item 6)	₹2,200 (A)	₹1,100 (A)	₹1,075 (F)	₹2,225 (A)
Material Price Variance =				
(Standard Price per unit of material – Actual Price per unit of material) × Actual Quantity of Material used	₹1,600 (A)	₹1,900 (F)	₹2,175 (A)	₹1,875 (A)
$(\text{Item 3} - \text{Item 4}) \times \text{Item 2}$				

(Contd.)

₹600 (A)			
	₹3000 (A)	₹3250 (F)	₹350 (A)
₹375 (A)	₹2600 (A)	₹3875 (F)	₹900 (F)
₹225 (A)	₹400 (A)	₹625 (A)	₹1,250 (A)
	₹375 (A) ₹225 (A)	₹375 (A) ₹2600 (A) ₹225 (A) ₹400 (A)	₹375 (A) ₹2600 (A) ₹3875 (F) ₹225 (A) ₹400 (A) ₹625 (A)

Notes:

- 1. Since more than one material is used for production, the formula given for Material Yield Variance is used.
- 2. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 3. Check: Material Cost Variance = Material Price Variance + Material Usage Variance.
- 4. Check: Material Usage Variance = Material Mix Variance + Material Yield Variance.

Problem 10 (Problem on calculation of Material Variances)

The standard cost of a chemical mixture is given as follows:

4 tons of material X at ₹20 per ton

6 tons of material Y at ₹30 per ton

Standard yield is 90% of the input.

The actual cost for the period is as follows:

4.5 tons of material X at ₹15 per ton

5.5 tons of material Y at ₹34 per ton

Actual yield is 9.1 tons.

Solution

For ease of obtaining information, the data in the problem has been tabulated in the following format:

Matarial	Standard Mix			Actual Mix			
Material	Tons	Price (₹ per Ton)	Amount (₹)	Tons	Price (₹ per Ton)	Amount (₹)	
X	4	20	80	4.5	15	67.50	
Y	6	30	180	5.5	34	187.00	
	10	-	260	10.0	-	254.50	
	1	Std. Loss	-	0.9	Act. Loss	-	
	9	Std. Yield	260	9.1	Act. Yield	254.50	

Notes:

- 1. Standard Yield is 90% of the input. Hence, Standard Yield is 9 tons. That is, Standard Loss is 1 ton.
- 2. Actual Yield is 9.1 tons. Hence, Actual Loss is 0.9 tons.

		Raw Material X	Raw Material Y
1	Standard Quantity required for Actual Production	$(4/9) \times 9.1$ tons	$(6/9) \times 9.1$ tons
	(Standard Quantity for each raw material/Standard Output)×Actual Output	= 4.04 tons	= 6.06 tons
2	Actual Quantity of material used	4.5 tons	5.5 tons
3	Standard Price	₹20 per ton	₹30 per ton
4	Actual Price	₹15 per ton	₹34 per ton
5	Standard Material Cost for Actual Production (1×3)	₹80.80	₹181.80
6	Actual Material Cost (2×4)	₹67.50	₹187.00
7	Revised Standard Quantity =	$\frac{10}{10} \times 4$	$\frac{10}{10} \times 6$
	Quantity of all raw materials) × Standard Quantity of each raw material	= 4 tons	= 6 tons

Ascertainment of Inputs

Calculation of Variances

	Raw Material X	Raw Material Y	Total
Material Cost Variance =			
Standard Material Cost for Actual Production – Actual Material	₹13 30 (F)	₹5 20 (A)	₹8 10 (F)
Cost	(15.50 (1)	(3.20 (11)	(0.10 (1)
(Item 5 – Item 6)			
Material Price Variance =			
(Standard Price per unit of material – Actual Price per unit of	₹22.50 (F)	₹22 (A)	₹0.50 (F)
material) × Actual Quantity of Material used			
$(\text{Item } 3 - \text{Item } 4) \times \text{Item } 2$			
Material Usage Variance =			
(Standard Quantity for Actual Production - Actual Quantity	₹9.20 (A)	₹16.80 (F)	₹7.60 (F)
used) \times Standard Price per unit of material	().20 (11)	(10.00 (1)	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 3$			
Material Mix Variance =			
(Revised Standard Quantity – Actual Quantity) × Standard Price	₹10 (A)	₹15 (F)	₹5 (F)
$(\text{Item 7} - \text{Item 2}) \times \text{Item 3}$			
Material Yield Variance =			
(Standard Quantity for Actual Production – Revised Standard Quantity) × Standard Price	₹0.80 (F)	₹1.80 (F)	₹ 2.60 (F)
$(\text{Item } 1 - \text{Item } 7) \times \text{Item } 3$			

Notes:

- 1. Since more than one material is used for production, the formula given for Material Yield Variance is used.
- 2. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 3. Check: Material Cost Variance = Material Price Variance + Material Usage Variance.
- 4. Check: Material Usage Variance = Material Mix Variance + Material Yield Variance.

Problem 11 (Problem on calculation of Material Variances)

The standard cost of a chemical mixture AB is given as follows:

40% of material A @ ₹400 per kg

60% of material B @ ₹600 per kg

A standard loss of 10% is anticipated in production.

The following particulars are available for the month of September 2009:

180 kg of material A has been used @ ₹360 per kg

220 kg of material B has been used @ ₹680 per kg

The actual production of AB is 360 kg.

Calculate material variances.

Solution

For ease of obtaining information, the data in the problem has been tabulated in the following format:

	Standard Mix		Actual Mix			
Material	kg	Price (₹) per kg	Amount (₹)	kg	Price (₹) per kg	Amount (₹)
А	160	400	64000	180	360	64800
В	240	600	144000	220	680	149600
	400	-	208000	400	-	214400
	40	Std. Loss	-	40	Act. Loss	-
	360	Std. Yield	208000	360	Act. Yield	214400

Notes:

- 1. Standard Input Quantity is not given in the problem. It is given as a percentage. Hence, it is calculated as a percentage of Total Actual Input, which is 400 kg.
- 2. Standard loss of 10% is anticipated in production. Hence, for an input quantity of 400 kg, the loss is 40 kg and the yield is 360 kg.
- 3. Actual Yield is 360 kg. Hence, Actual Loss is 40 kg.

Ascertainment of Inputs

		Raw Material X	Raw Material Y
1	Standard Quantity required for Actual Production (Standard quantity for each raw material/Standard Output) × Actual Output	$\frac{160}{360} \times 360$	$\frac{240}{360} \times 360$
2	Actual Quantity of material used	180 kg	220 kg
3	Standard Price	₹400 per kg	₹600 per kg
4	Actual Price	₹360 per kg	₹680 per kg
5	Standard Material Cost for Actual Production (1×3)	₹64,000	₹1,44,000
6	Actual Material Cost (2×4)	₹64,800	₹1,49,600
7	Revised Standard Quantity = (Total of Actual Input Quantity of all raw materials/Total of Standard Input Quantity of all raw Materials) × Standard Quantity of each raw Material	$\frac{400}{400} \times 160 \text{ kg}$ $= 160 \text{ kg}$	$\frac{400}{400} \times 240 \text{ kg}$ $= 240 \text{ kg}$

3.30 + Cost Management

Calculation of Variances

	Raw Material X	Raw Material Y	Total
Material Cost Variance = Standard material Cost for Actual Production – Actual material Cost (Item 5 – Item 6)	₹800 (A)	₹5,600 (A)	₹6,400 (A)
Material Price Variance = (Standard Price per unit of material – Actual Price per unit of material) × Actual Quantity of Material used (Item 3 – Item 4) × Item 2	₹7,200 (F)	₹17,600 (A)	₹10,400 (A)
Material Usage Variance = (Standard Quantity for Actual Production – Actual Quantity used) × Standard Price per unit of material (Item 1 – Item 2) × Item 3	₹8,000 (A)	₹12,000 (F)	₹4,000 (F)
Material Mix Variance = (Revised Standard Quantity – Actual Quantity) × Standard Price (Item 7 – Item 2) × Item 3	₹8,000 (A)	₹12,000 (F)	₹4,000 (F)
Material Yield Variance = (Standard Quantity for Actual Production – Revised Standard Quantity) × Standard Price (Item 1 – Item 7) × Item 3	Nil	Nil	Nil

Notes:

- 1. Since more than one material is used for production, the formula given for Material Yield Variance is used.
- 2. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 3. Check: Material Cost Variance = Material Price Variance + Material Usage Variance.
- 4. Check: Material Usage Variance = Material Mix Variance + Material Yield Variance.

Problems on Computation of Labour Variances

Problem 12 (Problem on calculation of Labour Variances)

The standard time and the rate for producing one unit of component A is given as follows:

Standard hours per unit:	30 hours
Standard rate:	₹8 per hour

The actual data along with related information are as follows:

Actual production:	1,000 units
Actual hours:	30,600 hours
Actual rate:	₹7.80 per hour

Calculate all possible labour variances.

Solution

Ascertainment of Inputs

1	Standard Time required for Actual Production	1,000 units × 30 Hours per unit = 30,000 hours
2	Actual Time taken	30,600 hours
3	Standard Rate	₹8 per hour

4	Actual Rate	₹7.80 per hour
5	Standard Labour Cost for Actual Production (1×3)	30,000 hours × ₹8.00 per hour = ₹ 2,40,000
6	Actual Labour Cost (2×4)	30,600 hours × ₹7.80 per hour = ₹ 2,38,680
7	Standard Yield = Actual Time taken/Standard Time per unit of Output	$\frac{30,600 \text{ hours}}{30 \text{ hours}} = 1020 \text{ units}$
8	Actual Yield	1000 units
9	Standard Labour Cost per unit of output	30 hours × ₹8 per hour = ₹ 240

Calculation of Variances

Labour Cost Variance = (Standard Labour Cost for Actual Production – Actual Labour Cost) (Item 5 – Item 6)	₹2,40,000 – ₹2,38,680 = ₹ 1,320 (F)	
Labour Rate Variance = (Standard Rate – Actual Rate) × Actual Time taken (Item 3 – Item 4) × Item 2	(₹8 – ₹7.80) × 30,600 hours = ₹ 6,120 (F)	
Labour Efficiency Variance = (Standard Time for Actual Production – Actual Time) × Standard Rate (Item 1 – Item 2) × Item 3	(30,000 hours – 30,600 hours) × ₹8 per hour = ₹ 4,800 (A)	
Labour Yield Variance = (Actual Yield – Standard Yield) × Standard Labour Cost per unit of yield (Item 8 – Item 7) × Item 9	(1,000 units – 1,020 units) × ₹240 per unit = ₹ 4,800 (A)	

Notes:

- 1. Since only one category of labour is used in production, Labour Mix Variance cannot be calculated.
- 2. Since, Labour Mix Variance cannot be calculated, Labour Efficiency Variance should be equal to Labour Yield Variance.
- 3. Since only one category of labour is used in production, the formula given for calculating Labour Yield Variance is used.
- 4. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 5. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.

Problem 13 (Problem on calculation of Labour Variances)

From the following information, calculate labour variances for Department A and Department B.

	Department A	Department B
Actual Direct Wages (₹)	2,000	1,800
Standard Hours produced	8,000	6,000
Standard Rate per hour (₹)	0.30	0.35
Actual Hours worked	8,200	5,800

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Solution

Ascertainment of Inputs

		Department A	Department B
1	Standard Time required for Actual Production	8,000 hours	6,000 hours
2	Actual Time taken	8,200 hours	5,800 hours
3	Standard Rate	₹0.30 per hour	₹0.35 per hour
4	Actual Rate	₹2,000 8,200 hours = ₹ 0.2439 per hour	₹1,800 5,800 hours = ₹ 0.3103 per hour
5	Standard Labour Cost for Actual Production (1×3)	₹2,400	₹2,100
6	Actual Labour Cost (given)	₹2,000	₹1,800

Calculation of Variances

	Department A	Department B
Labour Cost Variance =		
(Standard Labour Cost for Actual Production – Actual Labour Cost)	₹400 (F)	₹300 (F)
(Item 5 - Item 6)		
Labour Rate Variance =	₹460 (F)	₹230 (F)
(Standard Rate – Actual Rate) × Actual Time taken	(approximated to	(approximated to
$(\text{Item } 3 - \text{Item } 4) \times \text{Item } 2$	nearest rupee)	nearest rupee)
Labour Efficiency Variance =		
(Standard Time for Actual Production – Actual Time) × Standard Rate	₹60 (A)	₹70 (F)
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 3$		

Notes:

- 1. Since details of output are not provided, Labour Yield Variance cannot be calculated.
- 2. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 3. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.

Problem 14 (Problem on calculation of Labour Variances)

X Co. Ltd manufactures a particular product, the standard direct labour cost of which is ₹120 per unit, comprising of:

Grade of Workers	Hours	Rate per hour (₹)	Amount (₹)
А	30	2	60
В	20	3	60
	120		120

During the month of November 2017, 100 units were actually produced and the actual cost of which consist of:

Grade of Workers Actual Time (Hours)		Actual Rate per hour (₹)	Amount (₹)	
A	3,200	1.50	4,800	
В	1,900	4.00	7,600	
	5,100		12,400	

Calculate different labour variances.

Solution

		Grade A Workers	Grade B Workers
1		100 units × 30 hours	100 units \times 20 hours
1	Standard Time required for Actual Production	= 3,000 hours	= 2,000 hours
2	Actual Time taken	3,200 hours	1,900 hours
3	Standard Rate	₹2 per hour	₹3 per hour
4	Actual Rate	₹1.50 per hour	₹4 per hour
5	Standard Labour Cost for Actual Production (1×3)	₹6,000	₹6,000
6	Actual Labour Cost (2×4)	₹4,800	₹7,600
7	Revised Standard Time = (Total of Effective Actual Time taken by all category of workers /Total of Standard Time for all category of workers) × Standard Time for each category of worker Total of Actual Time = 3200 + 1900 = 5100 Hours	$\frac{5100}{5000} \times 3000$ = 3,060 hours	$\frac{5100}{5000} \times 2000$ = 2,040 hours
	Total of Standard Time = $3000 + 2000 = 5000$ Hours		

Ascertainment of Inputs

Calculation of Variances

	Grade A Workers	Grade B Workers	Total
Labour Cost Variance = (Standard Labour Cost for Actual Production – Actual Labour Cost) (Item 5 – Item 6)	₹1,200 (F)	₹1,600 (A)	₹400 (A)
Labour Rate Variance = (Standard Rate – Actual Rate) × Actual Time taken (Item 3 – Item 4) × Item 2	₹1,600 (F)	₹1,900 (A)	₹300 (A)
Labour Efficiency Variance = (Standard Time for Actual Production – Actual Time) × Standard Rate (Item 1 – Item 2) × Item 3	₹400 (A)	₹300 (F)	₹100 (A)
Labour Mix Variance = (Revised Standard Time – Actual Time) × Standard Rate (Item 7 – Item 2) × Item 3	₹280 (A)	₹420 (F)	₹140 (F)
Labour Yield Variance = (Standard Time for Actual Production – Revised Standard Time) × Standard Rate (Item 1 – Item 7) × Item 3	₹120 (A)	₹120 (A)	₹240 (A)

Notes:

1. Since more than one category of workers is used for production, the formula given for Labour Yield Variance is used.

- 2. No information regarding idle time is provided. Hence, Effective Actual Time is same as Actual Time.
- 3. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 4. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.
- 5. Check: Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance.

Problem 15 (Problem on calculation of Labour Variances)

Standard labour hours and the standard rates for the production of an article A is given as follows:

	No. of hours	Rate per hour (₹)
Skilled	5	1.50
Unskilled	8	0.50
Semi-skilled	4	0.75

From the actual data given as follows, calculate all possible labour variances.

Number of articles produced: 1000 units

Total number of hours spent on the job:

Skilled - 4500; Unskilled - 10000; and Semi-skilled - 4200

Rate per hour:

Skilled – ₹2; Unskilled – ₹0.45 and Semi-skilled – ₹0.75.

Solution

Ascertainment of Inputs

		Skilled	Unskilled	Semi-skilled
1	Standard Time required for Actual	1,000 units \times 5 hours	1,000 units \times 8 hours	1,000 units \times 4 hours
	Production	= 5,000 hours	= 8,000 hours	= 4,000 hours
2	Actual Time taken	4,500 hours	10,000 hours	4,200 hours
3	Standard Rate	₹1.50 per hour	₹0.50 per hour	₹0.75 per hour
4	Actual Rate	₹2.00 per hour	₹0.45 per hour	₹0.75 per hour
5	Standard Labour Cost for Actual Production (1×3)	₹7,500	₹7,500 ₹4,000	
6	Actual Labour Cost (2×4)	₹9,000	₹4,500	₹3,150
	Revised Standard Time =			
7	(Total of Effective Actual Time taken by all category of workers /Total of Standard Time for all category of workers) × Standard Time for each category of worker	$\frac{18700}{17000} \times 5000$	$\frac{18700}{17000} \times 8000$	$\frac{18700}{17000} \times 4000$
	Total of Actual Time = 5,000 + 8,000 + 4,000 = 17,000 hours	= 5,500 hours	= 8,800 hours	= 4,400 hours
	Total of Standard Time = $4,500 + 10,000 + 4,200 = 18,700$ hours			

	Skilled	Unskilled	Semi-skilled	Total
Labour Cost Variance =				
(Standard Labour Cost for Actual Production – Actual	₹1.500 (A)	₹500 (A)	₹150 (A)	₹2.150 (A)
Labour Cost)	, , ,		()	, ()
(Item 5 – Item 6)				
Labour Rate Variance =				
(Standard Rate – Actual Rate) × Actual Time taken	₹2,250 (A)	₹500 (F)	Nil	₹1750 (A)
$(\text{Item } 3 - \text{Item } 4) \times \text{Item } 2$				
Labour Efficiency Variance =				
(Standard Time for Actual Production – Actual Time)	₹750 (F)	₹1,000 (Δ)	₹150 (A)	₹400 (Δ)
× Standard Rate	(750(1)	(1,000 (71)	(150 (11)	(400 (71)
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 3$				
Labour Mix Variance =				
(Revised Standard Time - Actual Time) × Standard	₹1 500 (F)	₹600 (A)	₹150 (F)	₹1.050 (F)
Rate	(1,500 (1)	(000 (11)	(150 (1)	(1,050 (1)
$(\text{Item 7} - \text{Item 2}) \times \text{Item 3}$				
Labour Yield Variance =				
(Standard Time for Actual Production - Revised	₹750 (A)	₹400 (A)	₹300 (A)	₹1.450 (A)
Standard Time) × Standard Rate	(150(A)	(A) 00FX	(300 (4)	(1,10(11)
$(\text{Item } 1 - \text{Item } 7) \times \text{Item } 3$				

Calculation of Variances

Notes:

- 1. Since more than one category of workers is used for production, the formula given for Labour Yield Variance is used.
- 2. No information regarding idle time is provided. Hence, Effective Actual Time is same as Actual Time.
- 3. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 4. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.
- 5. Check: Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance.

Problem 16 (Problem on calculation of Labour Variances)

The budgeted labour force for producing 1000 articles of X is as follows:

30 men, at 40 paisa per hour for 50 hours

20 women, at 30 paisa per hour for 30 hours

10 boys, at 20 paisa per hour for 20 hours

The actual data and the related work force are as follows:

Articles produced: 1000 units

25 men at 45 paisa per hour for 50 hours

30 women at 30 paisa per hour for 30 hours

10 boys at 20 paisa per hour for 15 hours

Calculate Labour Variances.

Solution

Ascertainment of Inputs

Note that the Standards and Actuals are given for same volume of output.

		Men	Women	Boys	
1	Standard Time required for Actual	$30 \text{ men} \times 50 \text{ hours}$	20 women \times 30 hours	10 boys \times 20 hours	
1	Production	= 1,500 hours	= 600 hours	= 200 hours	
2	A stud Time taken 25 men × 50 hours 3		30 women \times 30 hours	10 boys \times 15 hours	
2	Actual Time taken	= 1,250 hours	= 900 hours	= 150 hours	
3	Standard Rate	₹0.40 per hour	₹0.30 per hour	₹0.20 per hour	
4	Actual Rate	₹0.45 per hour	₹0.30 per hour	₹0.20 per hour	
5	Standard Labour Cost for Actual Production (1×3)	₹600	₹180	₹40	
6	Actual Labour Cost (2×4)	₹562.50	₹270	₹30	
7	Revised Standard Time = (Total of Effective Actual Time taken by all category of workers / Total of Standard Time for all category of workers) × Standard Time for each category of worker	$\frac{2300}{2300} \times 1500 \text{ hours}$	$\frac{2300}{2300} \times 600$ hours	$\frac{2300}{2300}$ × 200 hours	
	Total of Actual Time = $1,250 + 900 + 150 = 2,300$ hours Total of Standard Time = $1500 + 600 + 200 = 2,300$ hours	= 1,500 hours	= 600 hours	= 200 hours	

Calculation of Variances

	Men	Women	Boys	Total
Labour Cost Variance =				
(Standard Labour Cost for Actual Production – Actual Labour Cost)	₹37.50 (F)	₹90 (A)	₹10 (F)	₹42.50 (A)
(Item 5 – Item 6)				
Labour Rate Variance =				
(Standard Rate – Actual Rate) × Actual Time taken	₹62.50 (A)	Nil	Nil	₹62.50 (A)
$(\text{Item } 3 - \text{Item } 4) \times \text{Item } 2$				
Labour Efficiency Variance =				
(Standard Time for Actual Production – Actual Time) × Standard Rate	₹100 (F)	₹90 (A)	₹10 (F)	₹20 (F)
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 3$				
Labour Mix Variance =				
(Revised Standard Time – Actual Time) × Standard Rate	₹100 (F)	₹90 (A)	₹10 (F)	₹20 (F)
$(\text{Item 7} - \text{Item 2}) \times \text{Item 3}$				
Labour Yield Variance =				
(Standard Time for Actual Production – Revised Standard Time) ×	Nil	Nil	Nil	Nil
(Item 1 – Item 7) × Item 3				
Notes:

- 1. Since more than one category of workers is used for production, the formula given for Labour Yield Variance is used.
- 2. No information regarding idle time is provided. Hence, Effective Actual Time is same as Actual Time.
- 3. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 4. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.
- 5. Check: Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance.

Problem 17 (Problem on calculation of Labour Variances)

The details regarding the composition and the weekly wage rates of the labour force engaged on a job, scheduled to be completed in 30 weeks, are as follows:

Stand		dard	Actual		
Workers	No. of workers	Weekly wage rate per worker (₹)	No. of workers	Weekly wage rate per worker (₹)	
Skilled	75	60	70	70	
Semi-skilled	45	40	30	50	
Unskilled	60	30	80	20	

The work is actually completed in 32 weeks. Calculate the various labour variances.

Solution

The problem has not provided information regarding the units produced or output. Hence, it is assumed that the Standards and Actuals given are for same volume of production.

Ascertainment of Inputs

		Skilled	Semi-skilled	Unskilled
1	Standard Time required for Actual	75 Workers × 30 Weeks =	45 Workers × 30 Weeks =	60 Workers × 30 Weeks =
1	Production	2250 Worker Weeks	1350 Worker Weeks	1800 Worker Weeks
2	A stual Time taken	70 Workers × 32 Weeks =	30 Workers × 32 Weeks =	80 Workers × 32 Weeks =
2		2240 Worker Weeks	960 Worker Weeks	2560 Worker Weeks
3	Standard Rate	₹60 per worker per week	₹40 per worker per week	₹30 per worker per week
4	Actual Rate	₹70 per worker per week ₹50 per worker per week		₹20 per worker per week
5	Standard Labour Cost for Actual Production (1×3)	₹1,35,000	₹54,000	₹54,000
6	Actual Labour Cost (2×4)	₹1,56,800	₹48,000	₹51,200
	Revised Standard Time = (Total of Effective Actual Time taken by all category of workers /Total of Standard			
7	Time for all category of workers) \times Standard Time for each category of worker	$\frac{5760}{5400} \times 2250$	$\frac{5760}{5400}$ × 1350	$\frac{5760}{5400}$ × 1800
	Total of Actual Time = 2,240 + 960 + 2,560 = 5,760 Worker Weeks	= 2400 Worker Weeks	= 1440 Worker Weeks	= 1920 Worker Weeks
	Total of Standard Time = 2,250 + 1,350 + 1,800 = 5,400 Worker Weeks			

3.38 + Cost Management

Calculation of Variances

	Skilled	Semi-skilled	Unskilled	Total
Labour Cost Variance =				
(Standard Labour Cost for Actual Production – Actual Labour Cost)	₹21,800 (A)	₹6,000 (F)	₹2,800 (F)	₹13,000 (A)
(Item 5 – Item 6)				
Labour Rate Variance =				
(Standard Rate – Actual Rate) × Actual Time taken	₹22,400 (A)	₹9,600 (A)	₹25,600 (F)	₹6,400 (A)
$(\text{Item } 3 - \text{Item } 4) \times \text{Item } 2$				
Labour Efficiency Variance =				
(Standard Time for Actual Production – Actual Time) \times Standard Rate	₹600 (F)	₹15,600 (F)	₹22,800 (A)	₹6,600 (A)
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 3$				
Labour Mix Variance =				
(Revised Standard Time – Actual Time) × Standard Rate	₹9,600 (F)	₹19,200 (F)	₹19,200 (A)	₹9,600 (F)
$(\text{Item 7} - \text{Item 2}) \times \text{Item 3}$				
Labour Yield Variance =				
(Standard Time for Actual Production – Revised Standard Time) × Standard Rate	₹9,000 (A)	₹3,600 (A)	₹3,600 (A)	₹16,200 (A)
$(\text{Item } 1 - \text{Item } 7) \times \text{Item } 3$				

Notes:

- 1. Since more than one category of worker is used for production, the previous formula for Labour Yield Variance is used.
- 2. No information regarding idle time is provided. Hence, Effective Actual Time is same as Actual Time.
- 3. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 4. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.
- 5. Check: Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance.

Problem 18 (Problem on calculation of Labour Variances)

A contract job is scheduled to be completed in 30 weeks, with a labour force of 100 skilled operators, 40 semi-skilled operators and 60 unskilled operators. The standard weekly wages for each category of labour force are: Skilled – $\gtrless60$; Semi-skilled – $\gtrless36$ and Unskilled – $\gtrless24$.

The work is actually completed in 32 weeks with a labour force of 80 skilled, 50 semi-skilled and 70 unskilled operators and the actual weekly wages amounted to ₹65 for skilled, ₹40 for semi-skilled and ₹20 for unskilled labour force.

Analyse the different labour cost variances.

Solution

The problem has not provided information regarding the units produced or the output. Hence, it is assumed that the Standards and Actuals given are for same volume of production.

		Skilled	Semi-skilled	Unskilled
1	Standard Time required for Actual Production	100 Workers × 30 Weeks = 3,000 Worker Weeks	40 Workers × 30 Weeks = 1,200 Worker Weeks	60 Workers × 30 Weeks = 1,800 Worker Weeks
2	Actual Time taken	80 Workers × 32 Weeks = 2,560 Worker Weeks	50 Workers × 32 Weeks = 1,600 Worker Weeks	70 Workers × 32 Weeks = 2,240 Worker Weeks
3	Standard Rate	₹60 per worker per week	₹36 per worker per week	₹24 per worker per week
4	Actual Rate	₹65 per worker per week	₹40 per worker per week	₹20 per worker per week
5	Standard Labour Cost for Actual Production (1×3)	₹1,80,000	₹43,200	₹43,200
6	Actual Labour Cost (2×4)	₹1,66,400	₹64,000	₹44,800
7	Revised Standard Time = (Total of Effective Actual Time taken by all category of workers /Total of Standard Time for all category of workers) × Standard Time for each category of worker Total of Actual Time = 2560 + 1600 + 2240 = 6,400 Worker Weeks Total of Standard Time = 3000 + 1200 + 1800 = 6,000 Worker Weeks	$\frac{6400}{6000} \times 3000$ = 3,200 Worker Weeks		<u>6400</u> 6000 = 1,920 Worker Weeks

Ascertainment of Inputs

Calculation of Variances

	Skilled	Semi-skilled	Unskilled	Total
Labour Cost Variance = (Standard Labour Cost for Actual Production – Actual Labour Cost) (Item 5 – Item 6)	₹13,600 (F)	₹20,800 (A)	₹1,600 (A)	₹8,800 (A)
Labour Rate Variance = (Standard Rate – Actual Rate) × Actual Time taken (Item 3 – Item 4) × Item 2	₹12,800 (A)	₹6,400 (A)	₹8,960 (F)	₹10,240 (A)
Labour Efficiency Variance = (Standard Time for Actual Production – Actual Time) × Standard Rate (Item 1 – Item 2) × Item 3	₹26,400 (F)	₹14,400 (A)	₹10,560 (A)	₹1,440 (F)
Labour Mix Variance = (Revised Standard Time – Actual Time) × Standard Rate (Item 7 – Item 2) × Item 3	₹38,400 (F)	₹11,520 (A)	₹7,680 (A)	₹19,200 (F)
Labour Yield Variance = (Standard Time for Actual Production – Revised Standard Time) × Standard Rate (Item 1 – Item 7) × Item 3	₹12,000 (A)	₹2,880 (A)	₹2,880 (A)	₹17,760 (A)

Notes:

1. Since more than one category of workers are used for production, the formula given for Labour Yield Variance is used.

- 2. No information regarding idle time is provided. Hence, Effective Actual Time is same as Actual Time.
- 3. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 4. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.
- 5. Check: Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance.

Problem 19 (Problem on calculation of Labour Variances)

The standard labour component and the actual labour component engaged during the month are as follows:

	Skilled	Semi-skilled	Unskilled
Standard number of workers in a group	30	10	10
Standard wage rate (₹ per hour)	5	3	2
Actual number of workers employed during the month in the group	24	15	12
Actual wage rate per hour (₹)	6	2.50	2

During the month of 200 working hours, the group produced 9,600 hours of standard work.

Calculate all possible labour variances.

Solution

The statement "the group produced 9,600 hours of standard work" means the standard time required for actual production.

So, the Total Standard Time for Actual Production is 9,600 Hours.

The Standard Time as per information in the problem is:

Skilled	$30 \text{ workers} \times 200 \text{ hours} = 6,000 \text{ hours}$
Semi-skilled	10 workers \times 200 hours = 2,000 hours
Unskilled	10 workers \times 200 hours = 2,000 hours

The ratio of Standard Time amongst Skilled, Semi-skilled and Unskilled Workers is 6:2:2.

The Standard Time for actual production (which is 9,600 hours) must be considered for each category of workers in this ratio.

Ascertainment of Inputs

		Skilled	Semi-skilled	Unskilled
1	Standard Time required for Actual Production	9600 hours × $\frac{6}{10}$ = 5,760 hours	9600 hours × $\frac{2}{10}$ = 1,920 hours	9600 hours $\times \frac{6}{10}$ = 1,920 hours
2	Actual Time taken	24 workers × 200 hours = 4,800 hours	15 workers × 200 hours = 3,000 hours	12 workers × 200 hours = 2,400 hours
3	Standard Rate	₹5.00 per hour	₹3.00 per hour	₹2.00 per hour
4	Actual Rate	₹6.00 per hour	₹2.50 per hour	₹2.00 per hour
5	Standard Labour Cost for Actual Production (1×3)	₹28,800	₹5,760	₹3,840
6	Actual Labour Cost (2×4)	₹28,800	₹7,500	₹4,800
7	Revised Standard Time = (Total of Effective Actual Time taken by all category of workers /Total of Standard Time for all category of workers) × Standard Time for each category of worker Total of Actual Time = 4800 + 3000 + 2400 = 10,200 Worker Weeks Total of Standard Time = 5760 + 1920 + 1920 = 9,600 Worker Weeks	$\frac{10200}{9600} \times 5760$ = 6,120 hours	<u>10200</u> 9600 ≥ 2,040 hours	<u>10200</u> 9600 ≥ 2,040 hours

	Skilled	Semi-skilled	Unskilled	Total
Labour Cost Variance = (Standard Labour Cost for Actual Production – Actual Labour Cost) (Item 5 – Item 6)	Nil	₹1,740 (A)	₹960 (A)	₹2,700 (A)
Labour Rate Variance = (Standard Rate – Actual Rate) × Actual time taken (Item 3 – Item 4) × Item 2	₹4,800 (A)	₹1,500 (F)	Nil	₹3,300 (A)
Labour Efficiency Variance = (Standard Time for Actual Production – Actual Time) × Standard Rate (Item 1 – Item 2) × Item 3	₹4,800 (F)	₹3,240 (A)	₹960 (A)	₹600 (F)
Labour Mix Variance = (Revised Standard Time – Actual Time) × Standard Rate (Item 7 – Item 2) × Item 3	₹6,600 (F)	₹2,880 (A)	₹720 (A)	₹3000 (F)
Labour Yield Variance = (Standard Time for Actual Production – Revised Standard Time) × Standard Rate (Item 1 – Item 7) × Item 3	₹1,800 (A)	₹360 (A)	₹240 (A)	₹2,400 (A)

Calculation of Variances

Notes:

- 1. Since more than one category of workers is used for production, the formula given for Labour Yield Variance is used.
- 2. No information regarding idle time is provided. Hence, Effective Actual Time is same as Actual Time.
- 3. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 4. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.
- 5. Check: Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance.

Problem 20 (Problem on calculation of Labour Variances)

The standard output of product EXE is 25 units per hour in the manufacturing department of a company employing 100 workers. The standard wage rate per labour hour is $\overline{\mathbf{c}}$ 6.

In a 42-hour week, the department produced 1040 units of EXE, despite 5% of the time being lost due to an abnormal reason. The hourly wage rates actually paid were ₹6.20, ₹6 and ₹5.70 respectively, to 10, 30 and 60 of the workers. Compute the relevant variances.

Solution

Ascertainment of Inputs

(a) Standard Time for Actual Production

Problem states that standard output is 25 units per hour in a department employing 100 workers. That is, according to Standards, 25 units can be produced in 100 working hours (1 hour \times 100 workers). So, the Standard Time per unit is 100 working hours divided by 25 units = 4 worker hours per unit Actual output is 1040 units.

So, the Standard Time for actual output is $1040 \text{ units} \times 4 \text{ hours per unit} = 4,160 \text{ worker hours}$

(b) Actual Time taken

Actual Time is the time, which is actually paid for.

The company operates for 42 hours per week. Actual number of workers employed are (10 + 30 + 60) = 100. So, actual working hours are 100 workers \times 42 hours per week = 4,200 worker hours

(c) Standard Labour Rate per unit of time

The standard rate is given as ₹6 per worker hour

(d) Actual Labour Rate per unit of time

The problem states that 'the hourly wage rate actually paid were $\overline{\mathbf{c}}$ 6.20, $\overline{\mathbf{c}}$ 6 and $\overline{\mathbf{c}}$ 5.70 respectively to 10, 30 and 60 of the workers'.

So, Actual Rate per hour is calculated as follows:

(10 workers $\times \overline{\mathbf{5}}$ 6.20 per hour) + (30 workers $\times \overline{\mathbf{5}}$ 6 per hour) + (60 workers $\times \overline{\mathbf{5}}$ 5.70 per hour) = $\overline{\mathbf{584.}}$

₹584 is the actual wages paid per hour for 100 workers. So, the Average Actual Labour Rate per hour is:

 $\frac{₹584}{100 \text{ workers}} = ₹5.84 \text{ per worker hour}$

(e) Actual Yield

The actual output (or yield) is given as 1.040 units.

(f) Standard Yield

Actual Effective Time taken Standard Yield = $\frac{1}{\text{Standard Time per unit of output}}$

Actual Effective Time Taken = Actual Time paid for – Idle Time. So, Actual Effective Time Taken = 4,200 working hours – (5% of 4,200 working hours)

= 4,200 - 210 = 3,990 working hours

Standard Time per unit of output is 4 hours (See Point 1)

So, Standard Yield = $\frac{3990}{4}$ = 997.5 units

(g) Standard Labour Cost per Unit of Output

Standard Time required per unit of output is 4 hours. Standard Rate per working hour is ₹6. Hence, Standard Labour Cost per unit of output = 4 hours $\times \overline{\mathbf{F}}6 = \overline{\mathbf{F}}\mathbf{24}$.

Calculation of Variances

A. Labour Cost Variance

Labour Cost Variance = (Standard Labour Cost for Actual Production – Actual Labour Cost) = (4,160 working hours $\times \overline{\mathbf{5}}$ 6 per working hour) – (4,200 working hours $\times \overline{\mathbf{5}}$.84 per

working hour)

B. Labour Rate Variance

Labour Rate Variance = (Standard Rate – Actual Rate) × Actual Time taken = (₹6 – ₹5.84) × 4200 working hours = ₹672 (F)

C. Labour Efficiency Variance

Labour Efficiency Variance = (Standard Time for Actual Production – Actual Time) × Standard Rate = (4,160 working hours – 4,200 hours) × ₹6 = ₹240 (A)

D. Labour Yield Variance

Labour Yield Variance = (Actual Yield – Standard Yield) × Standard Labour Cost per unit of yield = (1,040 units – 997.50 units) × ₹24 = ₹1020 (F)

E. Idle-Time Variance

Idle-Time Variance = (Actual Idle Time × Standard Labour Rate per unit of time)

= (5% of 4200 working hours) $\times \overline{\mathbf{76}} = 210$ working hours $\times \overline{\mathbf{76}} = \overline{\mathbf{71,260}}$ (A)

Notes:

- 1. Enough details for calculating Labour Mix Variance are not provided in the problem.
- 2. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 3. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance
- 4. Check: Labour Efficiency Variance = Labour Yield Variance + Idle-Time Variance
- 5. In case, Labour Mix Variance can be calculated, Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance + Idle-Time Variance.

Problem 21 (Problem on calculation of Labour Variances)

A gang of workers normally consist of 30 men, 15 women and 10 boys. They are paid at the standard rates as follows:

Men: ₹0.80 per hour; Women: ₹0.60 per hour; and Boys: ₹0.40 per hour.

In a normal working week of 40 hours, the gang is expected to produce 2000 units of output.

During the week ended 31 March 2018, the gang consisted of 40 men, 10 women and 5 boys.

The actual wages paid were ₹0.70; ₹0.65 and ₹0.30 per hour for men, women and boys respectively.

4 hours were lost due to power failure and 1,600 units were actually produced.

Calculate the different labour variances.

Solution

Note that the actual production is 1,600 units, while the standards are given for 2,000 units of output.

		Men	Women	Boys
1	Standard Time required for Actual Production	(30 Men × 40 hours) × 1600 units/2000 units = 960 hours	(15 Women × 40 hours) × 1600 units/2000 units = 480 hours	(10 Boys × 40 hours) × 1600 units/2000 units = 320 hours
2	Actual Time taken (i.e., Actual Time paid for)	40 Men × 40 hours = 1,600 hours	10 Women × 40 hours = 400 hours	5 Boys × 40 hours = 200 hours
3	Idle Time @ 4 hours per week	40 Men × 4 hours = 160 hours	10 Women × 4 hours = 40 hours	5 Boys × 4 hours = 20 hours
4	Effective Actual Time = Actual Time paid for – Idle Time $(2-3)$	1,440 hours	360 hours	180 hours
5	Standard Rate	₹0.80 per hour	₹0.60 per hour	₹0.40 per hour
6	Actual Rate	₹0.70 per hour	₹0.65 per hour	₹0.30 per hour
7	Standard Labour Cost for Actual Production (1×5)	₹768	₹288	₹128
8	Actual Labour Cost (2×6)	₹1,120	₹260	₹60
9	Revised Standard Time = (Total of Effective Actual Time taken by all category of workers /Total of Standard Time for all category of workers) × Standard Time for each category of worker Total of Effective Actual Time taken = 1440 + 360 + 180 = 1,980 Hours	<pre></pre>	$\frac{1980}{1760} \times 480$ = 540 hours	$\frac{1980}{1760} \times 320$ = 360 hours
	Total of Standard Time = $960 + 480 + 320$ = 1 760 Hours			

Ascertainment of Inputs

Calculation of Variances

	Men	Women	Boys	Total
Labour Cost Variance =				
(Standard Labour Cost for Actual Production – Actual Labour Cost)	₹352 (A)	₹28 (F)	₹68 (F)	₹256 (A)
(Item 7 – Item 8)				
Labour Rate Variance =				
(Standard Rate – Actual Rate) × Actual Time taken	₹160 (F)	₹20 (A)	₹20 (F)	₹160 (F)
$(\text{Item 5} - \text{Item 6}) \times \text{Item 2}$				
Labour Efficiency Variance =				
(Standard Time for Actual Production – Actual Time) × Standard Rate	₹512 (A)	₹48 (F)	₹48 (F)	₹416 (A)
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 5$				
Labour Mix Variance =				
(Revised Standard Time – Effective Actual Time) × Standard Rate	₹288 (A)	₹108 (F)	₹72 (F)	₹108 (A)
$(\text{Item 9} - \text{Item 4}) \times \text{Item 5}$				
Labour Yield Variance =				
(Standard Time for Actual Production – Revised Standard Time) \times	₹96 (A)	₹36 (A)	₹16 (A)	₹148 (A)
Standard Rate				(110 (11)
$(\text{Item } 1 - \text{Item } 9) \times \text{Item } 5$				
Idle-Time Variance = (Idle Time × Standard Rate)	₹128 (A)	₹24 (A)	₹8 (A)	₹160 (A)
$(\text{Item } 3 \times \text{Item } 5)$	(120 (A)	127 (A)	(A)	(100 (A)

Notes:

- 1. Since more than one category of workers is used for production, the formula given for Labour Yield Variance is used.
- 2. Idle-Time Variance is always an Adverse Variance.
- 3. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 4. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.
- 5. Check: Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance + Idle-Time Variance.

Problem 22 (Problem on calculation of Labour Variances)

The following was the composition of a gang of workers in a factory during a particular month in one of the production departments. The standard composition of workers and wage rate per hour were as follows:

- Skilled:2 workers at a standard rate of ₹20 per hour eachSemi-skilled:4 workers at a standard rate of ₹12 per hour each
- Unskilled: 4 workers at a standard rate of ₹8 per hour each
- The standard output of the gang was 4 units per hour, of the product.

During the month in question, however, the actual composition of the gang and hourly rates paid were as follows:

Nature of Worker	No. of workers	Wage rate per worker per hour (₹)
Skilled	2	20
Semi-skilled	3	14
Unskilled	5	10

The gang was engaged for 200 hours during the month, which included 12 hours when no production was possible, due to machine breakdown, 810 units of the product were recorded as the output of the gang during the month.

You are required to:

- (a) compute the standard unit labour cost of the product;
- (b) compute the total variance in labour cost during the month; and
- (c) analyse the variance in (b) into sub-variances and reconcile.

Solution

Note that the standard output is 4 units per hour. The standard composition is 2 skilled, 4 semi-skilled and 4 un-skilled workers. So, for producing 4 units, the standard time is as follows:

Skilled Workers: 2 workers \times 1 hour = 2 hours

Semi-skilled Workers: 4 workers \times 1 hour = 4 hours

Unskilled Workers: 4 workers \times 1 hour = 4 hours

For computing variances, the standard time must be ascertained for actual output. The actual output is 810 units.

		Skilled	Semi-skilled	Unskilled
1	Standard Time required for Actual Production	$\frac{2 \text{ hours}}{4 \text{ units}} \times 810 \text{ units}$ $= 405 \text{ hours}$	$\frac{4 \text{ hours}}{4 \text{ units}} \times 810 \text{ units}$ $= 810 \text{ hours}$	$\frac{4 \text{ hours}}{4 \text{ units}} \times 810 \text{ units}$ $= 810 \text{ hours}$
2	Actual Time taken (i.e., Actual Time paid for)	2 workers × 200 hours = 400 hours	3 workers × 200 hours = 600 hours	5 workers × 200 hours = 1000 hours
3	Idle Time @ 12 hours during the month	2 workers × 12 hours = 24 hours	4 workers × 12 hours = 48 hours	4 workers × 12 hours = 48 hours
4	Effective Actual Time = Actual Time paid for $-$ Idle Time (2 - 3)	376 hours	552 hours	952 hours
5	Standard Rate	₹20 per hour	₹12 per hour	₹8 per hour
6	Actual Rate	₹20 per hour	₹14 per hour	₹10 per hour
7	Standard Labour Cost for Actual Production (1×5)	₹8,100	₹9,720	₹6,480
8	Actual Labour Cost (2×6)	₹8,000	₹8,400	₹10,000
9	Revised Standard Time = (Total of Effective Actual Time taken by all category of workers /Total of Standard Time for all category of workers) × Standard Time for each category of worker Total of Effective Actual Time taken = 376 + 552+952 = 1,880 Hours Total of Standard Time = 405 + 810 + 810 = 2,025 Hours	$\frac{1880}{2025} \times 405 \text{ hours}$ = 376 hours	$\frac{1880}{2025} \times 810 \text{ hours}$ = 752 hours	$\frac{1880}{2025} \times 810 \text{ hours}$ = 752 hours

Ascertainment of Inputs

3.46 + Cost Management

	Skilled	Semi-skilled	Unskilled	Total
Labour Cost Variance =				
(Standard Labour Cost for Actual Production – Actual Labour Cost)	₹100 (F)	₹1320 (F)	₹3,520 (A)	₹2,100 (A)
(Item 7 – Item 8)				
Labour Rate Variance =				
(Standard Rate – Actual Rate) × Actual Time taken	Nil	₹1200 (A)	₹2000 (A)	₹3200 (A)
$(\text{Item } 5 - \text{Item } 6) \times \text{Item } 2$				
Labour Efficiency Variance =				
(Standard Time for Actual Production – Actual Time) × Standard Rate	₹100 (F)	₹2520 (F)	₹1520 (A)	₹1100 (F)
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 5$				
Labour Mix Variance =				
(Revised Standard Time – Effective Actual Time) × Standard Rate	Nil	₹2400 (F)	₹1600 (A)	₹800 (F)
$(\text{Item 9} - \text{Item 4}) \times \text{Item 5}$				
Labour Yield Variance =				
(Standard Time for Actual Production – Revised Standard Time) × Standard Rate	₹580 (F)	₹696 (F)	₹464 (F)	₹1,740 (F)
$(\text{Item } 1 - \text{Item } 9) \times \text{Item } 5$				
Idle-Time Variance = (Idle Time × Standard Rate) (Item 3 × Item 5)	₹480 (A)	₹576 (A)	₹384 (A)	₹1,440 (A)

Calculation of Variances

Notes:

- 1. Since more than one category of workers is used for production, the formula given for Labour Yield Variance is used.
- 2. Idle-Time Variance is always an Adverse Variance.
- 3. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 4. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.
- 5. Check: Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance + Idle-Time Variance.

Problems on Computation of Material and Labour Variances

Problem 23 (Problem on calculation of Material and Labour Variances)

The following details relating to the product X during the month of March 2018 are available. You are required to compute the Material and Labour Cost Variance and also to reconcile the standard and actual cost with the help of such variances:

Standard cost per unit:	
Material:	50 kg @ ₹40 per kg
Labour:	400 hrs @ ₹1 per hour
Actual cost for the month:	
Material:	4,900 kg @ ₹42 per kg
Labour:	39,600 hours @ ₹1.10 per hour
Actual production:	100 units

1	Standard Quantity required for Actual Production	100 units \times 50 kg per unit = 5,000 kg
2	Actual Quantity of material used	4,900 Kg
3	Standard Price of material	₹40 per kg
4	Actual Price	₹42 per kg
5	Standard Material Cost for Actual Production (1×3)	₹2,00,000
6	Actual Material Cost (2×4)	₹2,05,800
7	Standard Yield (on the basis of material input) = Actual Quantity of material used/Standard Quantity of material per unit of output	$\frac{4,900 \text{ kg}}{50 \text{ kg}} = 98 \text{ units}$
8	Actual Yield	100 units
9	Standard Cost of material per unit of output	50 kg × ₹40 per kg = ₹ 2,000
10	Standard Time required for Actual Production	100 units × 400 hours per unit = 40,000 hours
11	Actual Time taken	39,600 hours
12	Standard Rate	₹1 per hour
13	Actual Rate	₹1.10 per hour
14	Standard Labour Cost for Actual Production (10×12)	₹40,000
15	Actual Labour Cost (11×13)	₹43,560
16	Standard Yield (on the basis of labour hours) = Effective Actual Time taken/Standard Time per unit of output	$\frac{39600 \text{ hours}}{400 \text{ hours}} = 99 \text{ units}$
17	Standard Labour Cost per unit of output	400 hours × ₹1 per hour = ₹ 400

Ascertainment of Inputs

Solution

Calculation of Variances

Material Cost Variance = Standard material Cost for Actual Production – Actual material Cost (Item 5 – Item 6)	₹2,00,000 – ₹2,05,800 = ₹ 5,800 (A)
Material Price Variance = (Standard Price per unit of material – Actual Price per unit of material) × Actual Quantity of Material used (Item 3 – Item 4) × Item 2	(₹40 – ₹42) × 4900 kg = ₹ 9,800 (A)
Material Usage Variance = (Standard Quantity for Actual Production – Actual Quantity used) × Standard Price per unit of material (Item 1 – Item 2) × Item 3	(5000 kg – 4900 kg) × ₹40 per kg = ₹4000 (F)
Material Yield Variance = (Actual Yield – Standard Yield) × Standard cost per unit of yield (Item 8 – Item 7) × Item 9	(100 units – 98 units) × ₹2000 per unit = ₹ 4,000 (F)

(Contd.)

Labour Cost Variance = (Standard Labour Cost for Actual Production – Actual Labour Cost) (Item 14 - Item 15)	₹40,000 – ₹43,560 = ₹ 3,560 (A)
Labour Rate Variance = (Standard Rate – Actual Rate) × Actual Time taken (Item 12 – Item 13) × Item 11	(₹1 – ₹1.10) × 39600 hours = ₹ 3,960 (A)
Labour Efficiency Variance = (Standard Time for Actual Production – Actual Time) × Standard Rate (Item 10 – Item 11) × Item 12	(40000 hours – 39600 hours) × ₹1 per hour = ₹400 (F)
Labour Yield Variance = (Actual Yield – Standard Yield) × Standard Labour Cost per unit of yield (Item 8 – Item 16) × Item 17	(100 units – 99 units) × ₹400 per unit = ₹ 400 (F)

Notes:

- 1. Only one type of raw material and one category of workers are used in production. Accordingly, the appropriate formulae for Material Yield Variance and Labour Yield Variance have been used.
- 2. Material Mix Variance and Labour Mix Variance cannot be calculated for the reason mentioned in Note 1.
- 3. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 4. Check: Material Cost Variance = Material Price Variance + Material Usage Variance.
- 5. Check: Material Usage Variance = Material Yield Variance.
- 6. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.
- 7. Check: Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance + Idle-Time Variance.

Problem 24 (Problem on calculation of Material and Labour Variances)

A chemical company gives you the following standard and actual data of its chemical X. You are required to calculate:

- (a) Material Cost Variance
- (b) Material Price Variance
- (c) Material Yield Variance
- (d) Labour Cost Variance
- (e) Labour Rate Variance and
- (f) Labour Yield Variance

	Standard				Actual			
	kg	Hours	Rate (₹)	Amt. (₹)	kg	Hours	Rate (₹)	Amt. (₹)
Material								
А	450	-	20	9,000	450	-	19	8,550
В	360	-	10	3,600	360	-	11	3,960
Workers								
Skilled	-	2,400	2	4,800	-	2,400	2.25	5,400
Unskilled	-	1,200	1	1,200	-	1,200	1.25	1,500
	810			18,600	810			19,410
	90	Normal	Loss	-	50	Actual I	Loss	-
	720	Standard (Output	18,600	760	Actual O	utput	19,410

Solution

(A) Material Variances

Ascertainment of Inputs

		Material A	Material B
1	Standard Quantity required for Actual Production (Standard quantity for each raw material/Standard Output) × Actual Output	$\frac{450 \text{ kg}}{720 \text{ kg}} \times 760 \text{ kg}$ $= 475 \text{ kg}$	$\frac{360 \text{ kg}}{720 \text{ kg}} \times 760 \text{ kg}$ $= 380 \text{ kg}$
2	Actual Quantity of material used	450 kg	360 kg
3	Standard Price	₹20 per kg	₹10 per kg
4	Actual Price	₹19 per kg	₹11 per kg
5	Standard Material Cost for Actual Production (1×3)	₹9,500	₹3,800
6	Actual Material Cost (2×4)	₹8,550	₹3,960
7	Revised Standard Quantity = (Total of Actual Input Quantity of all raw materials/ Total of Standard Input Quantity of all raw materials) × Standard Quantity of each raw material	$\frac{810 \text{ kg}}{810 \text{ kg}} \times 450 \text{ kg}$ $= 450 \text{ kg}$	$\frac{810 \text{ kg}}{810 \text{ kg}} \times 360 \text{ kg}$ $= 360 \text{ kg}$

Calculation of Variances

	Material A	Material B	Total
Material Cost Variance =			
Standard material Cost for Actual Production - Actual material Cost	₹950 (F)	₹160 (A)	₹790 (F)
(Item 5 – Item 6)			
Material Price Variance =			
(Standard Price per unit of material – Actual Price per unit of material) × Actual Quantity of Material used	₹450 (F)	₹360 (A)	₹90 (F)
$(\text{Item } 3 - \text{Item } 4) \times \text{Item } 2$			
Material Usage Variance =			
(Standard Quantity for Actual Production – Actual Quantity used) \times Standard Price per unit of material	₹500 (F)	₹200 (F)	₹700 (F)
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 3$			
Material Mix Variance =			
(Revised Standard Quantity – Actual Quantity) × Standard Price	Nil	Nil	Nil
$(\text{Item 7} - \text{Item 2}) \times \text{Item 3}$			
Material Yield Variance =			
(Standard Quantity for Actual Production – Revised Standard Quantity) × Standard Price	₹500 (F)	₹200 (F)	₹700 (F)
$(\text{Item } 1 - \text{Item } 7) \times \text{Item } 3$			

Notes:

- 1. Since more than one material is used for production, the formula given for Material Yield Variance is used.
- 2. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 3. Check: Material Cost Variance = Material Price Variance + Material Usage Variance.
- 4. Check: Material Usage Variance = Material Mix Variance + Material Yield Variance.

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(B) Labour Variances

		Skilled	Unskilled
1	Standard Time required for Actual Production	$\frac{2400 \text{ hours}}{720 \text{ kg}} \times 760 \text{ kg}$ = 2,533. 33 hours	$\frac{1200 \text{ hours}}{720 \text{ kg}} \times 760 \text{ kg}$ =1,266.67 hours
2	Actual Time taken	2,400 hours	1,200 hours
3	Standard Rate	₹2 per hour	₹1 per hour
4	Actual Rate	₹2.25 per hour	₹1.25 per hour
5	Standard Labour Cost for Actual Production (1×3)	₹5,066.66	₹1,266.67
6	Actual Labour Cost (2×4)	₹5,400.00	₹1,500.00
7	Revised Standard Time = (Total of Effective Actual Time taken by all category of workers /Total of Standard Time for all category of workers) × Standard Time for each category of worker Total of Actual Time = 2400 + 1200 = 3,600 hours Total of Standard Time = 2,533.33 + 1,266.67 = 3,800 hours	$\frac{3600}{3800} \times 2533.33$ = 2,400 hours	$\frac{3600}{3800} \times 1266.67$ = 1,200 hours

Ascertainment of Inputs

Calculation of Variances

	Skilled	Unskilled	Total
Labour Cost Variance =			
(Standard Labour Cost for Actual Production – Actual Labour Cost)	₹333.34 (A)	₹233.33 (A)	₹566.67 (A)
(Item 5 Item 6)			
Labour Rate Variance =			
(Standard Rate – Actual Rate) × Actual Time taken	₹600 (A)	₹300 (A)	₹900 (A)
$(\text{Item } 3 - \text{Item } 4) \times \text{Item } 2$			
Labour Efficiency Variance =			
(Standard Time for Actual Production – Actual Time) × Standard Rate	₹266.66 (F)	₹66.67 (F)	₹333.34 (F)
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 3$			
Labour Mix Variance =			
(Revised Standard Time – Actual Time) × Standard Rate	Nil	Nil	Nil
$(Item 7 - Item 2) \times Item 3$			
Labour Yield Variance =			
(Standard Time for Actual Production – Revised Standard Time) × Standard	₹266.66 (F)	₹66.67 (F)	₹333.34 (F)
$(\text{Item } 1 - \text{Item } 7) \times \text{Item } 3$			

Notes:

1. Since more than one category of workers is used for production, the formula given for Labour Yield Variance is used.

- 2. No information regarding idle time is provided. Hence, Effective Actual Time is same as Actual Time.
- 3. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 4. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.
- 5. Check: Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance.

Problem 25 (Problem on calculation of Material and Labour Variances)

Calculate possible material and labour variances from the following data:

	Standard				Ac	tual		
	kg	Hours	Rate (₹)	Amt. (₹)	kg	Hours	Rate (₹)	Amt. (₹)
Material								
A	400	-	50	20000	420	-	45	18900
В	200	-	20	40000	240	-	25	6000
C	100	-	15	1500	90	-	15	1350
Labour								
Men	-	100	2.00	200	-	120	2.50	300
Women	-	200	1.50	300	-	240	1.60	384
	700			26000	750			26934
	25	1	Normal Loss	-	75		Act. Loss	-
	675		Std. Output	26000	675		Act. Output	26934

Solution

(A) Material Variances

Ascertainment of Inputs

		Material A	Material B	Material C
	Standard Quantity required for Actual Production			
1	(Since, the standard and actual outputs are same, the given standard quantity itself is standard quantity for actual production)	400 kg	200 kg	100 kg
2	Actual Quantity of material used	420 kg	240 kg	90 kg
3	Standard Price per kg	₹50	₹20	₹15
4	Actual Price per kg	₹45	₹25	₹15
5	Standard Material Cost for Actual Production (1×3)	₹20,000	₹4,000	₹1,500
6	Actual Material Cost (2×4)	₹18,900	₹6,000	₹1,350
	Revised Standard Quantity =			
7	(Total of Actual Input Quantity of all raw materials/Total of Standard Input	$\frac{750 \text{ kg}}{700 \text{ kg}} \times 400 \text{ kg}$	$\frac{750 \text{ kg}}{700 \text{ kg}} \times 200 \text{ kg}$	$\frac{750 \text{ kg}}{700 \text{ kg}} \times 100 \text{ kg}$
	Quantity of all raw materials) × Standard Quantity of each raw material	= 428. 57 kg	= 214.29 kg	= 107.14 kg

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Calculation of Variances

	Material A	Material B	Material C	Total
Material Cost Variance = Standard Material Cost for Actual Production – Actual Material Cost (Item 5 - Item 6)	₹1,100 (F)	₹2,000 (A)	₹150 (F)	₹750 (A)
Material Price Variance = (Standard Price per unit of material – Actual Price per unit of material) × Actual Quantity of Material used (Item 3 – Item 4) × Item 2	₹2,100 (F)	₹1,200 (A)	Nil	₹900 (F)
Material Usage Variance = (Standard Quantity for Actual Production – Actual Quantity used) × Standard Price per unit of material (Item 1 – Item 2) × Item 3	₹1,000 (A)	₹800 (A)	₹150 (F)	₹1,650 (A)
Material Mix Variance = (Revised Standard Quantity – Actual Quantity) × Standard Price (Item 7 – Item 2) × Item 3	₹428.50 (F)	₹514.20 (A)	₹257.10 (F)	₹171.40 (F)
Material Yield Variance = (Standard Quantity for Actual Production – Revised Standard Quantity) × Standard Price (Item 1 – Item 7) × Item 3	₹1,428.50 (A)	₹285.80 (A)	₹107.1 (A)	₹1,821.40 (A)

Notes:

- 1. Since more than one material is used for production, the formula given for Material Yield Variance is used.
- 2. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 3. Check: Material Cost Variance = Material Price Variance + Material Usage Variance.
- 4. Check: Material Usage Variance = Material Mix Variance + Material Yield Variance.

(B) Labour Variances

Ascertainment of Inputs

		Men	Women
1	Standard Time required for Actual Production (Since, the standard and actual outputs are same, the given standard time itself is	100 hours	200 hours
2	standard time for actual production)	120 hours	240 hours
3	Standard Rate per hour	720 nours ₹2.00	₹1 50
4	Actual Rate per hour	₹2.50	₹1.60
5	Standard Labour Cost for Actual Production (1×3)	₹200	₹300
6	Actual Labour Cost (2×4)	₹300	₹384
7	Revised Standard Time = (Total of Effective Actual Time taken by all category of workers /Total of Standard Time for all category of workers) \times Standard Time for each category of worker Total of Actual Time = $120 + 240 = 360$ hours Total of Standard Time = $100 + 200 = 300$ hours	$\frac{360}{300} \times 100$ = 120 hours	$\frac{360}{300} \times 200$ = 240 hours

Calculation of Variances

	Men	Women	Total
Labour Cost Variance =			
(Standard Labour Cost for Actual Production – Actual Labour Cost)	₹100 (A)	₹84 (A)	₹184 (A)
(Item 5 – Item 6)			
Labour Rate Variance =			
(Standard Rate – Actual Rate) × Actual Time taken	₹60 (A)	₹24 (A)	₹84 (A)
$(\text{Item } 3 - \text{Item } 4) \times \text{Item } 2$			
Labour Efficiency Variance =			
(Standard Time for Actual Production – Actual Time) × Standard Rate	₹40 (A)	₹60 (A)	₹100 (A)
$(\text{Item } 1 - \text{Item } 2) \times \text{Item } 3$			
Labour Mix Variance =			
(Revised Standard Time – Actual Time) × Standard Rate	Nil	Nil	Nil
$(\text{Item 7} - \text{Item 2}) \times \text{Item 3}$			
Labour Yield Variance =			
(Standard Time for Actual Production – Revised Standard Time) \times	₹40 (A)	₹60 (A)	
Standard Rate			
$(\text{Item } 1 - \text{Item } 7) \times \text{Item } 3$			

Notes:

- 1. Since more than one category of workers is used for production, the formula given for Labour Yield Variance is used.
- 2. No information regarding idle time is provided. Hence, Effective Actual Time is same as Actual Time.
- 3. (F) indicates Favourable Variance and (A) indicates Adverse Variance.
- 4. Check: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance.
- 5. Check: Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance.

SUMMARY

- On the basis of the time period for which cost data is available or ascertainable, cost ascertainment can be made using two types of systems, viz., Historical Costing and Standard Costing.
- Historical Costing is a system of costing, wherein the actual costs are ascertained after they are incurred, whereas Standard Costing is a system of costing, which involves pre-determination of costs for each product or service.
- Standard Cost is a pre-determined cost, which determines what each product or service should cost under the given circumstances. It is the pre-determined operating cost calculated from the management's standards of efficient operation and the relevant necessary expenditure.
- Standard Costing is the technique of cost accounting, which compares the standard cost of each product or service with the actual costs, to determine the efficiency of the operations so that any remedial action may be taken immediately.
- Installation of a standard costing system involves the following steps: Establishment of Responsibility Centres and Cost Centres, Classification of Accounts, Selection of Standards and Setting of Standards.
- > Variance refers to the difference between the standard and actual values.
- Variance Analysis refers to the decomposition of variance into different components for identifying the reason for variance.

- The most appropriate and ideal classification of variances is done on the basis of elements of cost and impact. Accordingly, ascertaining the following variances will be useful for making decisions in a business enterprise, which has adopted standard costing: Material Variances, Labour Variances and Overhead Variances.
- Material Variances include: Material Cost Variance, Material Price Variance, Material Usage Variance, Material Mix Variance and Material Yield Variance.
- Labour Variances include: Labour Cost Variance, Labour Rate Variance, Labour Efficiency Variance, Labour Mix Variance, Labour Yield Variance and Idle-Time Variance.
- Overhead Variances include: Overhead Cost Variance, Variable Overhead Cost Variance, Variable Overhead Expenditure Variance, Variable Overhead Efficiency Variance, Fixed Overhead Cost Variance, Fixed Overhead Expenditure Variance, Fixed Overhead Volume Variance, Fixed Overhead Efficiency Variance, Fixed Overhead Capacity Variance and Fixed Overhead Calendar Variance.

SNAPSHOT OF FORMULAE

Material Variances

Name of the Variance	Formula		
Material Cost Variance	(Standard Material Cost for Actual Production – Actual Material Cost)		
Material Price Variance	(Standard Price – Actual Price) × Actual Quantity of Material		
Material Usage Variance	(Standard Quantity for Actual Production – Actual Quantity used) × Standard Price		
Material Mix Variance	(Revised Standard Quantity – Actual Quantity) × Standard Price		
	When only one material is used in production		
	(Actual Yield - Standard Yield) × Standard Material Cost per unit of yield		
	Notes: Standard Yield = $\frac{\text{Actual quantity of material consumed}}{\text{Standard quantity of material per unit of output}}$		
Material Yield Variance	Standard Material Cost per unit of yield = (Standard quantity per unit of output \times Standard price per unit of material)		
	When more than one material is used in production		
	(Standard Quantity for Actual Production – Revised Standard Quantity) × Standard Price per unit of material		

Labour Variances

Name of the Variance	Formula	
Labour Cost Variance	(Standard Labour Cost for Actual Production – Actual Labour Cost)	
Labour Rate Variance	(Standard Rate – Actual Rate) × Actual Time taken	
Labour Efficiency Variance	(Standard Time for Actual Production – Actual Time) × Standard Rate	
Labour Mix Variance (Gang Composition Variance)	(Revised Standard Time – Actual Time) × Standard Rate Revised Standard Time = (Total of Effective Actual Time taken by all category of workers/Total of Standard Time for all category of workers) × Standard Time for each category of worker	
	Note: Effective Actual Time = Actual Time paid for – Idle Time.	
Idle-Time Variance	Or (Actual Time Paid for – Actual Time worked) × Standard Rate	
	When only one category of labour is used in production	
	(Actual Yield – Standard Yield) × Standard Labour Cost per unit of yield	
Labour Yield Variance or Labour Sub-efficiency	<i>Notes:</i> Standard Yield = Actual Effective Time taken Standard Time per unit of output	
Variance	Standard Labour Cost per unit of yield = (Standard Time per unit of output × Standard Rate per time unit)	
	When more than one category of labour is used in production	
	(Standard Time for Actual Production – Revised Standard Time) × Standard Rate	

Problems on Material Variances

Problem 1

A manufacturing concern, which has adopted standard costing, furnishes the following information:

Standard	Actual
Material for 70 kg finished product: 100 kg	Output: 2,10,000 kg
Price of material: ₹1 per kg	Materials used: 2,80,000 kg
	Cost of materials: ₹2,52,000

Calculate: (a) Material Usage Variance (b) Material Price Variance and (c) Material Cost Variance

[Ans: (a) ₹20,000 (F), (b) ₹28,000 (F), and (c) ₹48,000 (F)]

Problem 2

The following standard and actual data relate to a manufacturing concern:

Standard

Material X = 40 kg @ ₹6	₹240
Material Y = 60 kg @ ₹4	₹240
	₹480

Standard output is 80% of input i.e., 80 kg. Process loss is 20%.

Actual

Material X = 600 kg @ ₹4

Material Y = 400 kg @ ₹6

Actual output is 70% of input i.e., 700 kg. Process loss is 30%.

You are required to calculate material variances.

Ans:

Variance	Material X	Material Y
Material Cost Variance	₹300 (A)	₹300 (A)
Material Price Variance	₹1200 (F)	₹800 (A)
Material Usage Variance	₹1500 (A)	₹500 (F)
Material Mix Variance	₹1200 (A)	₹800 (F)
Material Yield Variance	₹300 (A)	₹300 (A)

Problem 3

Girish Chemical Industries provides the following information from their records:

For making 10 kg of LUBKO, the standard material requirement is:

Material	Quantity (kg)	Rate per kg (₹)
А	8	6
В	4	4

During March 2018, 1000 kg of LUBKO were produced. The following was the actual composition of material used:

Material	Quantity (kg)	Rate per kg (₹)
А	750	7
В	500	5

Calculate material variances.

Ans:

Variance	Material A	Material B
Material Cost Variance	₹450 (A)	₹900 (A)
Material Price Variance	₹750 (A)	₹500 (A)
Material Usage Variance	₹300 (F)	₹400 (A)
Material Mix Variance	₹498 (F)	₹332 (A)
Material Yield Variance	₹198 (A)	₹68 (A)

Problem 4

Vishnu Ltd produces an article by blending two basic raw materials. It operates a standard costing system and the following standards have been set for raw materials:

Materials	Standard Mix	Standard price per kg (₹)
А	40%	4.00
В	60%	3.00

The standard loss in process is 15%.

During January 2018, the company produced 1700 kg of finished output. The position of stocks and purchases for the month of January 2018 is as follows:

Matarials	Stock on 01.01.2018	Stock on 31.01.2018	Purchased during January 2018	
wrateriais	kg	kg	kg	Cost (₹)
А	35	5	800	3400
В	40	50	1200	3300

Calculate material cost variances.

Variance	Material A	Material B
Material Cost Variance	₹327.50 (A)	₹327.50 (F)
Material Price Variance	₹207.50 (A)	₹297.50 (F)
Material Usage Variance	₹120.00 (A)	₹30.00 (F)
Material Mix Variance	₹88.00 (A)	₹66.00 (F)
Material Yield Variance	₹32.00 (A)	₹36.00 (A)

Problem 5

The standard material cost for a normal mix of one ton of chemical X is based on:

Chemical	Usage (kg)	Price per kg (₹)
А	240	6
В	400	12
С	649	10

During the month, 6.25 tons of X was produced from:

Chemical	Consumption (Tons)	Cost (₹)
А	1.6	11,200
В	2.4	30,000
С	4.5	47,250

Analyse the variances.

Ans:

Variance	Chemical A	Chemical B	Chemical C
Material Cost Variance	₹2,200 (A)	Nil	₹7,250 (A)
Material Price Variance	₹1,600 (A)	₹1,200 (A)	₹2,250 (A)
Material Usage Variance	₹600 (A)	₹1,200 (F)	₹5,000 (A)
Material Mix Variance	₹37.50 (A)	₹3,075 (F)	₹2,500 (A)
Material Yield Variance	₹562.50 (A)	₹1875 (A)	₹2,500 (A)

Problems on Labour Variances

Problem 6

Calculate all possible labour variances from the following data:

Particulars	Skilled	Unskilled
Standard Time (Hours)	500	500
Actual Tme (Hours)	400	700
Standard rate per hour (₹)	15	10
Actual rate per hour (₹)	20	15

Variance	Skilled	Unskilled
Labour Cost Variance	₹500 (A)	₹5,500 (A)
Labour Rate Variance	₹2,000 (A)	₹3,500 (A)
Labour Efficiency Variance	₹1,500 (F)	₹2,000 (A)
Labour Mix Variance	₹2,250 (F)	₹1,500 (A)
Labour Yield or Sub-efficiency Variance	₹750 (A)	₹500 (A)

Problem 7

The standard labour component and the actual labour component engaged during a week are given as follows:

	Skilled	Semi-skilled	Unskilled
Standard number of workers in a group	32	12	6
Standard wage rate (₹ per hour)	3	2	1
Actual number of workers employed during the month in the group	28	18	4
Actual wage rate per hour (₹)	4	3	2

During the 40-hour working week, the gang produced 1800 standard labour hours of work.

Calculate the various labour variances.

Ans:

Variance	Skilled	Semi-skilled	Unskilled
Labour Cost Variance	₹1,024 (A)	₹1,296 (A)	₹104 (A)
Labour Rate Variance	₹1,120 (A)	₹720 (A)	₹160 (A)
Labour Efficiency Variance	₹96 (F)	₹576 (A)	₹56 (F)
Labour Mix Variance	₹480 (F)	₹480 (A)	₹80 (F)
Labour Yield or Sub-efficiency Variance	₹384 (A)	₹96 (F)	₹24 (A)

Problem 8

The data obtained from a manufacturing concern are:

Standard

Number in the standard gang:	Men – 20, Women – 10	
Standard wage rate per hour:	Men – ₹0.90, Women – ₹0.80	
Standard output per gang hour:	50 units	
Actual		
Number in the actual gang:	Men – 16, Women – 18	
Actual wage rate per hour:	Men – ₹1.00, Women – ₹0.50	
Actual gang hours paid for:	40	
Actual gang hours worked for:	39	
Abnormal idle time:	1 hr	
Actual output:	2400 units	
Calculate the wage variances.		

Variance	Men	Women
Labour Cost Variance	₹224 (F)	₹24 (F)
Labour Rate Variance	₹64 (A)	₹216 (F)
Labour Efficiency Variance	₹288 (F)	₹192 (A)
Labour Mix Variance	₹234 (F)	₹208 (A)
Labour Yield or Sub-efficiency Variance	₹68.40 (F)	₹30.40 (F)
Labour Idle-Time Variance	₹14.40 (A)	₹14.40 (A)

Problem 9

The following data relate to a factory:

Particulars	Skilled	Unskilled
Number in standard gang	20	10
Standard rate per hour	₹1	₹0.60
Number in actual gang	16	14
Actual rate per hour	₹0.90	₹0.70

The working hours were 48 hours a week and the actual output was 1,200 standard hours.

Compute labour variances assuming that:

- (a) there is no abnormal idle-time
- (b) abnormal idle-time is one hour per employee

Ans:

Variance	When there is no idle time		In case of idle time	
variance	Skilled (₹)	Unskilled (₹)	Skilled (₹)	Unskilled (₹)
Labour Cost Variance	108.80 (F)	230.40 (A)	108.80 (F)	230.40 (A)
Labour Rate Variance	76.80 (F)	67.20 (A)	76.80 (F)	67.20 (A)
Labour Efficiency Variance	32 (F)	163.20 (A)	32 (F)	163.20 (A)
Labour Mix Variance	192 (F)	115.20 (A)	188 (F)	112.80 (A)
Labour Yield or Sub-efficiency Variance	160 (A)	48 (A)	140 (A)	42 (A)
Labour Idle-Time Variance	-	-	16 (A)	8.40 (A)

Problem on Material and Labour Variances

Problem 10

From the following data of A Co. Ltd., relating to budgeted and actual performance for the month of March 2018, compute Direct Materials and Direct Labour Cost Variances:

Budgeted data for March:	
Units to be manufactured	1,50,000
Units of direct material required (based on standard rates)	4,95,000
Planned purchase of raw materials (units)	5,40,000
Average unit cost of direct material	₹8
Direct labour hours per unit of finished goods	3/4hour
Direct labour cost (total)	₹29,92,500

Actual data at the end of March:	
Units actually manufactured	1,60,000
Direct material cost (purchase cost based on units actually issued)	₹43,41,900
Direct material cost (purchase cost based on units actually purchased)	₹45,10,000
Average unit cost of direct material	₹8.20
Total direct labour hours for March	1,25,000
Total direct labour cost for March	₹33,75,000

Variance	(₹)
Material Cost Variance	1,17,900 (A)
Material Price Variance	1,05,900 (A)
Material Usage Variance	12,000 (A)
Labour Cost Variance	1,83,000 (A)
Labour Rate Variance	50,000 (A)
Labour Efficiency Variance	1,33,000 (A)

Budgetary Control

CHAPTER OUTLINE

- 4.1 Introduction
- 4.2 Budget and Budgetary Control
 - 4.2.1 Budget
 - 4.2.2 Budgetary Control
- 4.3 Objectives of Budgetary Control
- 4.4 Essential Requirements for Effective Budgetary Control or Requisites of Effective Budgetary Control
 - 4.4.1 Defining of Objectives
 - 4.4.2 Fixing the Budget Period
 - 4.4.3 Identification of Key Factor or Budget Factor
 - 4.4.4 Appointment of Budget Committee and Budget Controller
 - 4.4.5 Preparation of Budget Manual
 - 4.4.6 Identification of Standard of Activity
 - 4.4.7 Obtaining Consent and Addressing Concerns at Each Stage of Budgeting Process

<u>chapter</u>

- 4.5 Differences between Standard Costing and Budgetary Control
- 4.6 Advantages of Budgetary Control
- 4.7 Limitations of Budgetary Control

4.8 Types of Budgets

- 4.8.1 Long-term Budgets
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- 4.8.3 Current Budgets
- 4.8.4 Fixed Budget
- 4.8.5 Flexible Budget
- 4.8.6 Functional Budgets
- 4.8.7 Master Budget

- 4.9 Preparation of Flexible Budgets and Cash Budgets
 - 4.9.1 Steps in Preparation of Flexible Budget
 - 4.9.2 Steps in Preparation of Cash Budget

Problems on Preparation of Flexible Budgets

Problems on Preparation of Cash Budgets

Summary

Exercises

4.1 INTRODUCTION

For effective management of resources, it is essential for a business entity to forecast the requirements for a given period and take necessary action to meet the requirements. The problems an entity faces on account of shortage of resource or excess of resources are well evident. For ensuring that any entity is able to manage its resources efficiently and effectively, a simple but effective tool that can be used is Budgetary Control.

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4.2 BUDGET AND BUDGETARY CONTROL

4.2.1 Budget

The Chartered Institute of Management Accounts (CIMA) defines a Budget as 'a quantitative expression of a plan for a defined period of time of the policy to be pursued during that period for the purpose of attaining a given objective. It may include income, expenditure and employment of capital'.

That is, a Budget is a pre-determined detailed plan of action, developed and distributed as a guide to current operations and as a partial basis for subsequent evaluation of performance.

From the given definition and meaning, the following can be understood as the features of a budget:

- 1. It is a quantitative statement (or a financial statement).
- 2. It is prepared prior to a defined period of time.
- 3. It is prepared for the purpose of attaining a given objective.
- 4. It may be prepared for income or expenditure or employment of capital.

4.2.2 Budgetary Control

The Chartered Institute of Management Accounts (CIMA) defines Budgetary Control as 'the establishment of Budgets, relating the responsibilities of executives to the requirements of a policy, and the continuous comparison of actual with budgeted results either to secure by individual action the objective of that policy or to provide a base for its revision'.

Budgetary Control is a system of management control and accounting in which all operations are forecasted and planned in advance to the extent possible and the actual results are compared with the forecast for identifying the deviations and taking corrective action, if necessary.

Based on the definition and meaning, Budgetary Control can be considered to involve the following:

- 1. Establishment of Budgets.
- 2. Continuous comparison of actuals with the Budget.
- 3. Taking corrective action for deviations.
- 4. Revising the budgets on the basis of past experience.
- 5. Identifying the person/persons responsible for any failures and fixing of responsibilities.

THEORY QUESTIONS

Section A Type Questions

- 1. Define Budget.
- 2. What is a Budget? State its features.
- 3. What is the meaning of Budgetary Control?
- 4. State the scope of Budgetary Control.

Section B Type Questions

1. State the meaning of Budget and Budgetary Control, along with their features and scopes.

4.3 OBJECTIVES OF BUDGETARY CONTROL

The following are the objectives/purposes of a Budgetary Control System:

- To define the overall goal of the business and determine the targets of performance for each department, section and individual in the enterprise.
- To lay down the responsibilities of each individual and specifying the expected performance from each person.
- To define the performance evaluation criteria for each individual, department, product and function.
- To enable optimum utilisation of resources i.e., deriving maximum benefits and profits with limited resources.
- To enable co-ordination between various functions and departments for ensuring smooth flow of the business process.
- To provide a basis for revision of current and future policies.
- To forecast and draw long-range plans with fair amount of accuracy.
- To bring in a sense of responsibility and achievement among all stakeholders.

THEORY QUESTIONS

Section A Type Questions

1. What is Budgetary Control? State any four objectives of Budgetary Control.

Section B Type Questions

1. Explain the objectives/purposes of Budgetary Control.

4.4 ESSENTIAL REQUIREMENTS FOR EFFECTIVE BUDGETARY CONTROL OR REQUISITES OF EFFECTIVE BUDGETARY CONTROL

The following aspects have to be taken care of for having an effective Budgetary Control System.

4.4.1 Defining of Objectives

The foremost requirement for having an effective Budgetary Control System is defining of the overall business goal and specifying the objectives for each department and function. When the goal and objectives are not identified or appropriately defined, the budgeting process will become directionless and the outcome will be of limited use for decision-making and future growth.

4.4.2 Fixing the Budget Period

Budget Period is the period for which a budget is prepared and employed. Normally, a financial year is considered for Budget Period, which may be broken into shorter periods like quarters or months. The period

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for which the budget has to be prepared depends on the type of budget and various other factors like demand for the product, supply period from suppliers, arrangement with the bankers etc.

4.4.3 Identification of Key Factor or Budget Factor

Key Factor refers to the resource, which is limited in supply. It is also called Limiting Factor. One of the main objectives of Budgetary Control is optimum utilisation of scarce resources. Unless the Key or Limiting Factors are identified and incorporated, the budgeting process might not give appropriate results.

4.4.4 Appointment of Budget Committee and Budget Controller

In large organisations, the budgeting process needs a team involving top executives, departmental heads and others responsible for various functions. Forming a committee to take care of the budgeting activity will be another requirement for the effective adoption of Budgetary Control. The Budget Committee will be an advisory body. It is formulated to perform functions like laying down general policies of management in relation to Budgetary System, providing necessary information to the heads of various departments for preparation of budgets, receiving of budgets from all departments and scrutinizing them, suggesting of revisions if required, formulation of Master Budget, comparison of actuals with budgets after the expiry of Budget Period, recommendation of corrective actions etc.

A Budgetary Controller can also be appointed for overseeing the entire budgeting process.

4.4.5 Preparation of Budget Manual

A Budget Manual is a schedule, document or booklet, which shows in written form, the budgeting organisation and procedures. It is defined as a document, which sets out inter alia the responsibilities of persons engaged in the routine of, and the forms and records required for Budgetary Control.

The main content of Budget Manual is statement of objectives, procedures to be followed, definition of duties and responsibilities, nature, type and specimen forms of various reports, persons responsible for preparation of the reports and the programme of distribution of these reports to various officers, account code and chart of accounts used by the company, budget calendar, Budget Period and follow-up procedures.

4.4.6 Identification of Standard of Activity

Laying down standards for future period on the basis of past experience and present conditions – both internal and external – forms the basis for estimations and forecasting. This aids the initial exercise of the budgeting activity.

4.4.7 Obtaining Consent and Addressing Concerns at Each Stage of Budgeting Process

At each stage of the process, obtaining the consent of all stakeholders is an essential requirement for the success of Budgetary Control System. Any disagreements, if not addressed, will lead to conflicts and could affect the achievement of the defined goals and objectives.

THEORY QUESTIONS

Section A Type Questions

- 1. List out the requirements for an effective Budgetary Control System.
- 2. What is Budget Period?
- 3. What is the meaning of Key Factor? Give examples.
- 4. What is a Budget Manual?

Section B Type Questions

1. Explain briefly the essential requirements for an effective Budgetary Control System.

4.5 DIFFERENCES BETWEEN STANDARD COSTING AND BUDGETARY CONTROL

Prima facie, both Standard Costing and Budgetary Control, appear to be same since both involve estimation, comparison and corrective action. However, Standard Costing and Budgetary Control are different from each other. The following table highlights the differences between Standard Costing and Budgetary Control.

Standard Costing	Budgetary Control
Standard Costs are pre-determined costs representing what the costs should be, at the level of efficient conditions of production and operation.	Budgets are financial and/or quantitative statements, prepared and approved prior to a defined period of time, of the policy to be pursued during that period of achieving that objective.
Standard Costing is usually restricted to costs.	Budgetary Control includes estimates of income, costs and employment of capital.
The scope of Standard Costing is relatively narrow, since it covers mainly production costs.	The scope of Budgetary Control is wide since it covers all operations, activities and functions of the business
Standard Costing is projection of cost accounts.	Budgetary Control is projection of financial accounts.
The variances are identified for each element of cost individually and decomposed.	Variances are identified at the head expense level, and not often decomposed.
Standard Costing is a more technically improved system, by which various causes of variances for each cost element can be analysed in minute detail and correction action taken accordingly.	Under Budgetary Control System, control over expenses is general and broad in nature, and not in as detailed manner as in Standard Costing.
A Standard Costing System cannot be operated in parts. All items of expenditure included in cost accounts are to be considered.	Budgetary Control is possible even in parts or for particular item of income or expenditure, according to the requirements of the management.

THEORY QUESTIONS

Section A Type Questions

1. List out any four differences between Standard Costing and Budgetary Control.

Section B Type Questions

1. Explain the distinguishing features between Standard Costing and Budgetary Control.

4.6 ADVANTAGES OF BUDGETARY CONTROL

Following are the advantages of Budgetary Control:

- It provides a framework and direction for efficient functioning of business and smooth process of carrying out various activities.
- It helps in control of expenditure.
- It provides yardstick for performance measurement of each individual and departments.
- It helps in measuring deviation of actuals from budgeted and provides framework for policy-making, policy-correction and corrective action.
- It helps in optimum utilisation of all resources at the disposal of the firm, particularly those, which are scarce.
- It provides a foundation for adopting and implementing a Standard Costing system.
- It develops 'cost sense' among employees and makes them cost conscious, thereby reducing wastage and improving profitability.
- It is useful in obtaining credit rating and other ratings from external agencies, when required.

4.7 LIMITATIONS OF BUDGETARY CONTROL

Following are some of the concerns of a Budgetary Control System:

- Since budgets are based on estimates and estimates are based on assumptions, the extent to which the system can be successful cannot be forecasted. There are all kinds of possibilities for the assumptions to go wrong, in which case the entire effort goes to waste.
- Unless the Budget Committee or the Budget Controller or the Budget Officer have adequate time and support for implementing budgeting process, the results from the system are not of any relevance.
- When there is no proper co-ordination or co-operation among employees in an organisation, Budgetary Control System will not give the expected results. Further, the system can give scope for more conflicts, confusion and chaos.
- The process of estimations, comparison and corrective action is very expensive. Unless a company is able to afford the high cost, Budgetary Control System cannot be implemented.
- Budget is just a tool in the hands of management, but not a substitute for management.
- Budgets are rigid documents. However, the dynamism in business needs flexibility in the process, which the Budgetary System may not provide for.

THEORY QUESTIONS

Section A Type Questions

- 1. What is Budgetary Control? List out any four advantages of Budgetary Control.
- 2. State any four limitations of Budgetary Control.

Section B Type Questions

- 1. Explain in detail the various advantages for an entity with the adoption of a Budgetary Control System.
- 2. Explain the problems and concerns associated with Budgetary Control System.

Section C Type Questions

- 1. What is Budgetary Control? Explain the features, advantages and limitations of Budgetary Control Systems.
- 2. Explain the requisites for an effective Budgetary Control System and the benefits from an effective Budgetary Control System.

4.8 TYPES OF BUDGETS

Budgets may be classified into different types on different bases. The following table summarises the bases and types of budgets:

On the basis of Time-period	On the basis of Capacity	On the basis of Coverage
Long-term Budgets	Fixed Budgets	Functional Budgets
Short-term Budgets	Flexible Budgets	Master Budget
Current Budgets		

A brief explanation of each of these budgets is given as follows:

4.8.1 Long-term Budgets

Long-term Budgets are budgets, which are prepared for a longer period, usually for a period more than one year. These budgets are very useful in business forecasting and forward planning.

4.8.2 Short-term Budgets

Short-term Budgets are budgets, which are prepared for a period of less than one year. These budgets are prepared in cases where a specific action has to be immediately taken to bring any variation under control.

4.8.3 Current Budgets

Current Budgets are budgets, which are established for use over a short period of time and are related to current conditions.

4.8.4 Fixed Budget

The Chartered Institute of Management Accountants defines Fixed Budget as 'a budget designed to remain unchanged, irrespective of the level of activity actually attained'.

A Fixed Budget does not change with actual volume of activity achieved. It operates at one level of activity and under one set of conditions.

Fixed Budgets can be useful tool for cost control under the following set of conditions:

- When the nature of business is not seasonal.
- When there is no impact of external factors on the business activities.
- When the demand for the product is certain and stable.
- When the supply of material and other resources are regular.
- When there is stability in prices.
- When there are no variations in production process or in performance in any other function.

Since these conditions are not realistic in nature, preparation of Fixed Budgets is a very rare phenomenon.

4.8.5 Flexible Budget

The Chartered Institute of Management Accountants defines Flexible Budget as "a budget, which, by recognising the difference between fixed, semi-variable and variable costs, is designed to change in relation to the level of activity attained".

Flexible Budgets are budgets, which are prepared at different levels of activity. It is prepared on the basis of the nature of cost (i.e., fixed, variable and semi-variable). Flexible Budgets are suitable when there are seasonal fluctuations in sales and other business activities, when there are constant changes in product line, when the business is engaged in make-to-order; and when the business activities are influenced by external factors.

A detailed discussion on the steps for preparing Flexible Budgets is provided later in this chapter, along with problems on preparation of Flexible Budgets.

4.8.6 Functional Budgets

Budgets, which relate to individual functions in an organisation, are known as Functional Budgets. Following are some of the commonly used Functional Budgets:

- 1. Sales Budget
- 2. Production Budget
- 3. Direct Material Budget
- 4. Direct Labour Budget
- 5. Production Overheads Budget
- 6. Administration Expenses Budget
- 7. Selling Costs Budget
- 8. Advertising Cost Budget
- 9. Research and Development Expenditure Budget
- 10. Capital Expenditure Budget
- 11. Cash Budget

The following paragraphs give a brief explanation of each of the listed types of budgets:

1. Sales Budget

A Sales Budget provides an estimate of quantity and Selling Price for each product for each zone or region. Usually, this is the first budget prepared and other budgets will be based on the outcome of Sales Budget.

Sales Budget is prepared after considering many factors like past demand, present market conditions, customers' tastes and preferences, the extent of competition, pricing policy, tax factors, etc.

Sales Budget is prepared for each product, for each region, for each distributor (or salesman or agent), for each period (quarterly or half-yearly).

This budget also provides sales target to be achieved by the sales department.

2. Production Budget

A Production Budget is prepared for estimating the required production for a given period. This budget is prepared on the basis of estimated sales (obtained from Sales Budget), inventory policy of the firm (with regard to finished goods), production capacity, procurement policy and other relevant factors.

Production Budget forms the basis for preparation of all expenditure budgets.

3. Direct Materials Budget

Direct Materials Budget is prepared for estimating the quantity of raw material required for budgeted production. This budget is prepared on the basis of Production Budget, inventory policy of the firm (with regard to raw materials), material purchase policy, stock levels to be maintained at the stores, delivery period by supplier etc.

The Material Requirement Budget is prepared along with Material Procurement Budget and Material Cost Budget.

4. Direct Labour Budget

Direct Labour Budget is prepared to estimate the labour time required for meeting the budgeting production target, the number of workers required, the labour rate, the labour cost and labour recruitment plan.

This budget is prepared on the basis of Production Budget, details of available labour, productivity of the present labour force, wage rate policy, and employment scenario in the country.

5. Production Overheads Budget

Production Overheads Budget is prepared for estimating the indirect material, inDirect Labour and other Indirect Expenses for production. It is also used for estimating Factory Overhead Absorption or Recovery rates.

Production Overhead Budget is prepared on the basis of Production Budget, nature of each item of indirect expenditure (i.e., whether fixed or variable), results of work–study, the condition of plant and machinery (i.e., age, wear and tear, obsolescence etc.) and other factors.

This budget is followed by preparation of Production Cost Budget.

6. Administration Expenses Budget

Administration Expenses Budget is prepared for estimating the expenditure to be incurred for office and administration like salaries, office rent and maintenance, printing and stationery, postage and telegram, fees and other related expenses.

This budget is prepared based on the past experience after incorporating for any change in price of material or services.

7. Selling Costs Budget

Selling Costs Budget is prepared for estimating the expenditure of marketing, advertising, remuneration for salesmen and all other expenditure relating to Sales.

This budget is prepared on the basis of Sales Budget, marketing policy, results of market surveys, competitor analysis, salesmen expectations and industry practices with regard to commissions, credit period and bad debts.

8. Advertising Cost Budget

Advertising Budget and Advertising Cost Budget is prepared for planning the advertisement and publicity, and the cost for advertisement. The budget includes deciding the medium of advertisement, the insertions or frequency, the reach, etc.

Preparation of this budget is based on the trends in the market, the cost of various advertising media, the ratings of each media, the reach and various other factors.

9. Research and Development Expenditure Budget

This budget is prepared for estimating the cost of research and development activities of the enterprise. This involves deciding upon the type of research, research plan and procedure, mode of carrying out research and development and the associated cost.

10. Capital Expenditure Budget

Capital Expenditure Budget or Capital Budgeting involves deciding whether to invest or not in a given investment opportunity, choosing between mutually exclusive investment alternatives, capital rationing and capital disinvestment.

The inputs for this budget is cash outflow (i.e., the extent of investment required), cash inflows (i.e., revenues and benefits) from investment and hurdle rate.

11. Cash Budget

Cash Budget is a budget prepared for estimation of Receipts and Payments (i.e., cash inflows and cash outflows) over a given period of time for ascertaining the availability of surplus funds or possibility of deficit.

Cash Budgets are prepared with the help of Sales Budget and all Cost Budgets viz., Material Cost Budget, Labour Cost Budget, Production Overheads Budget, Administration Expenses Budget, Sales Cost Budget, Advertising Cost Budget, Research and Development Expenditure Budget, etc.

A detailed explanation of the steps involved in preparing Cash Budgets is given later in this chapter, along with problems on preparation of Cash Budgets.

4.8.7 Master Budget

Master Budget is a consolidated summary of various Functional Budgets. It is prepared with the help of all Functional Budgets and it forms the source for preparation of Projected Financial Statements.

This chapter demonstrates preparation of Flexible Budget and Cash Budget.

THEORY QUESTIONS

Section A Type Questions

- 1. State the different bases for classification of budgets.
- 2. List the types of budget on the basis of time-period.
- 3. List the different types of budget on the basis of capacity.
- 4. List the different types of budget on the basis of coverage.
- 5. What are Long-term Budgets?
- 6. State the meaning of Current Budgets.
- 7. What is a Fixed Budget? How is it different from Flexible Budget?
- 8. What is a Flexible Budget?
- 9. List any six Functional Budgets.
- 10. What is Capital Expenditure Budget?
- 11. What is a Cash Budget?
- 12. What is a Master Budget?

Section B Type Questions

- 1. List the various types of budgets, classified on different bases.
- 2. What are Functional Budgets? List out the various types of Functional Budgets.
- 3. Explain briefly the different types of Functional Budgets.

Section C Type Questions

1. What is a Budget? List and explain the different types of budgets, classified on different bases.
4.9 PREPARATION OF FLEXIBLE BUDGETS AND CASH BUDGETS

4.9.1 Steps in Preparation of Flexible Budget

Flexible Budget is a budget prepared for estimating cost and profits at different levels of activity. Following are the steps to be followed in preparing Flexible Budget:

1. Ascertain the costs incurred or to be incurred in manufacturing a product.

2. Classify the costs under the following heads:

- Direct Materials
- Direct Labour
- Direct Expenses
- Factory Overheads
- Office and Administration Overheads
- Selling and Distribution Overheads

3. Identify the nature of each item of cost.

- Identify whether the item of cost is fixed or variable or semi-variable.
- Fixed Cost refers to the cost, which remains the same at different levels of production, but the Perunit Cost of which varies inversely with production.
- Variable Cost refers to the cost, which varies proportionately with production or sales, but the Perunit Cost of which remains the same at all levels of production.
- Semi-variable Cost refers to the cost, where neither the total amount nor the Per-unit Cost is the same.

How to ascertain the nature of cost?

It can be ascertained with the help of cost structure for at least two different levels of production.

- When the Total Cost remains same at different levels of production, it represents Fixed Cost.
- When the Per-unit Cost remains same at different levels of production, it represents Variable Cost.
- When neither the Total Cost nor the Per-unit Cost is same at different levels of production, it represents Semi-variable Cost.

Notes:

- 1. In the absence of clear information, all elements of Direct Cost can be considered as variable in nature.
- 2. In the absence of clear information, Office and Administration Overheads can be considered as fixed in nature.
- In case any item of cost is semi-variable in nature, it must be split into fixed portion and variable portion.

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4. Keep the blank format of Flexible Budget Statement ready.

Following is the format for preparing a Flexible Budget Statement

Dentfordern	Activity Le	evel	Activity Level		Activity Level	
Particulars	Total	Per Unit	Total	Total Per Unit		Per Unit
Direct Material						
Direct Labour						
Direct Expenses						
Prime Cost						
Factory Overheads						
Variable						
Fixed						
Factory Cost						
Office Overheads						
Variable						
Fixed						
Cost of Goods Sold						
Selling and Distribution						
Overheads						
Variable						
Fixed						
Total Cost						
Profits						
Sales						

Note: The number of columns can be increased or decreased depending on the number of activity levels for which Flexible Budget must be prepared.

- 5. Take each item of cost in the order of the format and follow the procedure described next:
 - In case the item of cost is fixed in nature, enter the cost amount in the Total columns of all activity levels. Divide the amount by number of units at each activity level and calculate the Per-unit Cost.
 - In case the item of cost is variable in nature, enter the Per-unit Cost in the Per Unit columns of all activity levels. Multiply Per-unit Cost by number of units at each activity level and calculate the Total Cost.
 - In case the item of cost is semi-variable in nature, split the same into fixed and variable and follow the aforementioned procedure for each portion separately.
- 6. When all elements of cost are entered in the format, calculate profits, if Selling Price is given; or calculate Selling Price and Sales when information regarding profits is given.

4.9.2 Steps in Preparation of Cash Budget

Cash Budget is a budget prepared for estimating surplus or deficit Cash Balance for a given period of time, usually short-term (i.e., three months or six months). It is prepared by forecasting the Receipts and Payments for the given period. Following are the steps to be followed for preparing Cash Budget:

1. Ascertain the Opening Balance of cash or bank at the beginning of the period under consideration.

- 2. Identify the receipts and payments over the given period and trace them to the sub-period they belong to (i.e., the specific month or quarter).
- 3. Keep the blank format of Cash Budget Statement ready.

The following is the format for preparing Cash Budget:

Particulars	Month One	Month Two	Month Three
Opening Balance			
Add: Receipts			
1			
2			
3			
4			
5			
6			
Total			
Less: Payments			
1			
2			
3			
4			
5			
6			
Closing Balance			

Note: The Number of columns can be increased or decreased depending on the number of months (or periods) for which Cash Budget is prepared.

- 4. List out all items of Receipts and Payments in the format.
- 5. Record the Opening Balance for the first period.
- 6. Record the amount for each item of Receipt and Payment in the column of respective month.
- 7. In case any Receipt or Payment is spread across more than one period, split the amount and show them in the column of the respective months. (See problems for illustration on this point).
- 8. Once all items of Receipts and Payments for all the periods are entered, calculate the Closing Balance for the first period by deducting Total of Payments from the Total of Opening Balance and Receipts.
- 9. Closing Balance of each period is the Opening Balance for the following period. So, record the Closing Balance of the first month as the Opening Balance for the second month and repeat the process of calculating the Closing Balance.
- 10. Repeat steps 8 and 9 for each month, till the Closing Balance of the last month is ascertained.

PROBLEMS

Problems on Preparation of Flexible Budgets

Problem 1 (Problem on preparation of Flexible Budget)

Prepare a Flexible Budget for the production at 80% (8,000 units) on the basis of the following information:

Particulars	Amount
Production at 50% capacity	5,000 units
Raw Materials	₹80 per unit
Direct Labour	₹50 per unit
Direct Expenses	₹20 per unit
Factory Expenses	₹5,00,000 (50% fixed)
Administration Expenses	₹3,00,000 (40% variable)

Solution

Step 1: Ascertainment of Inputs

Element of Cost	Nature of Cost	Requirement	At 5000 units capacity
Raw Materials	Variable	Per-unit Cost	₹80.00
Direct Labour	Variable	Per-unit Cost	₹50.00
Direct Expenses	Variable	Per-unit Cost	₹20.00
Factory Expenses	Semi-variable	Fixed portion – Total Cost Variable portion – Per-unit Cost	₹2,50,000 ₹50.00
Administration Expenses	Semi-variable	Fixed portion – Total Cost Variable portion – Per-unit Cost	₹1,80,000 ₹24.00

Notes:

- 1. The cost data in the problem is given for 5000 units capacity.
- The Total Factory Expenses are ₹5,00,000, of which 50% are fixed. So, the amount of Fixed Factory Expenses is ₹2,50,000 (50% of ₹5,00,000). The balance ₹2,50,000 is variable in nature. The Per-unit Variable Cost is ₹50.00 (i.e., ₹2,50,000/5000 units).
- The Total Administration Expenses are ₹3,00,000, of which 40% is variable. So, the amount of Variable Administration Expenses is ₹1,20,000 (40% of ₹3,00,000) and the amount of Fixed Administration Expense is ₹1,80,000 (i.e., ₹3,00,000 ₹1,20,000). The Per-unit Variable Cost is ₹24.00 (i.e., ₹1,20,000/5000 units).

Step 2: Preparation of Flexible Budget

Flexible Budget					
	For 50()0 units	For 8000 units		
Particulars	Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)	
Direct Materials	4,00,000.00	80.00	6,40,000.00	80.00	
Direct Labour	2,50,000.00	50.00	4,00,000.00	50.00	
Direct Expenses	1,00,000.00	20.00	1,60,000.00	20.00	
Prime Cost	7,50,000.00	150.00	12,00,000.00	150.00	
Factory Expenses					
Fixed	2,50,000.00	50.00	2,50,000.00	31.25	
Variable	2,50,000.00	50.00	4,00,000.00	50.00	
Factory Cost	12,50,000.00	250.00	18,50,000.00	231.25	
Administration Expenses					
Fixed	1,80,000.00	36.00	1,80,000.00	22.50	
Variable	1,20,000.00	24.00	1,92,000.00	24.00	
Cost of Goods Sold/Total Cost	15,50,000.00	310.00	22,22,000.00	277.75	

Problem 2 (Problem on preparation of Flexible Budget)

Prepare a Flexible Budget for production of 90% (9,000 units) on the basis of the following information:

Particulars	Amount
Production at 50% capacity	5,000 units
Raw Materials	₹75 per unit
Direct Labour	₹45 per unit
Direct Expenses	₹20 per unit
Factory Expenses	₹6,00,000 (40% fixed)
Administrative Expenses	₹4,00,000 (50% variable)

Solution

Step 1: Ascertainment of Inputs

Element of Cost	Nature of Cost	Requirement	At 5000 units capacity
Raw Materials	Variable	Per-unit Cost	₹75.00
Direct Labour	Variable	Per-unit Cost	₹45.00
Direct Expenses	Variable	Per-unit Cost	₹20.00
Easterne Essenances	Comi conichte	Fixed portion – Total Cost ₹2,40	₹2,40,000
Factory Expenses	Semi-variable	Variable portion – Per-unit Cost	₹72.00
Administration Expanses	Sami variabla	Fixed portion – Total Cost	₹2,00,000
Administration Expenses	Senn-variable	Variable portion – Per-unit Cost	₹40.00

Notes:

- 1. The cost data in the problem is given for 5000 units capacity.
- The Total Factory Expenses are ₹6,00,000, of which 40% are fixed. So, the amount of Fixed Factory Expense is ₹2,40,000 (40% of ₹6,00,000). The balance ₹3,60,000 is variable in nature. The Per-unit Variable Cost is ₹72.00 (i.e., ₹3,60,000/5000 units).

4.16 ★ Cost Management

The Total Administration Expense is ₹4,00,000, of which 50% is variable. So, the amount of Variable Administration Expense is ₹2,00,000 (50% of ₹4,00,000) and the amount of Fixed Administration Expense is ₹2,00,000 (i.e., ₹4,00,000 – ₹2,00,000). The Per-unit Variable Cost is ₹40.00 (i.e., ₹2,00,000/5000 units).

Step 2: Preparation of Flexible Budget

Flexible Budget					
	For 500	0 units	For 9000 units		
Particulars	Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)	
Direct Materials	3,75,000.00	75.00	6,75,000.00	75.00	
Direct Labour	2,25,000.00	45.00	4,05,000.00	45.00	
Direct Expenses	1,00,000.00	20.00	1,80,000.00	20.00	
Prime Cost	7,00,000.00	140.00	12,60,000.00	140.00	
Factory Expenses					
Fixed	2,40,000.00	48.00	2,40,000.00	26.67	
Variable	3,60,000.00	72.00	6,48,000.00	72.00	
Factory Cost	13,00,000.00	260.00	21,48,000.00	238.67	
Administration Expenses					
Fixed	2,00,000.00	40.00	2,00,000.00	22.22	
Variable	2,00,000.00	40.00	3,60,000.00	40.00	
Cost of Goods Sold/Total Cost	17,00,000.00	340.00	27,08,000.00	300.89	

Problem 3 (Problem on preparation of Flexible Budget)

The budgeted expenses for the production of 10,000 units are given as follows:

Particulars	Per Unit (₹)
Materials	80
Labour	40
Manufacturing Expenses (50% fixed)	20
Selling and Distribution Expenses (40% fixed)	10
Administration Expenses (fixed)	10
Total	160
Selling Price	200

Prepare Flexible Budget for 12,000 units.

Solution

Step 1: Ascertainment of Inputs

Element of Cost	Nature of Cost	Requirement	At 10,000 units capacity
Materials	Variable	Per-unit Cost	₹80.00
Labour	Variable	Per-unit Cost	₹40.00
Manufacturing Expenses	Semi-variable	Fixed portion – Total Cost Variable portion – Per-unit Cost	₹1,00,000 ₹10.00
Administration Expenses	Fixed	Total Cost	₹1,00,000
Selling and Distribution Expenses	Semi-variable	Fixed portion – Total Cost Variable portion – Per-unit Cost	₹40,000 ₹6.00

Notes:

- 1. The cost data in the problem is given for 10000 units capacity.
- At 10,000 units capacity, the Manufacturing Expense per unit is ₹20. So, the Total Manufacturing Expense is ₹2,00,000. With 50% being fixed, the fixed portion is ₹1,00,000. The balance of ₹1,00,000 is variable in nature and hence, the Variable Manufacturing Expense per unit is ₹10.00 (i.e., ₹1,00,000/10,000 units).
- 3. Administration Expenses are given as fixed. For 10,000 units, the Administration Expenditure is ₹10 per unit. So, the Total Administration Cost is ₹1,00,000.
- 4. At 10,000 units capacity, the Selling and Distribution Expense per unit is ₹10. So, the Total Selling and Distribution Expense is ₹1,00,000. With 40% being fixed, the fixed portion is ₹40,000. The balance of ₹60,000 is variable in nature and hence, the Variable Selling and Distribution Expense per unit is ₹6.00 (i.e., ₹60,000/10,000 units).

Flevible Budget

	For 100	For 10000 units		For12000 units	
Particulars	Total	Per Unit	Total	Per Unit	
	(₹)	(₹)	(₹)	(₹)	
Direct Materials	8,00,000.00	80.00	9,60,000.00	80.00	
Direct Labour	4,00,000.00	40.00	4,80,000.00	40.00	
Prime Cost	12,00,000.00	120.00	14,40,000.00	120.00	
Manufacturing Expenses					
Fixed	1,00,000.00	10.00	1,00,000.00	8.33	
Variable	1,00,000.00	10.00	1,20,000.00	10.00	
Factory Cost	14,00,000.00	140.00	16,60,000.00	138.33	
Administration Expenses (fixed)	1,00,000.00	10.00	1,00,000.00	8.33	
Cost of Goods Sold	15,00,000.00	150.00	17,60,000.00	146.67	
Selling and Distribution Expenses					
Fixed	40,000.00	4.00	40,000.00	3.33	
Variable	60,000.00	6.00	72,000.00	6.00	
Total Cost	16,00,000.00	160.00	18,72,000.00	156.00	
Profits (Balancing figure)	4,00,000.00	40.00	5,28,000.00	44.00	
Sales	20,00,000.00	200.00	24,00,000.00	200.00	

Step 2: Preparation of Flexible Budget

Problem 4 (Problem on preparation of Flexible Budget)

The budgeted expenses at 10,000 units of production are:

Particulars	Per Unit (₹)
Direct Materials	60
Direct Labour	30
Variable Overheads	20
Fixed Overheads (₹1,60,000)	16
Variable Expenses (Direct)	5
Selling Expenses (20% fixed)	15
Administration Expenses (₹50,000 fixed)	5
Distribution Expenses (20% fixed)	5
Total	156

Prepare Flexible Budget for 7,000 units.

Step 1: Ascertainment of Inputs

Element of Cost	Nature of Cost	Requirement	At 10,000 units capacity
Materials	Variable	Per-unit Cost	₹60.00
Labour	Variable	Per-unit Cost	₹30.00
Direct Expenses (given as Variable Expenses)	Variable	Per-unit Cost	₹5.00
Production or Factory Expanses	Semi variable	Fixed portion – Total Cost	₹1,60,000
Fielduction of Factory Expenses	Senn-variable	Variable portion – Per-unit Cost	₹20.00
Administration Expenses	Fixed	Total Cost	₹50,000
Solling Expanses	Somi variabla	Fixed portion – Total Cost	₹30,000
Sening Expenses	Senn-variable	Variable portion – Per-unit Cost	₹12.00
Distribution Expanses	Somi variabla	Fixed portion – Total Cost	₹10,000
Distribution Expenses	Senn-variable	Variable portion – Per-unit Cost	₹4.00

Notes:

- 1. The cost data in the problem is given for 10000 units capacity.
- 2. The Variable Overheads and Fixed Overheads mentioned in the problem are considered as Factory Overheads, since the other Overheads are specifically mentioned.
- 3. Administration Expenses are given as fixed. For 10,000 units, the Administration Expenditure is ₹5 per unit. So, the Total Administration Cost is ₹50,000.
- 4. At 10,000 units capacity, the Selling Expense per unit is ₹15. So, the Total Selling Expense is ₹1,50,000. With 20% being fixed, the fixed portion is ₹30,000. The balance of ₹1,20,000 is variable in nature and hence, the Variable Selling Expense per unit is ₹12.00 (i.e., ₹1,20,000/10,000 units).
- 5. At 10,000 units capacity, the Distribution Expense per unit is ₹5. So, the Total Distribution Expense is ₹50,000. With 20% being fixed, the fixed portion is ₹10,000. The balance of ₹40,000 is variable in nature and hence, the Variable Distribution Expense per unit is ₹4.00 (i.e., ₹40,000/10,000 units).

Step 2: Preparation of Flexible Budget

Flexible Budget

	For 10000	units	For 7000 units		
Particulars	Total	Per Unit	Total	Per Unit	
	(₹)	(₹)	(₹)	(₹)	
Direct Materials	6,00,000.00	60.00	4,20,000.00	60.00	
Direct Labour	3,00,000.00	30.00	2.10,000.00	30.00	
Direct Expenses	50,000.00	5.00	35,000.00	5.00	
Prime Cost	9,50,000.00	95.00	6,65,000.00	95.00	
Manufacturing Expenses					
Fixed	1,60,000.00	16.00	1,60,000.00	22.86	
Variable	2,00,000.00	20.00	1,40,000.00	20.00	
Factory Cost	13,10,000.00	131.00	9,65,000.00	137.86	
Administration Expenses (fixed)	50,000.00	5.00	50,000.00	7.14	
Cost of Goods Sold	13,60,000.00	136.00	10,15,000.00	145.00	

(Contd.)

Particulars		For 10000	units	For 7000 units		
		Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)	
Selling Expenses						
Fixed		30,000.00	3.00	30,000.00	4.29	
Variable		1,20,000.00	12.00	84,000.00	12.00	
Distribution Expenses						
Fixed		10,000.00	1.00	10,000.00	1.43	
Variable		40,000.00	4.00	28,000.00	4.00	
Tot	tal Cost	15,60,000.00	156.00	11,67,000.00	166.72	

Problem 5 (Problem on preparation of Flexible Budget)

The following details relate to 60% activity when the production was 600 units.

Particulars	Amount (₹)
Materials	120 per unit
Labour	50 per unit
Expenses	15 per unit
Factory Expenses	50,000 (40% fixed)
Administration Expenses	35,000 (70% fixed)

Prepare a Flexible Budget showing Marginal Cost and the Total Cost for 60%, 80% and 100% activities.

Solution Step 1: Ascertainment of Inputs

Element of Cost	Nature of Cost	Requirement	At 60% Capacity (600 Units)
Materials	Variable	Per-unit Cost	₹120.00
Labour	Variable	Per-unit Cost	₹50.00
Expenses (assumed as Direct Expenses)	Variable	Per-unit Cost	₹15.00
Factory Expenses	Semi-variable	Fixed portion – Total Cost Variable portion – Per-unit Cost	₹20,000 ₹50.00
Administration Expenses	Semi-variable	Fixed portion – Total Cost Variable portion – Per-unit Cost	₹24,500 ₹17.50

Notes:

- 1. The cost data in the problem is given for 600 units capacity.
- 2. The Total Factory Expenses are ₹50,000; of which, 40% are fixed. So, the amount of Fixed Factory Expenses is ₹20,000 (40% of ₹50,000). The balance ₹30,000 is variable in nature. The Per-unit Variable Cost is ₹50.00 (i.e., ₹30,000/600 units).

4.20 ♦ Cost Management

The Total Administration Expense is ₹35,000; of which, 70% are fixed. So, the amount of Fixed Administration Expense is ₹24,500 (70% of ₹35,000). The balance ₹10,500 is variable in nature. The Per-unit Variable Cost is ₹17.50 (i.e., ₹10,500/600 units).

Step 2: Preparation of Flexible Budget

, and the second s						
Particulars	60% Capacity (600 Units)		80% Ca (800 U	pacity nits)	100% Capacity (1000 Units)	
r ai ticulai s	Total	Per Unit	Total	Per Unit	Total	Per Unit
	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
Direct Materials	72,000.00	120.00	96,000.00	120.00	1,20,000.00	120.00
Direct Labour	30,000.00	50.00	40,000.00	50.00	50,000.00	50.00
Direct Expenses	9,000.00	15.00	12,000.00	15.00	15,000.00	15.00
Prime Cost	1,11,000.00	185.00	1,48,000.00	185.00	1,85,000.00	185.00
Factory Expenses						
Fixed	20,000.00	33.33	20,000.00	25.00	20,000.00	20.00
Variable	30,000.00	50.00	40,000.00	50.00	50,000.00	50.00
Factory Cost	1,61,000.00	268.33	2,08,000.00	260.00	2,55,000.00	255.00
Administration Expenses						
Fixed	24,500.00	40.83	24,500.00	30.63	24,500.00	24.50
Variable	10,500.00	17.50	14,000.00	17.50	17,500.00	17.50
Total Cost	1,96,000.00	326.66	2,46,500.00	308.13	2,97,000.00	297.00

Flexible Budget

Problem 6 (Problem on preparation of Flexible Budget)

The expenses budgeted for the production of 10,000 units in a factory are given as follows:

Particulars	Amount (₹)
Material	70 per unit
Labour	25 per unit
Variable Overhead	20 per unit
Fixed Overhead (₹1,00,000)	10 per unit
Variable Expenses (direct)	5 per unit
Selling Expenses (10% fixed)	13 per unit
Distribution Expenses (20% fixed)	7 per unit
Administration Expenses (₹50,000)	5 per unit
Total Cost	155 per unit
Selling Price	200 per unit

Prepare a budget at 60% and 80% levels of capacities in order to facilitate the management in decision-making. Assume that the Administration Expenses are rigid for all levels of activities.

Element of Cost	Nature of Cost	Requirement	At 10,000 units capacity
Materials	Variable	Per-unit Cost	₹70.00
Labour	Variable	Per-unit Cost	₹25.00
Direct Expenses (given as Variable Expenses)	Variable	Per-unit Cost	₹5.00
Production or Factory	Sami variabla	Fixed portion – Total Cost	₹1,00,000
Expenses	Senn-variable	Variable portion – Per-unit Cost	₹20.00
Administration Expenses	Fixed	Total Cost	₹50,000
Salling European	Sami yaniahla	Fixed portion – Total Cost	₹13,000
Sening Expenses	Semi-variable	Variable portion – Per-unit Cost	₹11.70
Distribution Expanses	Sami yaniahla	Fixed portion – Total Cost	₹14,000
Distribution Expenses	Semi-variable	Variable portion – Per-unit Cost	₹5.60

Step 1: Ascertainment of Inputs

Notes:

- 1. The cost data in the problem is given for 10000 units capacity.
- 2. The Variable Overheads and Fixed Overheads mentioned in the problem are considered as Factory Overheads, since the other Overheads are specifically mentioned.
- 3. Administration Expenses are given as fixed. For 10,000 units, the Administration expenditure is ₹5 per unit. So, the Total Administration Cost is ₹50,000.
- 4. At 10,000 units capacity, the Selling Expenses per unit is ₹13. So, the Total Selling Expense is ₹1,30,000. With 10% being fixed, the fixed portion is ₹13,000. The balance of ₹1,17,000 is variable in nature and hence, the Variable Selling Expense per unit is ₹11.70 (i.e., ₹1,17,000/10,000 units).
- 5. At 10,000 units capacity, the Distribution Expense per unit is ₹7. So, the Total Distribution Expense is ₹70,000. With 20% being fixed, the fixed portion is ₹14,000. The balance of ₹56,000 is variable in nature and hence, the Variable Distribution Expense per unit is ₹5.60 (i.e., ₹56,000/10,000 units).

Step 2: Preparation of Flexible Budget

Flexible Budget

	For 10000 units		For 6000	units	For 8000 units	
Particulars	Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)
Direct Materials	7,00,000.00	70.00	4,20,000.00	70.00	5,60,000.00	70.00
Direct Labour	2,50,000.00	25.00	1,50,000.00	25.00	2,00,000.00	25.00
Direct Expenses	50,000.00	5.00	30,000.00	5.00	40,000.00	5.00
Prime Cost	10,00,000.00	100.00	6,00,000.00	100.00	8,00,000.00	100.00
Manufacturing Expenses						
Fixed	1,00,000.00	10.00	1,00,000.00	16.67	1,00,000.00	12.50
Variable	2,00,000.00	20.00	1,20,000.00	20.00	1,60,000.00	20.00
Factory Cost	13,00,000.00	130.00	8,20,000.00	136.67	10,60,000.00	132.50
Administration Expenses (fixed)	50,000.00	5.00	50,000.00	8.33	50,000.00	6.25
Cost of Goods Sold	13,50,000.00	135.00	8,70,000.00	145.00	11,10,000.00	138.75

(Contd.)

4.22 ♦ *Cost Management*

	For 10000 units		For 6000 units		For 8000 units	
Particulars	Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)
Selling Expenses						
Fixed	13,000.00	1.30	13,000.00	2.17	13,000.00	1.63
Variable	1,17,000.00	11.70	70,200.00	11.70	93,600.00	11.70
Distribution Expenses						
Fixed	14,000.00	1.40	14,000.00	2.33	14,000.00	1.75
Variable	56,000.00	5.60	33,600.00	5.60	44,800.00	5.60
Total Cost	15,40,000.00	155.00	10,00,800.00	166.80	12,75,400.00	159.43
Profits (Balancing figure)	4,60,000.00	45.00	1,99,200.00	33.20	3,24,600.00	40.57
Sales	20,00,000.00	200.00	12,00,000.00	200.00	16,00,000.00	200.00

Problem 7 (Problem on preparation of Flexible Budget when there are variations in Selling Price)

A manufacturing company has the production capacity of 10,000 units per annum. The expenses for production of 5,000 (50%) units for a period are given as follows:

	Per Unit (₹)
Materials	40
Wages	20
Manufacturing Expenses	10
Administration Expenses (all fixed)	5
Selling and Distribution Expense (60% fixed)	5
Total	80
Profit	20
Selling Price	100

Prepare a Flexible Budget for 60%, 70% and 90% levels of activity. It is expected that the present Unit Selling Price will remain constant up to 60% activity, beyond which, a 5% reduction is contemplated up to 90% activity levels.

Solution

Step 1: Ascertainment of Inputs

Element of Cost	Nature of Cost	Requirement	At 5,000 units capacity
Materials	Variable	Per-unit Cost	₹40
Wages	Variable	Per-unit Cost	₹20
Manufacturing Expenses (assumed to be variable, on account of lack of information)	Variable	Per-unit Cost	₹10
Administration Expenses	Fixed	Total Cost	₹25,000
Selling and Distribution Expenses	Semi-variable	Fixed portion – Total Cost Variable portion – Per-unit Cost	₹15,000 ₹2

Notes:

- 1. The cost data in the problem is given for 5000 units capacity.
- 2. Administration Expenses are given as fixed. For 5,000 units, the Administration Expenditure is ₹5 per unit. So, the Total Administration Cost is ₹25,000.
- At 5,000 units capacity, the Selling and Distribution Expense per unit is ₹5, So, the Total Selling and Distribution Expense is ₹25,000. With 60% being fixed, the fixed portion is ₹15,000. The balance of ₹10,000 is variable in nature and hence, the Variable Selling and Distribution Expense per unit is ₹2.00 (i.e., ₹10,000/5,000 units).
- Selling Price is ₹100 per unit, up to 60% level of activity. For 70% and 90% levels of activity, the Selling Price is 5% less, which would be ₹95 per unit (₹100 5% of ₹100).

Flexible Budget

	60% Ca (6000 U	apacity 70% Capa Units) (7000 Uni		pacity Inits)	acity 90% Capacity nits) (9000 Units)	
Particulars	Total	Per Unit	Total	Per Unit	Total	Per Unit
	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
Direct Materials	2,40,000.00	40.00	2,80,000.00	40.00	3,60,000.00	40.00
Direct Labour	1,20,000.00	20.00	1,40,000.00	20.00	1,80,000.00	20.00
Prime Cost	3,60,000.00	60.00	4.20,000.00	60.00	5,40,000.00	60.00
Manufacturing Expenses						
Variable	60,000.00	10.00	70,000.00	10.00	90,000.00	10.00
Factory Cost	4,20,000.00	70.00	4,90,000.00	70.00	6,30,000.00	70.00
Administration Expenses						
Fixed	25,000.00	4.17	25,000.00	3.57	25,000.00	2.78
Cost of Goods Sold	4,45,000.00	74.17	5,15,000.00	73.57	6,55,000.00	72.78
Selling and Distribution Expenses						
Fixed	15,000.00	2.50	15,000.00	2.14	15,000.00	1.67
Variable	12,000.00	2.00	14,000.00	2.00	18,000.00	2.00
Total Cost	4,72,000.00	78.67	5,44,000.00	77.71	6,88,000.00	76.45
Profits (Balancing figure)	1,28,000.00	21.33	1,21,000.00	17.29	1,67,000.00	18.55
Sales	6,00,000.00	100.00	6,65,000.00	95.00	8,55,000.00	95.00

Step 2: Preparation of Flexible Budget

Problem 8 (Problem on preparation of Flexible Budget when there are variations in Selling Price and Material Cost)

A factory is currently working at 50% capacity and produces 10,000 units. Estimate the profits of the company when it works at 60% and 80% capacities.

At 60% capacity, Raw Material Cost increases by 2% and Selling Price falls by 2%. At 80% capacity, Raw Material Cost increases by 5% and Selling Price falls by 5%. At 50% capacity, the product costs ₹180 per unit and is sold at ₹200 per unit. The unit cost of ₹180 is made up as follows:

	Per Unit (₹)
Material	100
Labour	30
Factory Overhead (40% fixed)	30
Administration Overhead (50% fixed)	20

Step 1: Ascertainment of Inputs

Element of Cost	Nature of Cost	Requirement	At 50% Capacity (10,000 Units)
Materials	Variable	Per-unit Cost	₹100
Labour	Variable	Per-unit Cost	₹30
Factory Expenses	Semi-variable	Fixed portion – Total Cost Variable portion – Per-unit Cost	₹1,20,000 ₹18
Administration Expenses	Semi-variable	Fixed portion – Total Cost Variable portion – Per-unit Cost	₹1,00,000 ₹10

Notes:

- 1. The cost data in the problem is given for 10,000 units capacity.
- For 10,000 units, the per-unit Factory Expenditure is ₹30. So, the Total Factory Expenses are ₹3,00,000, of which 40% are fixed. So, the amount of Fixed Factory Expenses is ₹1,20,000 (40% of ₹3,00,000). The balance ₹1,80,000 is variable in nature. The Per-unit Variable Cost is ₹18.00 (i.e., ₹1,80,000/10,000 units).
- For 10,000 units, the per-unit Administration Expenditure is ₹20. So, the Total Administration Expenses are ₹2,00,000, of which, 50% are fixed. So, the amount of Fixed Administration Expenses is ₹1,00,000 (50% of ₹2,00,000). The balance ₹1,00,000 is variable in nature. The Per-unit Variable Cost is ₹10.00 (i.e., ₹1,00,000/10,000 units).
- 4. The Material Cost per unit and Selling Price per unit at different capacity levels will be as follows:

Capacity	Material Cost per unit (₹)	Selling Price per unit (₹)
50% (10,000 units)	100.00	200.00
60% (12,000 units)	102.00 (increase by 2%)	196.00 (decrease by 2%)
80% (16,000 units)	105.00 (increase by 5%)	190.00 (decrease by 5%)

Step 2: Preparation of Flexible Budget

Flexible Budget

Portioulors	50% Ca (10000 I	pacity Units)	60% Ca (12000 l	pacity Units)	80% Capacity (16000 Units)	
r ai ticulars	Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)
Direct Materials	10,00,000.00	100.00	12,24,000.00	102.00	16,80,000.00	105.00
Direct Labour	3,00,000.00	30.00	3,60,000.00	30.00	4,80,000.00	30.00
Prime Cost	13,00,000.00	130.00	15,84,000.00	132.00	21,60,000.00	135.00
Factory Expenses						
Fixed	1,20,000.00	12.00	1,20,000.00	10.00	1,20,000.00	7.50
Variable	1,80,000.00	18.00	2,16,000.00	18.00	2,88,000.00	18.00
Factory Cost	16,00,000.00	160.00	19,20,000.00	160.00	25,68,000.00	160.50
Administration Expenses						
Fixed	1,00,000.00	10.00	1,00,000.00	8.33	1,00,000.00	6.25
Variable	1,00,000.00	10.00	1,20,000.00	10.00	1,60,000.00	10.00
Total Cost	18,00,000.00	180.00	21,40,000.00	178.33	28,28,000.00	176.75
Profits (Balancing figure)	2,00,000.00	20.00	2,12,000.00	17.67	2,12,000.00	13.25
Sales	20,00,000.00	200.00	23,52,000.00	196.00	30,40,000.00	190.00

Problem 9 (Problem on preparation of Flexible Budget for estimation of Overheads)

Draw up a Flexible Budget for Overhead Expenses on the basis of the following data and determine the Overheads at 70% and 90% plant capacities.

	At 80% capacity (8000 units) (₹)
Variable Overheads	
Indirect Labour	12,000
Stores including spares	4,000
Semi-variable Overheads	
Power (60% fixed)	20,000
Repairs (60% fixed)	2,000
Fixed Overheads	
Depreciation	11,000
Insurance	3,000
Salaries	10,000
Estimated Direct Labour Hours	1,24,000

Solution

Step 1: Ascertainment of Inputs

Element of Cost	Nature of Cost	Requirement	At 80% Capacity (8,000 Units)
Indirect Labour	Variable	Per-unit Cost	₹1.50
Stores including spares	Variable	Per-unit Cost	₹0.50
Depreciation	Fixed	Total Cost	₹11,000
Insurance	Fixed	Total Cost	₹3,000
Salaries	Fixed	Total Cost	₹10,000
Dowor	Somi variabla	Fixed portion – Total Cost	₹12,000
rowei	Senn-variable	Variable portion – Per-unit Cost	₹1
Donaira	Sami variabla	Fixed portion – Total Cost	₹1,200
Repairs	Senn-variable	Variable portion – Per-unit Cost	₹0.10

Notes:

- 1. The cost data in the problem is given for 8,000 units capacity (i.e., 80% capacity).
- For 8,000 units, the Total Power Cost is ₹20,000, of which 60% are fixed. So, the amount of fixed power cost is ₹12,000 (60% of ₹20,000). The balance ₹8,000 is variable in nature. The Per-unit Variable Cost is ₹1.00 (i.e., ₹8,000/8,000 units).
- 3. For 8,000 units, the Total Repair Cost is ₹2,000, of which 60% are fixed. So, the amount of Fixed Repair Cost is ₹1,200 (60% of ₹2,000). The balance ₹800 is variable in nature. The Per-unit Variable Cost is ₹0.10 (i.e., ₹800/8,000 units).
- 4. Direct Labour Hours are 1,24,000 at 80% capacity. Hence, for 70% capacity, it would be $(1,24,000 \text{ hours} \times 70\%/80\%) = 1,08,500 \text{ hours}$ and Ear 00% capacity it would be $(124000 \text{ hours} \times 00\%/80\%) = 1.20,500 \text{ hours}$

For 90% capacity, it would be (124000 hours × 90%/80%) = **1,39,500 hours**

Portioulors		80% C (8000	Capacity 70% Cap 00 Units) (7000 U)		apacity Units)	pacity 90% Capac nits) (9000 Unit	
Faruculars		Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)
Fixed Overheads							
Depreciation		11,000.00	1.375	11,000.00	1.571	11,000.00	1.222
Insurance		3,000.00	0.375	3,000.00	0.429	3,000.00	0.333
Salaries		10,000.00	1.250	10,000.00	1.429	10,000.00	1.111
Variable Overheads							
Indirect Labour		12,000.00	1.500	10,500.00	1.500	13,500.00	1.500
Stores and spares		4,000.00	0.500	3,500.00	0.500	4,500.00	0.500
Semi-variable Overheads							
Power							
Fixed		12,000.00	1.500	12,000.00	1.714	12,000.00	1.333
Variable		8,000.00	1.000	7,000.00	1.000	9,000.00	1.000
Repairs							
Fixed		1,200.00	0.150	1,200.00	0.171	1,200.00	0.133
Variable		800.00	0.100	700.00	0.100	900.00	0.100
	Total	62,000.00	7.750	58,900.00	8.414	65,100.00	7.232
Direct Labour Hours		124	000	108	500	139	500
Overhead Rate per hour (Total Overheads/Direct Hours)	Labour	₹62,000/12 = ₹(4000 hours).50	₹58,900/10 = ₹(8500 hours).54	₹65,100/13 = ₹(9500 hours).47

Flexible Budget

Problem 10 (Problem on preparation of Flexible Budget when Semi-variable Expenses vary with capacity utilisation)

Particulars	Amount (₹)
Fixed Expenses	1,49,500
Variable Expenses at 50% capacity	2,67,000
Semi-variable Expenses at 50% capacity	89,500

Semi-variable Expenses are constant between 40% and 70% capacities and increase by 10% between 70% and 85% capacities, and by 15% between 85% and 100% capacities.

Sales at 50% capacity: ₹5,75,000; at 60% capacity: ₹6,40,000; and at 80% capacity: ₹7,90,000.

Prepare Flexible Budget at 60% and 80% capacities.

	At 50% Capacity (₹)	At 60% Capacity (₹)	At 80% Capacity (₹)
Fixed Expenses	1,49,500	1,49,500	1,49,500
Variable Expenses (See Note 1)	2,67,000	3,20,400	4,27,200
Semi-variable Expenses (See Note 2)	89,500	89,500	98,450
Total Cost	5,06,000	5,59,400	6,75,150
Profits (Balancing figure)	69,000	80,600	1,14,850
Sales	5,75,000	6,40,000	7,90,000

Notes:

- Variable Expenses vary proportionately with the capacity. For 50% capacity, the Variable Expenditure is ₹2,67,000. So, at 60% capacity, it is ₹3,20,400 (i.e., ₹2,67,000 × 60%/50%), and at 80% capacity, it is ₹4,27,200 (i.e., ₹2,67,000 × 80%/50%).
- 2. The problem states that Semi-variable Expenses will be constant between 40% and 70% capacity, but increase by 10% between 70% and 85% capacity. Hence, for 50% and 60% capacities, the Semi-variable Expenses are taken as ₹89,500 and at 80% capacity, it is taken 10% higher i.e., ₹98,450 (₹89,500 + 10% of ₹89,500).

Problem 11 (Problem on preparation of Flexible Budget when Semi-variable Expenses vary with capacity utilisation)

X Co. produces a standard product, whose estimated Cost per unit is given as follows:

	Cost per unit (₹)
Raw Material	10
Direct Wages	8
Direct Expenses	2
Variable Overheads	3

Semi-variable Overheads at 100% activity level (10,000 units) are expected to be ₹40,000 and these Overheads vary in steps of ₹2,000 for each change in output of 1,000 units.

The Fixed Overheads are estimated at ₹50,000. Selling Price per unit is expected to be ₹40.

Prepare a Flexible Budget at 50%, 70% and 90% levels of activities.

During the same period, the following expenses were incurred for producing 7,000 units. Present the budget report to the management in a suitable form.

Particulars	Amount (₹)
Materials	69,500
Direct Wages	56,600
Direct Expenses	14,100
Variable Overheads	35,100
Fixed Overheads	70,000

Step 1: Calculation of Semi-variable Overheads

Semi-variable Overheads are ₹40,000 at 100% capacity (i.e., 10,000 units).

For every change in output by 1000 units, Semi-variable Expenses change by ₹2,000.

With change in output, the cost that changes is Variable Cost.

So, for every 1000 units, the Variable Cost is ₹2000.

That is, Variable Cost per unit is ₹2.00 (₹2,000/1000 units).

For 10,000 units, the Semi-variable Cost is ₹40,000.

The variable portion is ₹2 per unit i.e., ₹20,000.

Hence, the fixed portion is ₹20,000.

For the levels at which budget has to be prepared, the Semi-variable Cost will be:

	For 5000 Units	For 7000 Units	For 9000 Units
Fixed portion of Semi-variable Expenses	20,000.00	20,000.00	20,000.00
Variable portion of Semi-variable Expenses @ ₹2 per unit	10,000.00	14,000.00	18,000.00
	30,000.00	34,000.00	38,000.00

Step 2: Preparation of Flexible Budget

Flexible Budget

Doutionloss	50% Ca (5000	apacity Units)	70% Capacity (7000 Units)		90% Capacity (9000 Units)	
raruculars	Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)
Raw Material	50,000.00	10.00	70,000.00	10.00	90,000.00	10.00
Direct Wages	40,000.00	8.00	56,000.00	8.00	72,000.00	8.00
Direct Expenses	10,000.00	2.00	14,000.00	2.00	18,000.00	2.00
Prime Cost	1,00,000.00	20.00	1,40,000.00	20.00	1,80,000.00	20.00
Overheads						
Variable	15,000.00	3.00	21,000.00	3.00	27,000.00	3.00
Fixed	50,000.00	10.00	50,000.00	7.14	50,000.00	5.56
Semi-variable						
Fixed	20,000.00	4.00	20,000.00	2.86	20,000.00	2.22
Variable	10,000.00	2.00	14,000.00	2.00	18,000.00	2.00
Total Cost	1,95,000.00	39.00	2,45,000.00	35.00	2,95,000.00	32.78
Profits (Balancing figure)	5,000.00	1.00	35,000.00	5.00	65,000.00	7.22
Sales	2,00,000.00	40.00	2,80,000.00	40.00	3,60,000.00	40.00

	(₹)	(₹)
Budgeted Profits		35,000.00
Add: Favourable Variances from the Budget		
Material Cost (₹70,000 – ₹69,500)	500.00	500.00
		35,500.00
Less: Adverse Variances from the Budget		
Labour Cost (₹56,600 – ₹56,000)	600.00	
Direct Expenses (₹14,100 – ₹14,000)	100.00	
Variable Overheads [₹35,100 – (₹21,000 + ₹14,000)]	100.00	800.00
		34,700.00

Report to Management for Activity Level of 7000 Units

Notes:

- 1. The actual cost for 7000 units is given in the problem. The total of all actual expenses amount to ₹2,45,300.
- 2. Assuming that Sales Revenue will be same as the Budgeted Sales i.e., ₹2,80,000, the actual profit is ₹34,700 (i.e., ₹2,80,000 ₹2,45,300).
- 3. There is no variance in Fixed Cost. The Total Fixed Cost budgeted was ₹50,000 + ₹20,000 = ₹70,000; and the actual Fixed Cost is also the same.

Problem 12 (Problem on preparation of Flexible Budget)

A company produces a standard product, whose Cost per unit is as follows:

Raw Material	₹4
Direct Labour	₹2
Variable Overhead	₹5
Semi-variable Costs	
Indirect Material	₹235
Indirect Labour	₹156
Repairs and Maintenance	₹570
The Variable Costs per unit, include	ed in Semi-variable Costs, are:
Indirect Material	₹0.05
Indirect Labour	₹0.08
Repairs and Maintenance	₹0.10
Fixed Costs	
Factory	₹2,000
Administration	₹3,000
Selling and Distribution	₹2,500

The aforementioned costs are for 70% capacity, producing 700 units. The Selling Price is ₹30 per unit.

Prepare a Flexible Budget at 60%, 80% and 100% capacities.

Solution

Step 1: Decomposing of Semi-variable Overheads

The cost details in the problem are given at 70% capacity (i.e., for 700 units).

There are 3 items of Semi-variable Cost and for each item, the cost for 700 units is given, along with variable portion per unit.

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	Indirect Material (₹)	Indirect Labour (₹)	Repairs and Maintenance (₹)
Variable Cost per unit	0.05	0.08	0.10
Total Cost for 700 units	235.00	156.00	570.00
Less: Variable portion			
(700 units × Variable Cost per unit)	35.00	56.00	70.00
Fixed Portio	n 200.00	100.00	500.00

The following table shows the ascertainment of fixed portion included in the Semi-variable Cost:

Step 2: Preparation of Flexible Budget

Flexible Budget

Doutionlars	60% Capacity 80% Capacity 100% Capacit (600 Units) (800 Units) (1000 Units)		ity 80% Capacity) (800 Units)		Capacity Units)	
raruculars	Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)	Total (₹)	Per Unit (₹)
Raw Material	2,400.00	4.00	3,200.00	4.00	4,000.00	4.00
Direct Wages	1,200.00	2.00	1,600.00	2.00	2,000.00	2.00
Prime Cost	3,600.00	6.00	4,800.00	6.00	6,000.00	6.00
Factory Overheads						
Variable	3,000.00	5.00	4,000.00	5.00	5,000.00	5.00
Fixed	2,000.00	3.33	2,000.00	2.50	2,000.00	2.00
Semi-variable						
Indirect Material						
Fixed	200.00	0.33	200.00	0.25	200.00	0.20
Variable	30.00	0.05	40.00	0.05	50.00	0.05
Indirect Labour						
Fixed	100.00	0.17	100.00	0.13	100.00	0.10
Variable	48.00	0.08	64.00	0.08	80.00	0.08
Repair and Maintenance						
Fixed	500.00	0.83	500.00	0.63	500.00	0.50
Variable	60.00	0.10	80.00	0.10	100.00	0.10
Factory Cost	9,538.00	15.89	11,784.00	14.74	14,030.00	14.03
Add: Administration						
Overheads (fixed)	3,000.00	5.00	3,000.00	3.75	3,000.00	3.00
Cost of Goods Sold	12,538.00	20.89	14,784.00	18.49	17,030.00	17.03
Add: Selling and Distribution						
Overheads (fixed)	2,500.00	4.17	2,500.00	3.13	2,500.00	2.50
Total Cost	15,038.00	25.06	17,284.00	21.62	19,530.00	19.53
Profits (Balancing figure)	2,962.00	4,94	6,716.00	8.38	10,470.00	10.47
Sales	18,000.00	30.00	24,000.00	30.00	30,000.00	30.00

Note: It is assumed that the Variable Overhead given in the problem is the Variable Factory Overhead.

Problems on Preparation of Cash Budgets

Problem 13 (Problem on statement showing receipts on sales)

The sales forecast of a corporation is given as follows. The sales are offered net 30 days. Of the receivables, 80% are collected in the month following the month of actual sale and 10% are collected each month thereafter. Of these sales, 15% are for cash. You are required to prepare a Schedule of Cash Inflows for the months of September, October, November and December 2017.

Month	Sales (₹)
July	9,00,000
August	8,00,000
September	7,50,000
October	6,00,000
November	5,80,000
December	5,50,000

Solution

The analysis of receipts is shown in the following table:

	July	August	September	October	November	December
Total Sales (₹)	9,00,000	8,00,000	7,50,000	6,00,000	5,80,000	5,50,000
Cash Sales @ 15% Collected in the month of sale (₹)	1,35,000	1,20,000	1,12,500	90,000	87,000	82,500
Credit Sales during the month (₹)	7,65,000	6,80,000	6,37,500	5,10,000	4,93,000	4,67,500
80% of credit sales will be collected as first instalment in the month of	August	September	October	November	December	January
10% of credit sales will be collected as second instalment in the month of	September	October	November	December	January	February
10% of credit sales will be collected as third instalment in the month of	October	November	December	January	February	March

Schedule of Cash Flows from September to December 2017

	September (₹)	October (₹)	November (₹)	December (₹)
Cash Sales	1,12,500	90,000	87,000	82,500
Collection from Debtors				
First Instalment	5,44,000	5,10,000	4,08,000	3,94,400
Second Instalment	76,500	68,000	63,750	51,000
Third Instalment		76,500	68,000	63,750
	7,33,000	7,44,500	6,26,750	5,91,650

Problem 14 (Problem on statement showing receipts on sales)

Sales in January, February and March 2018 amount to ₹1,40,000, ₹1,80,000 and ₹2,20,000 respectively. Of these sales, 25% are on cash basis and a credit period of one month is allowed to debtors. A cash discount of 2% is allowed on cash sales. You are required to calculate the amount of cash received during the months of February and March.

Solution

The analysis of receipts is shown in the following table:

	January	February	March
Total Sales (₹)	1,40,000	1,80,000	2,20,000
Cash Sales (25% of Total Sales) ₹	35,000	45,000	55,000
Credit sales	1,05,000	1,35,000	1,65,000
Collection in the month of	February	March	April
Cash sales after discount @ 2%	₹34,300	₹44,100	₹53,900

Schedule of Cash Flows from January to March 2018

	January (₹)	February (₹)	March (₹)
Collection from cash sales (after discount)	34,300	44,100	53,900
Collection from Debtors		1,05,000	1,35,000
	34,300	1,49,100	1,88,900

Notes:

- 1. Since sales of December 2017 are not given, the collection from debtors for the month of January cannot be ascertained.
- 2. The credit sales of the month of March 2018 are collected from debtors in the month of April 2018.

Problem 15 (Problem on preparation of Cash Outflow Schedule)

A company has its Cost of Goods Sold at 70% of its sales. Of this cost, 70% is paid in the month of sales and the balance in the next month. Salary and Administrative Expenses amounted to ₹40,000 per month plus 5% of sales. These expenses must be paid during the month following the month when the expenses are actually incurred. The company also has 10% debentures of ₹1,50,000 and interest has to be paid in four quarters, from January onwards. The company gives its actual and forecasted sales as follows:

Month	Actual Sales (₹)	Month	Forecast Sales (₹)
January	2,00,000	May	2,00,000
February	2,00,000	June	2,50,000
March	3,00,000	July	2,50,000
April	3,00,000	August	3,00,000

You are required to prepare a schedule of Cash Outflows for six months, from March onwards.

Analysis of cash flows is shown in the following table:

	January	February	March	April	May	June	July	August
Sales (₹)	2,00,000	2,00,000	3,00,000	3,00,000	2,00,000	2,50,000	2,50,000	3,00,000
Cost of Goods Sold (COGS) (70% of Sales)	1,40,000	1,40,000	2,10,000	2,10,000	1,40,000	1,75,000	1,75,000	2,10,000
COGS payable in the month of sales – 70% of COGS (₹)	98,000	98,000	1,47,000	1,47,000	98,000	1,22,500	1,22,500	1,47,000
Balance COGS, payable in the following month (₹)	42,000	42,000	63,000	63,000	42,000	52,500	52,500	63,000
Salary and Administrative Expenses, payable in the following month = $\overline{\mathbf{x}}40,000 + 5\%$ of Sales ($\overline{\mathbf{x}}$)	50,000	50,000	55,000	55,000	50,000	52.500	52,500	55,000
Interest on Debentures $(₹1,50,000 \times 10\% \times 3/12)$	3,750	-	-	3,750	-	-	3,750	

Statement of Cash Outflows

(All figures in ₹)

	March	April	May	June	July	August
Cost of Goods Sold						
- Of the current month	1,47,000	1,47,000	98,000	1,22,500	1,22,500	1,47,000
- Of the previous month	42,000	63,000	63,000	42,000	52,500	52,500
Salary and Administrative Expenses	50,000	55,000	55,000	50,000	52,500	52,500
Interest on Debentures		3,750			3,750	
	2,39,000	2,68,750	2,16,000	2,14,500	2,31,250	2,52,000

Problem 16 (Problem on preparation of Cash Budget)

Bangalore Garments wishes to arrange for overdraft facilities with the bankers, during the period April–June, 2018. Prepare a Cash Budget with the help of the following information, indicating the extent of overdraft facility that the company will require at the end of each month.

Month	Sales (₹)	Purchases (₹)	Wages (₹)
February	1,80,000	1,24,000	12,000
March	1,92,000	1,44,000	14,000
April	1,08,000	2,43,000	11,000
May	1,74,000	2,46,000	10,000
June	1,26,000	2,68,000	15,000

4.34 *♦ Cost Management*

- (a) 50% of the credit sales are realised in the month following the sales and the remaining 50% in the second month, following the sales.
- (b) The creditors are paid in the month following the month of purchase.
- (c) The bank balance, as on 1 April 2018, is ₹25,000.

Solution

Cash Budget for 3 months, ending June 2018

	April	May	June
1. Opening Balance	25,000	56,000	(47,000)
2. Receipts			
Collection from customers			
- 50% of credit sales of the previous month	96,000	54,000	87,000
- 50% of credit sales of the month preceding the previous month	90,000	96,000	54,000
3. Total (1 + 2)	2,11,000	2,06,000	94,000
4. Payments			
Payment to creditors	1,44,000	2,43,000	2,46,000
Payment of wages	11,000	10,000	15,000
	1,55,000	2,53,000	2,61,000
5. Closing Balance (3 – 4)	56,000	(47,000)	(1,67,000)

The company has to arrange for an overdraft of ₹47,000 for the month of May and ₹1,20,000 (i.e., ₹1,67,000 – ₹47,000) for the month of June.

Notes:

- 1. It is assumed that the entire sales of each month are credit sales.
- 2. It is assumed that the entire purchases of each month are credit purchases.
- 3. It is assumed that wages are paid in the same month in which they are due.
- 4. Opening Balance of each month is the Closing Balance of the previous month.

Problem 17 (Problem on preparation of Cash Budget)

Prepare a Cash Budget for three months, commencing from 1 June, when the Cash Balance was ₹1,56,400.

(All figures in ₹)

Month	Sales	Purchases	Wages	Factory Expenses	Selling Expenses
April	80,000	41,000	5,600	3,900	10,000
May	76,000	40,000	5,400	4,200	14,000
June	78,000	38,000	5,400	5,100	15,000
July	90,000	37,000	4,800	5,100	17,000
August	95,000	35,000	4,700	6,000	13,000

Additional information:

- (a) 20% of sales is on cash basis.
- (b) Customers are allowed a credit period of two months.
- (c) Suppliers allow a credit period of one month.
- (d) Lag in payment of wages is one month.
- (e) Lag in payment of Factory Expenses is half a month.
- (f) Lag in payment of Selling Expenses quarter of a month.

		June	July	August
1.	Opening Balance	1,56,400	1,71,200	1,85,000
2.	Receipts			
	- Cash Sales	15,600	18,000	19,000
	- Collection from customers	64,000	60,800	62,400
3.	Total (1 + 2)	2,36,000	2,50,000	2,66,400
4.	Payments			
	- Payment to creditors for previous month's purchases	40,000	38,000	37,000
	- Payment of wages of previous month	5,400	5,400	4,800
	Payment of Factory Expenses			
	- Half of the current month's expenses	2,550	2,550	3,000
	- Half of the previous month's expenses	2,100	2,550	2,550
	Payment of Selling Expenses			
	- 3/4 th of current month expenses	11,250	12,750	9.750
	- 1/4 th of previous month expenses	3,500	3,750	4,250
		64,800	65,000	61,350
5.	Closing Balance (3 – 4)	1,71,200	1,85,000	2,05,050

Cash Budget for 3 months, ending August 2018

Notes:

1. Analysis of inflows on account of sales is given in the following table:

	April	May	June	July	August
Total Sales (₹)	80,000	76,000	78,000	90,000	95,000
Cash Sales (20% of Total Sales)	16,000	15,200	15,600	18,000	19,000
Credit Sales receivable two months after the month of sales	64,000	60,800	62,400	72,000	76,000

- 2. Lag (i.e., delay) in payment of Factory Expenses is half a month. So, each month, half of the current month's expenses and half of the previous month's expenses will be paid.
- 3. Lag (i.e., delay) in payment of Selling Expenses is quarter of a month. So, each month, one-fourth of the previous month's expenses and three-fourth of the current month's expenses will be paid.
- 4. Opening Balance of each month is the Closing Balance of the previous month.

Problem 18 (Problem on preparation of Cash Budget)

From the following data forecast the cash position at the end of April, May and June.

Month	Sales	Purchases	Wages	Selling Expenses
February	1,20,000	80,000	10,000	7,000
March	1,30,000	98,000	12,000	9,000
April	70,000	1,00,000	8,000	5,000
May	1,16,000	1,03,000	10,000	10,000
June	85,000	80,000	8,000	6,000

Additional Information:

(a) Sales at 10% are realised in the month of sales, balance is realised equally in the subsequent two months.

- (b) Creditors are paid for in the month following the month of supply.
- (c) 20% of the wages are paid in arrears in the following month.
- (d) Selling Expenses are paid in the same month.
- (e) Income Tax of ₹20,000 is payable in June.
- (f) Dividend of ₹12,000 is also payable in June.
- (g) Income from investment of ₹2,000 is received half-yearly in March and September.
- (h) Cash on hand on 1 April is estimated to be ₹40,000.

Cash Budget for 3 months, from April to June

	April	May	June
1. Opening Balance	40,000	47,700	29,700
 2. Receipts - Revenue from sales during the month (10%) Collection from outcomes for calca during the preceding 	7,000	11,600	8,500
- Collection from customers for sales during the preceding month (45%)	58,500	31,500	52,200
 Conection from customers for sales during two months preceding the current month (45%) Income from investment 	54,000	58,500 	31,500
3. Total (1 + 2)	1,59,500	1,49,300	1,21,900
 4. Payments - Payment to creditors for previous month's purchases - Payment of wages 	98,000	1,00,000	1,03,000
 80% of current month's wages 20% of preceding month's wages 	6,400 2,400	8,000 1,600	6,400 2,000
Payment of Selling ExpensesIncome Tax	5,000	10,000	6.000 20,000
- Dividends			$\frac{12,000}{1,49,400}$
5. Closing Balance (3 – 4)	47,700	29,700	(-) 27,500

Notes:

1. The following table gives the analysis of Sales Revenue:

(All figures in ₹)

	February	March	April	May	June
Total Sales	1,20,000	1,30,000	70,000	1,16,000	85,000
Sales Revenue receivable in the same month of sales (10%)	12,000	13,000	7,000	11,600	8,500
50% of the remaining Sales Revenue receivable in the month following the month of sales	54,000	58,500	31,500	52,200	38,250
50% of the remaining Sales Revenue receivable during two months following the month of sale	54,000	58,500	31,500	52,200	38,250

2. Income from investment is expected in the months of March and September. Since the Budget Period does not include these months, the 'income from investment' is not shown.

3. "20% of wages are paid in arrears in the following month" means that each month, 80% of the current month's wages and 20% of the previous month's wages are paid.

Problem 19 (Problem on preparation of Cash Budget)

From the following forecasts of income and expenditure, prepare a Cash Budget for 3 months, commencing from 1 June, when the bank balance is likely to be ₹10,000.

Month	Sales	Purchases	Wages	Factory Expenses	Selling and Distribution Expenses
April	80,000	41,000	5,600	3,900	10,000
May	76,500	40,000	5,400	4,200	14,000
June	78,500	38,500	5,400	5,100	15,000
July	90,000	37,000	4,800	5,100	17,000
August	95,500	35,000	4,700	6,000	13,000

Additional Information:

- (a) Assume that 50% of sales are for cash.
- (b) There is a two-month credit period allowed to customers and received from suppliers.
- (c) A Sales Commission of 5% on Total Sales is payable in the second month after Sales.
- (d) A plant valued at ₹65,000 will be purchased and paid for in the month of August.
- (e) Dividends of ₹15,000 have to be paid in July.
- (f) Advance income tax is to be paid in June to the extent of ₹10,000.
- (g) Dividends from investments amounting to ₹1,000 are expected in July.
- (h) Lag in payment of wages is quarter of a month.
- (i) Share call money of ₹30,000 is due to be collected, with a premium of ₹5,000, in the first week of August.

Solution

Cash Budget for 3 months, from June to August

	June	July	August
1. Opening Balance	10,000	8,750	11,125
 2. Receipts - Cash sales - Collection from customers for sales made during two months 	39,250	45,000	47,750
preceding the current month'	40,000	38,250	39,250
- Dividend Income		1,000	
- Share call money with premium			35,000
3. Total (1 + 2)	89,250	93,000	1,33,125
 4. Payments Payment to suppliers for purchases made during two months preceding the current month Wages 3/4th of current month wages 	41,000	40,000	38,500
◆ 1/4 th of previous month wages	1,350	1,350	1,200
- Factory Expenses	5,100	5,100	6,000
- Selling and Distribution Expenses	15,000	13,000	17,000
 Sales Commission (5% of sales made during two months preceding the current month) Purchase of plant Payment of dividend Advance income tax 	4,000 <u>10,000</u> 80,500	3,825 15,000 81,875	3,925 65,000 1,35,150
5. Closing Balance $(3-4)$	8,750	11,125	(-)2,025

Notes:

- 1. Lag in payment of wages is quarter of a month. So, each month, 75% of the current month's wages and 25% of the previous month's wages are to be paid.
- 2. In the absence of information, it is assumed that Factory Expenses and Selling and Distribution Expenses will be paid in the same month of the expenditure.
- 3. Sales Commission is payable in the second month after Sales. So, for Sales made in the month of April, the commission is payable in the month of June and so forth.

Problem 20 (Problem on preparation of Cash Budget)

ABC Ltd., a newly started company, wishes to prepare Cash Budget from January 2018. Prepare a Cash Budget for the first six months from the following estimated revenue and expenses.

Month	Total Sales	Materials	Wages	Production Overheads	Selling and Distribution Overheads
January	20,000	22,000	4,000	3,200	800
February	22,000	14,000	4,400	3,300	900
March	28,000	14,000	4,600	3,400	900
April	36,000	22,000	4,600	3,500	1,000
May	30,000	20,000	4,000	3,200	900
June	40,000	25,000	5,000	3,600	1,200

Cash Balance on 1 January was ₹10,000.

A new machine is to be installed at ₹20,000 on credit, to be repaid in two equal instalments in March and April.

Sales Commission at 5% on Total Sales is to be paid after a month, following the actual sales.

₹10,000 being the amount of second call may be received in March. Share Premium, amounting to ₹2,000, is also obtainable with the second call.

Period of credit allowed by suppliers:	2 months
Period of credit allowed to customers:	1 month
Delay in payment of Overheads:	1 month
Delay in payment of wages:	$\frac{1}{2}$ month

Assume Cash Sales to be 50% of Total Sales.

Solution

Cash Budget for six months, from January to June 2018

(All figures in ₹)

(All figures in ₹)

	January	February	March	April	May	June
1. Opening Balance	10,000	18,000	29,800	25,000	22,700	31,100
 2. Receipts Cash Sales Collection from customers for sales made during the month preceding the 	10,000	11,000	14,000	18,000	15,000	20,000
current month	Nil	10,000	11,000	14,000	18,000	15,000
- Share call money with premium			12,000			

(Contd.)

	January	February	March	April	May	June
3. Total (1 + 2)	20,000	39,000	66,800	57,000	55,700	66,100
4. Payments						
- Payment to suppliers for purchases						
made during two months preceding the						
current month	Nil	Nil	22,000	14,000	14,000	22,000
- Wages						
 ¹/₂ of current month wages 	2,000	2,200	2,300	2,300	2,000	2,500
 ¹/₂ of previous month wages 	Nil	2,000	2,200	2,300	2,300	2,000
- Production Overheads of preceding						
month	Nil	3,200	3,300	3,400	3,500	3,200
- Selling and Distribution Expenses of						
preceding month	Nil	800	900	900	1,000	900
- Sales Commission (5% on Total Sales						
made during the month preceding the						
current month)	Nil	1,000	1,100	1,400	1,800	1,500
- Instalment for purchase of machinery			10,000	10,000		
	2,000	9,200	41,800	34,300	24,600	32,100
5. Closing Balance (3 – 4)	18,000	29,800	25,000	22,700	31,100	34,000

Notes:

- 1. Since the business is a new venture, any receipts and payments based on preceding months' activity will not be available in the initial months.
- 2. Cost of purchase of machinery is ₹20,000. It is payable in two equal instalments. Hence, each instalment is ₹10,000 (i.e., ₹20,000/2).

Problem 21 (Problem on preparation of Cash Budget)

A large retail store makes 25% of its sales in cash and the remainder in 30 days terms. Due to faulty collection practice, there have been losses from bad debts to the extent of 1% on credit sales on an average in the past. The experience of the company is that normally 60% of the credit sales are collected in the month following sales, 25% in the second following month and 14% in the third following month.

Sales in the preceding three months have been as follows:

January	₹80,000			
February	₹1,00,000			
March	₹1,40,000			
Sales for the next three months are estimated as:				
April	₹1,50,000			
May	₹1,10,000			
June	₹1,00,000			

Prepare a schedule of the expected cash collections during the months of April, May and June for presentation to the Finance Manager.

What will be the cash receipts if the credit policy is enforced strictly so that there are no overdue accounts and bad debts?

4.40 ◆ *Cost Management*

Solution

(A) Under the present collection practice

The following table gives the analysis of collections on sales.

(All figures are in ₹)

	January	February	March	April	May	June
Total Sales	80,000	1,00,000	1,40,000	1,50,000	1,10,000	1,00,000
Cash Sales (25%)	20,000	25,000	35,000	37,500	27,500	25,000
Credit Sales (Balance 75%)	60,000	75,000	1,05,000	1,12,500	82,500	75,000
Bad Debts (1% of credit sales)	600	750	1,050	1,125	825	750
Collection in the following month of sales (60% of credit sales) as first instalment	36,000	45,000	63,000	67,500	49,500	45,000
Collection in the second month following the month of sales (25% of credit sales) as second instalment	15,000	18,750	26,250	28,125	20,625	18,750
Collection in the third month following the month of sales (14% of credit sales) as third instalment	8,400	10,500	14,700	15,750	11,550	10,500

Schedule of Cash Inflows for three months, from April to June

(All figures in ₹)

	April	May	June
Cash Sales	37,500	27,500	25,000
Collection from Debtors			
First Instalment	63,000	67,500	49,500
Second Instalment	18,750	26,250	28,125
Third Instalment	8,400	10,500	14,700
	1,27,650	1,31,750	1,17,325

(B) When credit policy is strictly enforced

Schedule of Cash Inflows for three months, from April to June

(All figures in ₹)

	April	May	June
Cash Sales	37,500	27,500	25,000
Collection from customers for Credit			
Sales of previous month	1,05,000	1,12,500	82,500
-	1,42,500	1,40,000	1,07,500

SUMMARY

- Budget is a quantitative expression of a plan for a defined period of time of the policy to be pursued during that period for the purpose of attaining a given objective. It may include income, expenditure and employment of capital.
- Budgetary Control is the establishment of budgets, relating the responsibilities of executives to the requirements of a policy, and the continuous comparison of actual with budgeted results, either to secure by individual action the objective of that policy or to provide a base for its revision.
- ➢ For ensuring that the Budgetary Control System adopted by a business concern is effective, the following requirements have to be taken care of:
 - Defining the objectives
 - Fixing the Budget Period
 - Identification of Key Factor or Budget Factor
 - Appointment of Budget Committee and Budget Controller
 - Preparation of Budget Manual
 - Identification of standard of activity
 - Obtaining consent and addressing concerns
- > Budgets are of different types classified on the following bases:
 - On the basis of time period: Long-term Budgets, Short-term Budgets and Current Budgets
 - On the basis of capacity: Fixed Budget and Flexible Budget
 - On the basis of coverage: Functional Budgets and Master Budget
- Functional Budgets include Sales Budget, Production Budget, Direct Material Budget, Direct Labour Budget, Production Overheads Budget, Administration Expenses Budget, Selling Costs Budget, Advertising Cost Budget, Research and Development Expenditure Budget, Capital Expenditure Budget, Cash Budge, etc\
- > Flexible Budget is a budget prepared for estimating cost and profits at different levels of activity.
- > Cash Budget is a budget prepared for estimating surplus or deficit Cash Balance for a given period of time.

Section B Type Questions

Problem 1 (Problem on preparation of Flexible Budget)

Prepare a Flexible Budget for the production at 80% (8,000 units) on the basis of the following information:

Particulars	Amount		
Production at 50% capacity	5,000 units		
Raw Materials	₹80 per unit		
Direct Labour	₹50 per unit		
Direct Expenses	₹20 per unit		
Factory Expenses	₹50,000 (50% fixed)		
Administration Expenses	₹30,000 (40% variable)		

[Bangalore University B.Com December (2012)]

[Ans: At 50% capacity, Total Cost: ₹8,30,000, at ₹166 per unit; At 80% capacity, Total Cost: ₹13,02,200, at ₹162.75 per unit]

Problem 2 (Problem on preparation of Flexible Budget)

Prepare a Flexible Budget for production of 90% (9,000 units) on the basis of the following information:

Particulars	Amount
Production at 50% capacity	5,000 units
Raw Materials	₹75 per unit
Direct Labour	₹45 per unit
Direct Expenses	₹20 per unit
Factory Expenses	₹60,000 (40% fixed)
Administrative Expenses	₹40,000 (50% variable)

[Bangalore University B.Com December (2011)]

[Ans: At 50% capacity, Total Cost: ₹8,00,000, at ₹160 per unit; At 90% capacity, Total Cost: ₹14,04,800, at ₹156.09 per unit]

Problem 3 (Problem on preparation of Flexible Budget)

The expenses for budgeted production of 10,000 units in a factory are given as follows:

	Per Unit (₹)
Material	50
Labour	20
Variable Overheads	10
Fixed Overheads (₹50,000)	5
Variable Expenses (Direct)	2
Selling Expenses (10% fixed)	10
Distribution Expenses (20% fixed)	5
Administration Expenses (₹40,000)	4
Total	106

Prepare Budget for production of 8,000 units

[Ans: For 8,000 units, Total Cost: ₹8,70,000, at ₹108.75 per unit; For 10,000 units, Total Cost: ₹10,60,000, at ₹106 per unit]

Problem 4 (Problem on preparation of Flexible Budget)

Particulars	Amount (₹)
Fixed Expenses	1,49,500
Variable Expenses at 50% capacity	2,67,000
Semi-variable Expenses at 50% capacity	89,500

Semi-variable Expenses are constant between 40% and 70% capacity and increases by 10% between 70% and 85% capacity and by 15% between 85% and 100% capacity.

Sales at 50% capacity: ₹5,75,000, at 60% capacity: ₹6,40,000 and at 80% capacity: ₹7,90,000.

Prepare Flexible Budget at 60% and 80% capacities.

[Ans: At 50% capacity, Total Cost: ₹5,06,000; Profit: ₹69,000; At 60% capacity, Total Cost: ₹5,59,400; Profit: ₹80,600; At 80% capacity, Total Cost: ₹6,75,150; Profit: ₹1,14,850]

Problem 5 (Problem on preparation of Cash Budget)

Credit sales for November, December, January, February and March are ₹1,20,000, ₹1,80,000, ₹1,40,000, ₹2,60,000 and ₹2,20,000 respectively. Credit period of one month is allowed to debtors. However, it is observed that 20% of the debtors invariably delay payment by one more month. You are required to calculate the amount of cash collected from debtors during the months of January, February and March.

[Ans: Collections from debtors in the month of January: ₹1,68,000; February: ₹1,48,000 and March: ₹2,36,000]

Section C Type Questions

Problem 1 (Problem on preparation of Flexible Budget)

Happy Ltd. has prepared the following budget, for the production of 10,000 units of a commodity manufactured by them.

	Per Unit (₹)
Raw Material	2.52
Direct Labour	0.75
Direct Expenses	0.10
Works Overhead (60% fixed)	2.50
Administration Overhead (80% fixed)	0.40
Selling Overhead (50% Fixed)	0.20

Prepare a revised Flexible Budget for the production of 6,000 units and 7,000 units, showing the Total Cost and the Cost per unit.

[Bangalore University B.Com December (2010)]

[Ans: For 10,000 units, Total Cost: ₹64,700, at ₹6.47 per unit; For 6,000 units, Total Cost: ₹46,500, at ₹7.75 per unit; For 7,000 units, Total Cost: ₹51,050, at ₹7.29 per unit]

4.44 *♦ Cost Management*

Problem 2 (Problem on preparation of Flexible Budget)

A manufacturing company has the production capacity of 10,000 units per annum. The expenses for production of 5,000 (50%) units for a period are given as follows:

	Per Unit (₹)
Materials	40
Wages	20
Manufacturing Expenses	10
Administration Expenses (All fixed)	5
Selling and Distribution Expense (60% fixed)	5
Total	80
Profit	20
Selling Price	100

Prepare a Flexible Budget for 60%, 70% and 90% level of activity. It is expected that the present unit selling-price will remain constant up to 60% activity, beyond which, a 5% reduction is contemplated up to 90% activity levels.

[Bangalore University B.Com, December (2009)]

[Ans: At 50% capacity, Total Cost: ₹4,00,000, at ₹80.00 per unit; Sales: ₹5,00,000;
 At 60% capacity, Total Cost: ₹4,72,000, at ₹78.67 per unit; Sales: ₹6,00,000;
 At 70% capacity, Total Cost: ₹5,44,000, at ₹77.71 per unit; Sales: ₹6,65,000;
 At 90% capacity, Total Cost: ₹6,88,000, at ₹76.43 per unit; Sales: ₹8,55,000]

Problem 3 (Problem on preparation of Flexible Budget)

The expenses for budgeted production of 10,000 units in a factory are as follows:

	Per Unit (₹)
Materials	70
Labour	25
Variable Overheads	20
Fixed Overheads (₹1,00,000)	10
Variable Expenses (Direct)	5
Selling Expenses (10% fixed)	13
Distribution Expenses (20% fixed)	7
Administration Expenses (₹50,000)	5
Total	155

Prepare a budget for production of 8,000 units and 6,000 units.

[Ans: For 6,000 units, Total Cost: ₹10,0,800, at ₹166.80 per unit; For 8,000 units, Total Cost: ₹12,75,400, at ₹159.425 per unit; For 10,000 units, Total Cost: ₹15,55,000, at ₹155 per unit]

Problem 4 (Problem on preparation of Flexible Budget)

The following information, at 50% capacity, is given. Prepare Flexible Budget and forecast the profit or loss at 60%, 70% and 90% capacity.

Expenses at 50% capacity (₹)

(All figures in		
Fixed Expenses		
Salaries	50,000	
Rent and Taxes	40,000	
Depreciation	60,000	
Administration Expenses	70,000	
Variable Expenses		
Materials	2,00,000	
Labour	2,50,000	
Others	40,000	
Semi-variable Expenses		
Repair	1,00,000	
Indirect Labour	1,50,000	
Others	90,000	

It is estimated that Fixed Expenses will remain constant at all capacities. Semi-variable expenses will not change between 45% and 60% capacity, will rise by 10% between 60% and 75% capacity and increases further by 5% when capacity crosses 75%.

Estimated sales at various levels of capacity

At 60% capacity, Sales:	₹11,00,000
At 70% capacity, Sales:	₹13,00,000
At 90% capacity, Sales:	₹15,00,000

[Ans: At 50% capacity, Total Cost: ₹10,50,00; At 60% capacity, Total Cost: ₹11,48,000; Loss: ₹48,000; At 70% capacity, Total Cost: ₹12,70,000; Profit: ₹30,000; At 90% capacity, Total Cost: ₹14,93,000; Profit: ₹7,000]

Problem 5 (Problem on preparation of Cash Budget)

Prepare a Cash Budget for three months, commencing on 1 June, when the bank balance is $\gtrless 1,00,000$.

(All figures in

Month	Sales	Purchases	Wages	Factory Expenses	Selling Expenses
April	80,000	41,000	5,600	3,900	10,000
May	76,000	40,000	5,400	4,200	14,000
June	78,000	38,000	5,400	5,100	15,000
July	90,000	37,000	4,800	5,100	17,000
August	95,000	35,000	4,700	6,000	13,000

(a) 20% of sales is on cash basis.

(b) Customers are allowed a credit period of two months.

(c) Suppliers allow one-month credit.

(d) Lag in payment of wages is one month.

- (e) Lag in payment of Factory Expenses is half a month.
- (f) Lag in payment of selling expenses is quarter of a month.

[Ans: Closing Cash Balance in the month of June ₹1,16,800; July ₹1,31,600 and August ₹1,53,650]

Problem 6 (Problem on preparation of Cash Budget)

From the following particulars, prepare Cash Budget for January to April 2018.

						8,
Month	Credit	Credit	Wages	Mfg.	Admin.	Selling
	Sales	Purchases		Expenses	Expenses	Expenses
Nov 2017	30,000	15,000	3,000	1,150	1,060	500
Dec 2017	35,000	20,000	3,200	1,225	1,040	550
Jan 2018	25,000	15,000	2,500	990	1,100	600
Feb 2018	30,000	20,000	3,000	1,050	1,150	620
Mar 2018	35,000	22,500	2,400	1,100	1,220	570
Apr 2018	40,000	25,000	2,600	1,200	1,180	710

Additional information:

- (a) Balance of cash in hand on 1 January 2018 is ₹15,000.
- (b) The customers are allowed a credit period of two months.
- (c) Creditors are allowing a credit period of two months.
- (d) Wages are paid on the 5^{th} of the next month.
- (e) Lag in the payment of other expenses is one month.
- (f) Dividend of ₹10,000 is payable in April 2018.
- (g) Plant is purchased on 1 January 2018 for ₹5,000.
- (h) Building is purchased on 1 March 2018 for ₹20,000 but the payment is agreed to be made in monthly instalments of ₹2,000. The first instalment is paid immediately on the purchase of building.

[Ans: Closing Cash Balance in the month of January: ₹18,985; February: ₹28,795; March: ₹30,975 and April: ₹23,685]

(All figures in ₹)

(All figures in ₹)

Problem 7 (Problem on preparation of Cash Budget)

From the following particulars, prepare Cash Budget for April, May and June 2018, and estimate the amount of Overdraft facility to be sought from the bankers of the company.

				(e)
Month	Sales	Purchases	Wages	Other Expenses
February 2018	1,20,000	84,000	10,000	7,000
March 2018	1,30,000	1,00,000	12,000	8,000
April 2018	80,000	1,04,000	8,000	6,000
May 2018	1,16,000	1,06,000	10,000	12,000
June 2018	88,000	80,000	8,000	6,000

Additional information:

- (a) Cash Balance on 1 April 2018 is ₹5,000.
- (b) Interest on investment of ₹5,000 per quarter falls due in April.
- (c) 20% of sales is realised in the month of sales, on which 2% of cash discount is allowed and the balance is realised equally in two subsequent months.
- (d) Payment for purchases is made in the following month.
- (e) 25% of wages is paid in the following month.
- (f) Other expenses are paid in the following month.
- (g) Rent is paid quarterly in advance, at ₹1,000 per month and it is due in April 2018.
- (h) First instalment of Advance Income Tax becomes payable before 15 June 2018.

[Ans: Closing Cash Balance in the month of April: ₹5,680; May: ₹7,084 (Overdraft) and June: ₹62,936 (Overdraft)]
chapter 5

Activity Based Costing

CHAPTER OUTLINE

5.1 Introduction

5.2 Traditional System of Absorbing Overheads

- 5.2.1 Estimation and Collection of Overheads
- 5.2.2 Cost Allocation
- 5.2.3 Cost Apportionment
- 5.2.4 Cost Re-apportionment
- 5.2.5 Absorption of Overheads
- 5.2.6 Treatment for Over-Absorption and Under-Absorption of Production Overheads

5.3 Limitations of Traditional System of Absorbing Overheads

- 5.4 Activity Based Costing
- 5.5 Absorption of Overheads under Activity Based Costing System
 - 5.5.1 Identification of Various Activities within the Organisation
 - 5.5.2 Estimation of the Cost of Each Activity
 - 5.5.3 Apportionment of Cost of Support Activities over Primary Activities
 - 5.5.4 Determination of Activity Cost Drivers for Each Activity or Cost Pool
 - 5.5.5 Calculation of Activity Cost Driver Rate
 - 5.5.6 Ascertainment of Overhead Cost of Cost Object
- 5.6 Differences between Traditional System and Activity Based Costing System of Absorbing Overheads
- 5.7 Steps Involved in Installation or Implementation of Activity Based Costing System
- 5.8 Advantages of Activity Based Costing System
- 5.9 Limitations of Activity Based Costing System
- Problems
- Summary

Exercises

5.1 INTRODUCTION

Costs incurred for manufacturing a product are broadly classified into two types viz., Direct Costs and Indirect Costs.

Direct Costs refers to the costs, which are directly related to/identified with/attributable to a cost centre or a cost unit. They includes raw material used in the finished product, wages paid to workers engaged in conversion of raw material to finished product and any other expenses, which can be directly attributed to the product.

Indirect Costs refer to the costs which are not directly related to/identified with/attributable to a particular cost centre or a cost unit. They include factory expenses, office expenses, selling and distribution expenses, etc., which are apportioned over different cost centres using appropriate basis. They are popularly called as Overheads.

Since Indirect Costs are not directly related to the product, they are absorbed into the cost of product following a particular process. Such a process, which has been traditionally followed for absorbing Overheads into cost of product, is referred as the Traditional System.

While the Traditional System of absorbing Overheads into the cost of a product is simple, it has its own limitations due to which the cost of the product ascertained under this system is not accurate and the decisions based on such costs are not reliable.

This chapter highlights the limitations of Traditional System of absorbing Overheads and introduces a new system for overcoming such limitations. The name of the new system is Activity Based Costing.

THEORY QUESTIONS

Section A Type Questions

- 1. State the meaning of Direct Cost and Indirect Costs.
- 2. State the different systems for absorbing of Overheads.

5.2 TRADITIONAL SYSTEM OF ABSORBING OVERHEADS

Under the traditional system, accounting and control of Overheads involves the following steps:

- 1. Estimation and Collection of Overheads
- 2. Cost Allocation
- 3. Cost Apportionment
- 4. Cost Re-apportionment
- 5. Absorption
- 6. Treatment for over-Absorption and under-Absorption of Overheads

Each of these steps is explained briefly in the following paragraphs.

5.2.1 Estimation and Collection of Overheads

The first stage in accounting for Overheads is to estimate the amount of Overheads, on the basis of the past figures and adjustments for future.

5.2.2 Cost Allocation

Allocation of Overheads refers to assigning a whole item of cost directly to a particular cost centre or cost unit. It implies relating Overheads directly to the various departments. Cost Allocation is possible, only if the Overhead is specifically related to a particular cost centre or cost unit. For example, salary paid to a supervisor who is in-charge of a particular product or department can be allocated to that specific product or department, electricity cost of each department can be allocated to the respective departments when separate power meters are installed for each department.

However, where the Overhead Cost is a general expenditure and not relating to a particular cost centre or cost unit, then Cost Allocation is not possible. In such cases, we must resort to Cost Apportionment.

5.2.3 Cost Apportionment

Overheads, which are not directly related to a particular cost centre or cost unit, cannot be directly allocated to the various departments or cost centres. Such un-allocable expenses are to be spread over the various departments or cost centres or an appropriate basis. Spreading over of such un-allocable expenses to various departments or cost centres on some suitable basis is called as Cost Apportionment. Thus, the Cost Apportionment refers to the allotment of proportion of cost to cost centres or cost units on some appropriate basis.

Criterion	Cost Allocation	Cost Apportionment
Meaning	It refers to assigning the entire cost directly to a cost centre or cost unit.	It refers to distribution of cost to more than one cost centre or cost unit on some equitable basis.
Nature of expenditure	Specific to the Cost Centre or Identifiable with the Cost Centre or Directly related to cost centre	General expenditure, not directly relatable to any cost centre; or common expenses
Number of Cost Centres involved	One	Many
Amount of Overhead charged to cost centre	Entire cost	Proportionate cost, on some appropriate basis.

The following are the differences between Cost Allocation and Cost Apportionment:

The following is the list of some of the common expenses and a suitable or appropriate basis of apportionment:

Type of Overhead	Basis of Apportionment
Purchase Department Expenses	Number of purchase orders or value of purchases
Material Handling Expenses	Value of materials consumed or Weight of Materials or Volume of Materials
Rent/Maintenance/Insurance on Building/Air- conditioning/Fire precaution service	Floor space occupied
Depreciation and Insurance of Assets	Value of Assets
Factory Lighting Expenses	Number of Light Points or Floor Space
Power Cost for machinery	Horse Power Rating of the machines or Machine Hours operated
Indirect Wages	Direct Wages
Supervision	Time Spent on Number of Employees or Direct Wages
Power and Steam Consumption/Internal Transport/ Management Salaries	Technical Estimates
Miscellaneous Production Expenses	Direct Wages

5.2.4 Cost Re-apportionment

After apportioning cost to various cost centres, the next phase in Overhead Accounting is cost re-apportionment. Where the entity has service departments, then the costs allocated and apportioned to the service departments must be re-distributed or re-apportioned to production departments, since service departments do not generate revenues for self-sustenance. While Cost Apportionment is called Primary Distribution of Overheads, Cost Re-apportionment is called Secondary Distribution of Overheads.

5.2.5 Absorption of Overheads

After estimation of Overheads, allocating or apportioning them to different cost centres and re-apportioning Overhead Costs of service centres to production departments, it is essential to express the Overhead Cost of each cost centre in terms of some parameter. Such expression of Overhead on some parameter and showing overhead rate is called Absorption.

Absorption of Overhead Costs, i.e., expressing Overhead Costs on some basis is essential for future estimations, and for estimating Overhead Cost of each individual job.

Following are some of the methods of absorbing Overheads:

- 1. Direct Method: Rate per unit of Output
- 2. Indirect Methods
 - Percentage of Direct Materials
 - Percentage of Prime Cost
 - Percentage of Direct Labour Cost
 - Labour Hour Rate
 - Machine Hour Rate

5.2.6 Treatment for Over-Absorption and Under-Absorption of Production Overheads

On the basis of Absorption of Overheads, Production Overheads for various jobs are estimated and included in the cost. When the actual Overheads are incurred, there is a possibility of difference between Overheads absorbed (i.e., Overheads estimated and included in the cost of job or product, based on Overhead Rate) and the actual Overheads incurred.

When the Overheads absorbed (i.e., estimated) are more than the actual Overheads, it is a case of over-Absorption; whereas, when the Overheads absorbed are less than actual Overheads, it is a case of under-Absorption.

The treatment for over and under-Absorption of Overheads, in costing records, is explained as follows:

1. Accounting Treatment for over-Absorption of Overheads

- Where the amount of over-Absorption is small, it can be credited to Costing Profit and Loss Account.
- Alternatively, it can be carried over to the next year, by transferring the amount of over-Absorption to Overhead Reserve Account or Suspense Account.
- Where the amount of over-Absorption is small, the cost of the job may be reduced or adjusted.

2. Accounting Treatment for under-Absorption of Overheads

• Where the amount of under-Absorption is small and immaterial, it can be completely debited to Costing Profit and Loss Account.

- Where the amount of under-Absorption is significant, and if such under-Absorption is due to normal reasons like genuine planning errors, changes in assumptions etc., then the extent of under-Absorption must be treated as increase in costs and added to the cost of job or product.
- Where the amount of under-Absorption is significant, and if such under-Absorption is due to abnormal reasons like strikes, obsolescence of stores and equipment, etc., then the extent of under-Absorption must be treated as loss and debited to Costing Profit and Loss Account.

THEORY QUESTIONS

Section A Type Questions

- 1. List out the steps in Absorbing Overheads under Traditional System.
- 2. What is Cost Allocation?
- 3. What is Cost Apportionment?
- 4. Explain the meaning of Cost Re-apportionment.
- 5. What is Absorption of Overheads?
- 6. State the common bases for Absorption of Overheads.

Section B Type Questions

1. Briefly explain the various steps for Absorption of Overheads under Traditional System.

5.3 LIMITATIONS OF TRADITIONAL SYSTEM OF ABSORBING OVERHEADS

Following are the limitations of the Traditional System of absorbing Overheads:

- 1. Under this system, costs are attributed to cost centres. However, costs are influenced by a particular factor (called Cost Driver), but not by cost centres.
- 2. Most popular method of absorbing Overheads are Machine Hour Rate method and Labour Hour Rate method. So, under Traditional System, Overheads are measured per unit of time, instead of per unit of product.
- 3. The denominators (i.e., Direct Material Cost, Direct Labour Cost, Prime Cost, Machine Hours, Labour Hours, etc.) are defective. These denominators are based on the assumption that higher the consumption of resources, higher is the Overhead Cost.
- 4. This system does not facilitate easy identification of Idle Capacity Costs or Abnormal Overhead Costs.
- 5. Cost control and reduction can be achieved when the source of cost is eliminated. Under Traditional System, the source of cost is cost centres/departments. Since they cannot be eliminated, the scope for cost control under this system is minimal.

These limitations have necessitated the introduction of Activity Based Costing.

THEORY QUESTIONS

Section A Type Questions

1. State any three limitations of Traditional System of absorbing Overheads.

Section B Type Questions

1. How is Overhead Cost absorbed under Traditional System? Explain the various limitations of this system.

5.4 ACTIVITY BASED COSTING

The Chartered Institute of Management Accountants, London, has defined Activity Based Costing as "An approach to the costing and monitoring of activities, which involves tracing resource consumption and costing final outputs. Resources are assigned to activities, and activities to cost objects, based on consumption estimates. The latter utilise Cost Drivers to attach activity costs to outputs."

From the definition, it can be understood that Activity Based Costing is a technique, which involves identification of cost with each cost-driving activity and making it as the basis of apportionment of costs over different cost objects/jobs/products/customers or services.

So, Activity Based Costing is an accounting methodology that assigns costs to activities rather than to products or services, based on their use of resources. It then assigns cost to Cost Objects, such as products or customers, based on their use of activities. This method traces the flow of activities in a business enterprise by creating a link between the activity and the Cost Object.

THEORY QUESTIONS

Section A Type Questions

- 1. What is Activity Based Costing?
- 2. Define Activity Based Costing.

5.5 ABSORPTION OF OVERHEADS UNDER ACTIVITY BASED COSTING SYSTEM

Under Activity Based Costing System, accounting and control of Overheads involves the following steps:

- 1. Identification of various activities within the organisation.
- 2. Estimation of the cost of each activity.
- 3. Apportionment of cost of support activities across primary activities on suitable basis.
- 4. Determination of Activity Cost Drivers for each Activity or Cost Pool.
- 5. Calculation of Activity Cost Driver Rate.
- 6. Assigning of Overheads to Cost Objects on the basis of Activity Cost Driver Rate.

Each step is explained, in detail, in the following paragraphs.

5.5.1 Identification of Various Activities within the Organisation

An activity refers to a collection of units of work or task. It is the sum total of various tasks required in completing a particular job or function or responsibility.

For example, Purchase Order Processing, Contract Negotiation, Material Receipt, Material Inspection and Bills Payable are the activities relating to procurement of material.

Purchase Order Processing comprises of determining order quantities, processing material purchase requests, calling requests for quotations, delivery finalisation and release of purchase orders.

Likewise, the activity of Material Inspection comprises of conducting quality tests, determining the acceptability criteria, intimation of test results to purchase, accounts and vendors.

Cooper and Kaplan, who propounded Activity Based Costing in 1987, classify all activities in an organisation into four categories viz.,

• Unit Level Activities

- Batch Level Activities
- Product Level Activities
- Facility Level Activities

These categories are known as Manufacturing Cost Hierarchy. A brief explanation of each of these activities is given as follows:

(a) Unit Level Activities

They are those activities, for which the consumption of resources can be identified with the number of units produced. The costs of some activities are strongly correlated to the number of units produced. All material-related activities, direct labour-related activities, machine-related activities and utility-related activities fall under this category.

(b) Batch Level Activities

They are those activities, which are related to setting up of a batch or a production run. The costs of such activities vary with the number of batches made. Material Movement, setting-up, purchase orders etc., are some of the activities under this category.

(c) Product Level Activities

They are those activities, which are performed to support different products in the product line. Designing a new product, updating the technology of existing products, product advertisement, etc., are some of the activities under this category.

(d) Facility Level Activities

They are those activities, which are necessary for sustaining the manufacturing process and cannot be directly attributed to individual products. Plant Management, Production Management, Heating and Lighting arrangements are some of the activities under this category.

Further, the activities in an enterprise can also be classified into **Primary Activities** and **Secondary Activities**. Primary Activities are those, which relate to production and Secondary Activities (or Support Activities) are those, which provide support and service for the performing of primary activities.

Procurement of materials, production, testing, marketing, etc., are examples of Primary Activities. Canteen, Transportation, Medical Check-up of Employees, etc., are examples of Secondary Activities.

Another classification of activities in an enterprise is based on value addition. On this basis, activities are classified into Value-Added Activities and Non Value-Added Activities.

Value-Added Activities are the activities, which are necessary for the utility or performance of the product. These are activities that customers perceive as adding usefulness to the product or service that they purchase. These activities improve or maintain the quality or function of a product and hence, customers are willing to pay for such value addition.

Non-Value-Added Activities are the additional and extraneous activities, which are not fully necessary for product performance or utility. These activities do not improve the quality or function of a product or service, and their elimination will not reduce the actual or perceived value that customers obtain by using the product or service.

Painting of pencils manufactured by a pencil factory is an example for value-added activity and painting a chair used by office clerk is an example for non-value-added activity.

5.5.2 Estimation of the Cost of Each Activity

After identifying the various activities in the organisation, the next step is to estimate the cost associated with performing each activity.

The cost of each activity is called Cost Pool or Cost Bucket. Summing up or grouping of all cost elements of the activity ascertains the Cost Pool. Cost element refers to the amount paid for a resource consumed by an activity. For example, Power Cost, Engineering Cost and Depreciation are cost elements in the Cost Pool for a Machine Activity.

5.5.3 Apportionment of Cost of Support Activities over Primary Activities

This is similar to re-apportionment of service department expenses to production departments.

On some suitable basis, the Cost Pool of support activities must be spread over the primary activities and included in the Cost Pool of primary activities. The basis depends on the extent of usage of support activities by the primary activities.

For example, canteen expenses can be distributed on the basis of number of persons using canteen facility under each primary activity, security expenses can be distributed on the basis of the space occupied by each primary activity or the value of the assets of each primary activity, etc.

5.5.4 Determination of Activity Cost Drivers for Each Activity or Cost Pool

Cost Driver refers to any factor, which causes a change in the cost of an activity. Cost drivers are classified into two types viz., Resource Cost Driver and Activity Cost Driver.

Resource Cost Driver is a measure of the quantity of resources consumed by an activity. For example, space occupied for an activity, quantity of paper used for an activity, etc.

Activity Cost Driver is a measure of frequency and intensity of the demands placed on activities by cost objects. It is used to assign cost to Cost Objects. For example, number of customer orders, number of purchase orders, number of part numbers used, etc.

Cost Object refers to any customer, product, service, contract, project or other work unit for which a separate cost measurement is desired.

Activity	Cost Drivers	
Procurement	Number of Purchase Orders	
Storage	Number of Receiving Reports	
Production Control	Number of Material Requests	
	Number of Job Cards	
Material Movement	Number of Parts Received	
Inspection	Number of Components Inspected	
Assembly	Number of Hours required for assembling a product	
Tasting	Number of Hours required for testing	
Testing	Number of Stages involved in testing	

Following table gives a list of Cost Drivers associated with different activities:

(Contd.)

Activity	Cost Drivers
	Number of Products in design
Design of Products, Services and Processes	Number of Parts per product
	Number of Engineering Hours
Descent and Development	Number of Research Products
Research and Development	Number of Man Hours on a project
	Number of Advertisements/Insertions
Marketing	Number of Sales Personnel
	Sales Revenue
	Number of items distributed
Distribution	Number of Customers
	Weight of Items distributed
	Number of Service calls
Customer Service	Number of Products serviced
	Number of Hours spend on servicing one product or one customer

These cost drivers are indicative, and there could be more than one Cost Driver for each activity.

5.5.5 Calculation of Activity Cost Driver Rate

Activity Cost Driver Rate is calculated using the following formula:

Activity Cost Driver Rate = $\frac{\text{Activity Cost Pool}}{\text{Level or Quantity of Cost Driver}}$

Using this rate, cost of Cost Object will be estimated.

5.5.6 Ascertainment of Overhead Cost of Cost Object

The last step under Activity Based Costing System is to find the cost (Overhead Cost) of each Cost Object i.e., customer, product, service etc. with the help of Activity-Cost Driver Rate and the quantity or volume of Cost Driver of each activity associated with the cost object.

THEORY QUESTIONS

Section A Type Questions

- 1. List the steps in absorbing Overheads under Activity Based Costing System.
- 2. What is an Activity?
- 3. List the types of activities as classified by Cooper and Kaplan.
- 4. What are Primary and Support Activities?
- 5. What are Value-added Activities?
- 6. What are Non-Value Added Activities?
- 7. What is Cost Pool or Cost Bucket?
- 8. What is a Cost Driver?
- 9. State the different types of Cost Drivers.
- 10. Explain the meaning of Activity Cost Driver.
- 11. Giver the meaning of Resource Cost Driver.

- 12. State the Cost Drivers for Marketing Activity.
- 13. What are the Cost Drivers for Customer Service Activity?
- 14. What is Activity Cost Driver Rate? How is it calculated?
- 15. What is Cost Object?

Section B Type Questions

- 1. Explain briefly the various steps in absorbing Overheads under Activity Based Costing system.
- 2. Explain in detail the meaning of Activity and the types of activities classified on different basis.

5.6 DIFFERENCES BETWEEN TRADITIONAL SYSTEM AND ACTIVITY BASED COSTING SYSTEM OF ABSORBING OVERHEADS

The following are the points of difference between the two systems of absorbing Overheads:

S. No.	Traditional System	Activity Based Costing System
1	Overheads are assigned to products/services on the basis of a single rate (i.e., either Machine Hours or Labour Hours, etc.)	Overheads are assigned to products/services on the basis of multiple rates (i.e., one rate for each activity)
2	Based on the assumption that resources are consumed by product/service.	Based on the assumption that resources are consumed by activities.
3	Under this system, the cost is first assigned to cost centres and then to products/services.	Under this system, cost is fist assigned to activities and based on the Cost Drivers, they are assigned to products/services.
4	It does not help in performing customer profitability analysis.	It helps in analysing customer profitability.
5	It can be used only for ascertaining cost of product or service only.	It can be used for ascertaining cost of any cost object (i.e., product, service, customer, market segment, etc.).
6	Under this system, products with larger volumes are overcharged and products with lower volumes are under charged.	Under this system, charging of costs does not depend on the volume of production or sales of each product, but on the basis of associated activities. Hence, this system ensures equitable assignment of costs.
7	Under this system, all Overhead Costs are assigned to all products	Under this system, assignment of costs to each product will be based on the activities associated with the products and hence all Overheads will not be assigned to all products.
8	Under this system, the segmentation of cost (into fixed and variable) is based only on volume.	Under this system, the segmentation of cost is based on volume and activities.
9	Future cost estimates under this system incorporates product line cost inaccuracies.	Future cost estimates under this system is based on accurate past cost.
10	There is a high possibility of misleading information.	There are very less chances for misleading information.
11	It could help well in short-term decision analysis.	Suitable for long-run strategic analysis.
12	Suitable when Direct Costs constitute a major portion of the Total Costs and production scenario is simple.	Suitable when Overheads constitute a major portion of Total Costs and production process is complex.

THEORY QUESTIONS

Section A Type Questions

1. State any four differences between Traditional System and Activity Based Costing System of absorbing Overheads.

Section B Type Questions

1. What is Activity Based Costing? How is it different from the Traditional System of absorbing Overheads into cost of product/service.

5.7 STEPS INVOLVED IN INSTALLATION OR IMPLEMENTATION OF ACTIVITY BASED COSTING SYSTEM

Following are the steps to be followed in implementing Activity Based costing System:

- 1. Specification of the objective or motive or purpose for pursuing Activity Based Costing like cost minimisation, value maximisation, elimination of non-value adding activities, etc.
- 2. Identification of costs, particularly Indirect Costs, which are not product specific
- 3. Specification of the production process with the help of key members of personnel and identification of resources to be committed, processing time involved, bottlenecks, etc.
- 4. Definition of activities involved and classifying them into primary and support activities
- 5. Selection of Cost Driver for each activity
- 6. Assignment of cost to each cost object
- 7. Training of staff
- 8. Review and follow-up

THEORY QUESTIONS

Section A Type Questions

1. List the steps involved in implementation of Activity Based Costing system.

Section B Type Questions

1. Explain the various steps to be followed in installation of ABC system.

5.8 ADVANTAGES OF ACTIVITY BASED COSTING SYSTEM

The points which favour adaption of Activity Based Costing System are listed as follows:

- This system provides more accurate product line cost, particularly where non-volume related Overheads are significant and manufacturing line comprises of diverse product mix.
- The system is flexible enough to measure costs not only for the products, but also for customers, segments, profit centres and any other cost object.
- This system provides long-term Variable Product Cost for facilitating strategic decision-making.
- Provides meaningful financial and non-financial measures, which are relevant for cost management and performance assessment at an operational level.
- It enables better pricing policy with the supply of accurate cost information.
- Helps in identification and understanding of cost behaviour and thereby improving the cost estimation system.
- It highlights the problem areas, which require attention to management.
- It provides for a more logical, acceptable and comprehensible basis for costing work.

THEORY QUESTIONS

Section A Type Questions

1. State any four benefits of Activity Based Costing System.

Section B Type Questions

1. What is Activity Based Costing System of absorbing Overheads? Explain the advantages of this system.

Section C Type Questions

1. What is Activity Based Costing? Explain the differences between Traditional System of absorbing Overheads and Activity Based Costing System, highlighting the benefits of Activity Based Costing System.

5.9 LIMITATIONS OF ACTIVITY BASED COSTING SYSTEM

The following are the arguments against adaptation of Activity Based Costing System:

- 1. It is very expensive to implement and maintain.
- 2. It is not very helpful for small organisations and organisations with one product and simple production processes.
- 3. It is not a simple task to identify a meaningful and convincing cost driver(s).
- 4. There is less evidence to prove about any increase in profits or profitability on account of Activity Based Costing System.
- 5. The information provided by this system is internal-oriented and is not acceptable for external agencies, particularly with reference to stock valuation.

THEORY QUESTIONS

Section A Type Questions

1. State any three limitations of Activity Based Costing System.

Section B Type Questions

1. Explain briefly the problems associated with Activity Based Costing System of Absorbing Overheads.

Section C Type Questions

- 1. What is Activity Based Costing? Explain the benefits and limitations of Activity Based Costing System of Absorbing Overheads.
- 2. Explain the steps involved in absorbing Overheads under Activity Based Costing System. What are the limitations of this system?

PROBLEMS

Problem 1 (Problem on identification of Activities)

Identify the typical activities in a manufacturing organisation relating to the following functions:

- (a) Procurement
- (b) Production Maintenance
- (c) Production Management
- (d) Quality Control
- (e) Marketing

Solution

Following are some of the typical activities relating to the functions:

Function	Activities	
	Purchase Order Processing	
	Contact negotiation	
Procurement	Material receipt	
	Material inspection	
	Accounts payable	
	Equipment maintenance and repair	
Production Maintenance	Facility planning and maintenance	
	Production forecast	
Production management	Production monitoring	
	Production expedition	
	Quality tests	
Quality Control	Product service	
	Customer complaints	
	Promotion	
	Pricing	
	Customer Negotiation	
Marketing	Order Processing	
	Invoice preparation	
	Delivery	
	Accounts receivable	

Note: The above-mentioned activities are typical examples. Depending on the nature of industry, company's structure and policy and other factors, the number of activities could be more or less than what is mentioned.

Problem 2 (Problem on calculation of Cost Pool)

Classify the following expenses on the basis of activities and calculate the Cost Pool for each activity. Also indicate the nature of activity i.e., primary activity or support activity.

Particulars	Amount (₹)
Salary of Purchase Manager	40,000
Salary of Maintenance Engineers	40,000
Salary of Testing Engineers and Staff	50,000
Telephone and Stationery Expenses	10,000
Cost of Consumables and Loose Tools	10,000
Depreciation on Maintenance Equipment	20,000
Depreciation on Testing Equipment	10,000
Cost of provisions for food preparation	30,000
Purchase Order Cost	30,000
Salary for Canteen Staff	20,000
Depreciation on Canteen Equipment	10,000
Vendor Selection and Management Cost	20,000

Solution

From the details of expenses given in the problem, four major activities can be identified, viz.,

- 1. Procurement of Materials
- 2. Equipment Maintenance
- 3. Product Testing
- 4. Canteen Services

Procurement of Materials, Equipment Maintenance and Product Testing are Primary Activities.

Canteen Services is a support activity.

The Cost Pool (i.e., the Total Cost for performing each activity) is shown in the following table:

Procurement

	(₹)
Salary of purchase manager	40,000
Telephone and stationery expenses	10,000
Purchase order cost	30,000
Vendor selection and cost management	20,000
Cost Pool	1,00,000

Maintenance

	(₹)
Salary of maintenance engineers	40,000
Cost of consumable and loose tools	10,000
Depreciation on maintenance equipment	20,000
Cost Pool	70,000

Testing

	(₹)
Salary of testing engineers and staff	40,000
Depreciation on testing equipment	10,000
Cost Pool	50,000

Canteen

	(₹)
Cost of provisions	30,000
Salary for canteen staff	20,000
Depreciation on canteen equipment	10,000
Cost Pool	60,000

Problem 3 (Problem on Apportionment of Support Activity Cost)

The following are the activities and their Cost Pool in a manufacturing organisation:

Particulars	Amount (₹)
Primary Activities	
Material Procurement	1,00,000
Equipment Maintenance	70,000
Product Testing	50,000
Support Activity	
Canteen Services	60,000

Employees of each activity use the canteen services and the following are the number of employees associated with each primary activity:

Material Procurement:	40 employees
Equipment Maintenance:	15 employees
Product Testing:	5 employees

Calculate the Revised Cost Pool of each activity after apportioning the cost of support activity.

Solution

	Procurement	Maintenance	Testing
	(₹)	(₹)	(₹)
Cost Pool	1,00,000	70,000	50,000
Add: Apportionment of cost of canteen services			
₹60,000 (in the ratio of employees i.e., 40:15:5)	40,000	15,000	5,000
Revised Cost Pool	1,40,000	85,000	55,000

Problem 4 (Problem on calculation of Activity Cost Driver Rate)

From the following information given, calculate Cost Driver Rate for each activity:

Activity	Activity Cost Pool for the year (₹)	Cost Driver	Cost Driver Volume
Procurement	1,40,000	Number of Purchase Orders	7000 Purchase Orders
Maintenance	85,000	Number of hours worked	2125 hours
Testing	55,000	Number of units tested	11000 units

Solution

Activity Cost Driver Rate = $\frac{\text{Activity Cost Pool}}{\text{Volume of Cost Driver}}$

Calculation of the Activity Cost Driver Rate for each activity is given as follows:

Procurement: $\frac{\overline{1,40,000}}{7000 \text{ purchase orders}} = \overline{20 \text{ per purchase order}}$

Maintenance: $\frac{\textcircled{7}85,000}{2125 \text{ hours}} = \textcircled{7}40 \text{ per hour}$

Testing:
$$\frac{\text{₹55,000}}{11000 \text{ units}} = \text{₹5 per unit}$$

Problem 5 (Problem on calculation of Cost of a job on the basis of Activity Based Costing System)

A customer places an order for 100000 units of a product. The Material Cost for the project is ₹1,00,000, and the Labour Cost is ₹50,000. The procurement of the material, required for the job, needs 2000 purchase orders and the machinery required for production needs maintenance of 1000 hours. Of the order quantity, 14% will be usually tested. If the manufacturer expects a profit of 20% on cost, what is the price that must be quoted for the order given the following details?

Cost of procurement:	₹20 per purchase order
Cost of maintenance:	₹40 per hour
Cost of testing:	₹5 per unit

Solution

Calculation of Cost and Price to be quoted for 100000 units

	(₹)
Material Cost (given)	1,00,000
Labour Cost (given)	50,000
Overheads	
Cost of procuring raw materials (2000 orders × ₹20 per order)	40,000
Cost of maintenance (1000 hours × ₹40 per hour)	40,000
Cost of testing (14% × 100000 units × ₹5 per unit)	70,000
Total Cost	3,00,000
<i>Add:</i> Desired Profit (20% on cost, i.e., 20% of ₹3,00,000)	60,000
Price to be quoted	3,60,000

Price to be quoted = $\frac{\mathbf{3},60,000}{100000 \text{ units}} = \mathbf{3}.60 \text{ per unit}$

Problem 6 (Problem on calculation of Cost of a batch on the basis of Activity Based Costing System)

The Budgeted Overhead and Cost Driver Volumes of Xylo Ltd. are as follows:

Cost Pool	Budgeted Overhead (₹)	Cost Driver	Budgeted Volume
Material Procurement	4,05,000	Number of orders	900
Machine set-up	3,60,000	Number of set-ups	450
Maintenance	2,40,000	Maintenance hours	3000
Quality Control	1,40,000	Number of inspections	700
Machinery	4,80,000	Number of machine hours	24000

The company has produced a batch of 2500 components of X. Its Material Cost was ₹1,10,000 and Labour Cost was ₹1,90,000. The usage of the activities of this batch is as follows:

Material Order	21
Set-ups of Machine	19
Maintenance Hours	510
Number of inspections	26
Machine Hours	1300

Calculate the Cost Driver Rates that are used for computing the appropriate amount of Overhead to this batch and ascertain the cost of the batch of components using Activity Based Costing.

[Bangalore University, B.Com, December (2016), December (2015)]

Solution

Step 1: Calculation of Cost Driver Rate for each Cost Pool

Cost Pool $Cost Driver Rate = \frac{Cost - 1}{Volume of Cost Driver}$

The Cost Driver Rate for each activity is as follows:

Material Procurement: $\frac{\overline{\langle}4,05,000}{900 \text{ orders}} = \overline{\langle}450 \text{ per order}$
Machine Set-up: $\frac{₹3,60,000}{450 \text{ set-ups}} = ₹800 \text{ per set-up}$
Maintenance : $\frac{₹2,40,000}{3000 \text{ hours}} = ₹80 \text{ per hour}$
Quality Control: ₹1,40,000 700 inspections = ₹200 per inspection
Machinery: $\frac{₹4,80,000}{24000 \text{ Machine Hours}} = ₹20 \text{ per machine hour}$

24000 Machine Hours

Step 2: Calculation of cost for a batch of 2500 components

	(₹)
Material Cost (given)	1,10,000
Labour Cost (given)	1,90,000
Overheads	
Material Procurement (21 orders × ₹450 per order)	9,450
Machine set-up (19 set-ups × ₹800 per set-up)	15,200
Maintenance (510 hours × ₹80 per hour)	40,800
Quality Control (26 inspections × ₹200 per inspection)	5,200
Machinery (1300 hours × ₹20 per hour)	26,000
Total Cost for a batch of 2500 components	3,96,650

Problem 7 (Problem on calculation of Cost of a batch on the basis of Activity Based Costing System)

Budgeted Overhead Cost Pool Cost Driver Budgeted Volume (₹) Material purchase 1,15,940 Number of orders 220 Material handling 50,048 Number of movements 136 Number of set-ups 104 Set-up 83,200 Maintenance 1,93,200 Maintenance hours 1680 **Ouality** control Number of inspections 34.200 180

1,44,000

The Budgeted Overhead and Cost Driver Volumes of MN Ltd. are as follows:

The company has produced a batch of 520 components of product X. Its Material Cost was ₹1,30,000 and Labour Cost was ₹2,45,000.

Number of machine hours

The usage of activities of the said batch was as follows:

Material Order	26
Maintenance Hours	690
Material Movements	18
Inspection	28
Set-ups	25
Machine Hours	1800

Machinery

Calculate Cost Driver Rates and ascertain the cost of the batch of components of product X using Activity Based Costing.

[Bangalore University B.Com December (2014)]

4800

Solution

Step 1: Calculation of Cost Driver Rate for each Cost Pool

 $Cost Driver Rate = \frac{Cost Pool}{Volume of Cost Driver}$

The Cost Driver Rate for each Activity is as follows:

Material Purchase:	₹1,15,940 220 orders = ₹527 per order		
Material Handling:	$\frac{\texttt{₹50,048}}{136 \text{ movements}} = \texttt{₹368 per movement}$		
Set-up : $\frac{₹83,200}{104 \text{ set-ups}}$	= ₹800 per set-up		
Maintenance: ₹1,93,200 1680 hours = ₹115 per hour			
Quality Control: $\frac{1}{18}$	$\frac{₹34,200}{0 \text{ inspections}} = ₹190 \text{ per inspection}$		
Machinery : $\frac{₹1}{4800 \text{ M}}$,44,000 lachine Hours = ₹30 per machine hour		

Step 2: Calculation of cost for a batch of 520 components

	(₹)
Material Cost (given)	1,30,000
Labour Cost (given)	2,45,000
Overheads	
Material Purchase (26 orders × ₹527 per order)	13,702
Material Handling (18 movements × ₹368 per movement)	6,624
Set-up (25 set-ups × ₹800 per set-up)	20,000
Maintenance (690 hours × ₹115 per hour)	79,350
Quality Control (28 inspections × ₹190 per inspection)	5,320
Machinery (1800 hours × ₹30 per hour)	54,000
Total Cost for batch of 520 components	5,53,996

Problem 8 (Problem on calculation of Cost under Traditional System and Activity Based Costing System)

The following is product Nova Shaft's data for next year's budget:

Activity	Cost Driver	Cost Driver Volume per year	Cost Pool (₹)
Purchasing	Purchase orders	1500	75,000
Setting	Batches produced	2800	1,12,000
Material handling	Material movements	8000	96,000
Inspection	Batches produced	2800	70,000
Machining costs	Machine hours	50000	1,50,000
			5,03,000

Data for one month

Purchase orders	25
Output	15000 units
Production batch size	100 units
Materials movement per batch	6
Machine hours per unit	0.1

Required:

- (i) Calculate the Budgeted Overheads using Absorption Costing (Absorb Overheads on the Machine Hour Basis).
- (ii) Calculate the Budgeted Overhead Costs using Activity Based Costing Principles.
- (iii) How can the company reduce the Activity Based Cost for Product Nova Shaft?

Solution

(i) Calculation of Budgeted Overheads under Traditional Costing System Total Overhead Cost: ₹5,03,000

Overheads must be absorbed on the basis of Machine Hours. Number of machine hours per year 50,000

So, Overhead Cost per Machine Hour = $\frac{\overline{5},03,000}{50000 \text{ hours}} = \overline{5}$ **10.06 per hour**

5.20 + Cost Management

Number of Machine Hours during the month = $15000 \text{ units} \times 0.1 \text{ hour per unit} = 1500 \text{ hours}$. So, Budgeted Overhead Cost for the month = $1500 \text{ hours} \times \overline{10.06} \text{ per hour} = \overline{15,090}$

(ii) Calculation of Budgeted Overheads under Activity Based Costing System Step 1: Calculation of Cost Driver Rate for each Cost Pool

 $Cost Driver Rate = \frac{Cost Pool}{Volume of Cost Driver}$

The Cost Driver Rate for each Activity is given as follows:

Activity	Cost Pool (₹)	Total Cost Driver Volume	Cost Driver Rate
Purchasing	75,000	1500 purchase orders	₹50 per order
Setting	1,12,000	2800 batches produced	₹40 per batch
Materials handling	96,000	8000 material movements	₹12 per material movement
Inspection	70,000	2800 batches produced	₹25 per batch
Machining costs	1,50,000	50000 machine hours	₹3 per machine hour

Step 2: Calculation of Budgeted Overhead Cost for a month

Output for the month is 15000 units

Production batch size is 100 units.

So, number of batches produced = $\frac{15000 \text{ units}}{100 \text{ units per batch}}$ = **150 batches**

Material movement is 6 per batch.

Hence, for 150 batches, the total material movement is $150 \times 6 = 900$ material movements Machine hours per unit is 0.1

Production budgeted for the month is 15000 units.

Hence, Machine Hours required for the month = 15000 units $\times 0.1$ hour per unit = **1500 hours.** Calculation of Budgeted Overhead Cost

Activity	Cost Driver	Budgeted Cost Driver Volume	Cost Driver Rate	Budgeted Cost (₹)
Purchasing	Purchase orders	25	₹50 per order	1,250
Setting	Batches produced	150	₹40 per batch	6,000
Materials handling	Material movements	900	₹12 per material movement	10,800
Inspection	Batches produced	150	₹25 per batch	3,750
Machining	Machine hours	1500	₹3 per machine hour	4,500
Total				26,300

(iii) Strategies for reduction of Activity Based Cost for the product

Achieving any or all or a combination of the following can reduce the cost under this system:

(a) Increasing the size per purchase order (i.e., reducing the number of purchase orders).

- (b) Increasing production per batch (i.e., reducing number of batches produced)
- (c) Reducing material movements
- (d) Reducing number of machine hours

Problem 9 (Problem on calculation of Cost of different products under Activity Based Costing System)

Traditional Ltd. is a manufacturer of a range of goods. The cost structure of its different products is as follows:

	Products		
	Α	В	С
Direct Materials	₹50 per unit	₹40 per unit	₹40 per unit
Direct Labour @ ₹10 per hour	₹30 per unit	₹40 per unit	₹50 per unit
Production Overheads	₹30 per unit	₹40 per unit	₹50 per unit
Total Cost	₹110 per unit	₹120 per unit	₹140 per unit
Quantity Produced	10,000	20,000	30,000

Traditional Ltd. was absorbing Overheads on the basis of Direct Labour Hours. A newly appointed Management Accountant has suggested that the company should introduce ABC system and has identified Cost Drivers and Cost Pools as follows:

Activity Cost Pool	Cost Driver	Associated Cost
Stores receiving	Purchase requisitions	₹2,96,000
Inspection	Number of production runs	₹8,94,000
Dispatch	Orders executed	₹2,10,000
Machine set-up	Number of set-ups	₹12,00,000

The following information is also supplied:

	Products		
	Α	В	С
Number of set-ups	360	390	450
Number of orders executed	180	270	300
Number of production runs	750	1050	1200
Number of purchase requisitions	300	450	500

You are required to calculate Activity Based Production Cost of all the three products.

Solution

Step 1: Calculation of Cost Driver Rate for each Cost Pool

Cost Driver Rate = $\frac{\text{Cost Pool}}{\text{Volume of Cost Driver}}$

Activity	Cost Pool (₹)	Total Cost Driver Volume	Cost Driver Rate
Stores receiving	2,96,000	1250 requisitions (300 + 450 + 500)	₹236.80 per requisition
Inspection	8,94,000	3000 production runs (750 + 1050 + 1200)	₹298 per production run
Dispatch	2,10,000	750 orders (180 + 270 + 300)	₹280 per order
Machine set-up	12,00,000	1200 set-ups (360 + 390 + 450)	₹1000 per set-up

The Cost Driver Rate for each activity is given as follows:

Step 2: Calculation of Cost of each product

	Product		
	Α	В	С
	(₹)	(₹)	(₹)
Direct Material Cost			
(Number of units × Material Cost per unit)	5,00,000	8,00,000	12,00,000
Direct Labour Cost			
(Number of units × Labour Cost per unit)	3,00,000	8,00,000	15,00,000
Overheads			
Stores receiving			
(Number of requisitions × Rate per Requisition)	71,040	1,06,560	1,18,400
Inspection			
(Number of production runs \times Rate per production run)	2,23,500	3,12,900	3,57,600
Dispatch			
(Number of orders executed × Rate per order)	50,400	75,600	84,000
Machine Set-up			
(Number of set-ups \times Rate per set-up)	3,60,000	3,90,000	4,50,000
Total Cost	15,04,940	24,85,060	37,10,000

Problem 10 (Problem on calculation of Cost and Profits of different products under Traditional System and Activity Based Costing System)

A Ltd. assembles three brands of motorcycles at the same factory: the 50cc Sunshine, the 250cc Roadster and the 1000cc Fireball. It sells the motorcycles throughout the world. In response to market pressure, A Ltd. has invested heavily in new manufacturing technology in recent years and as a result, has significantly reduced the size of its workforce.

Historically, the company has allocated all Overhead Costs using Total Direct Labour Hours, but is now considering introducing Activity Based Costing system. A Ltd.'s accountant has produced the following analysis:

	Annual Output (units)	Annual Direct Labour Hours	Selling Price per unit (₹)	Raw Material Cost per unit (₹)
Sunshine	2,000	2,00,000	4,000	400
Roadster	1,600	2,20,000	6,000	600
Fireball	400	80,000	8,000	900

Deliveries to retailers	The number of deliveries of motorcycles to retail showroom
Set-ups	The number of times the assembly line process is reset to accommodate a production run of a different type of motorcycle.
Purchase order	The number of purchase orders

The three Cost Drivers that generate Overheads are:

The annual Cost Driver volumes relating to each activity and for each type of motorcycle are as follows:

	Number of deliveries to retailers	Number of set-ups	Number of purchase orders
Sunshine	100	35	400
Roadster	80	40	300
Fireball	70	25	100

The annual Overhead Costs relating to these activities are as follows:

	(₹)
Deliveries to retailers	24,00,000
Set-up cost	60,00,000
Purchase orders	36,00,000
	120,00,000

All Direct Labour is paid at ₹5 per hour. The company holds no stocks.

Calculate the total profit on each of A Ltd.'s three brands of product using each of the following methods to attribute Overheads:

- (i) The existing method, based on labour hours
- (ii) Activity Based Costing

Solution

A. Under Traditional System

Total Overhead Cost = ₹120,00,000

Total Direct Labour Hours = 2,00,000 + 2,20,000 + 80,000 = 5,00,000 Hours

Overhead Cost per Labour Hour = $\frac{\overline{120,00,000}}{5,00,000 \text{ Hours}} = \overline{24}$

Statement of Cost and Profits

	Brand		
	Sunshine (₹)	Roadster (₹)	Fireball (₹)
Revenues (Output × Selling Price per unit)	80,00,000	96,00,000	32,00,000
Raw Material Cost			
(Output × Raw Material Cost per unit)	8,00,000	9,60,000	3,60,000
Direct Labour			
(Output × Direct Labour rate per unit ₹5)	10,00,000	11,00,000	4,00,000
Overheads			
(Annual Labour Hours × Overhead Cost per Labour Hour ₹24)	48,00,000	52,80,000	19,20,000
Total Cost	66,00,000	73,40,000	26,80,000
Profits (Revenues – Total Cost)	14,00,000	22,60,000	5,20,000

B. Under Activity Based Costing System Step 1: Calculation of Cost Driver Rate for each Cost Pool

Cost Driver Rate = $\frac{\text{Cost Pool}}{\text{Volume of Cost Driver}}$

The Cost Driver Rate for each activity is given as follows:

Activity	Cost Pool (₹)	Total Cost Driver Volume	Cost Driver Rate
Deliveries	24,00,000	250 deliveries (i.e., 100 + 80 + 70)	₹9,600 per delivery
Set-up	60,00,000	100 set-ups (i.e., 35 + 40 + 25)	₹60,000 per set-up
Purchase	36,00,000	800 purchase orders (i.e., 400 + 300 + 100)	₹ 4500 per order

Step 2: Calculation of Cost and of each product Statement of Cost and Profits

	Brand		
	Sunshine (₹)	Roadster (₹)	Fireball (₹)
Revenues (Output × Selling Price per unit)	80,00,000	96,00,000	32,00,000
Raw Material Cost			
(Output × Raw Material Cost per unit)	8,00,000	9,60,000	3,60,000
Direct Labour			
(Output × Direct Labour rate per unit ₹5)	10,00,000	11,00,000	4,00,000
Overheads			
Deliveries to Retailers			
(Number of deliveries × Rate per delivery)	9,60,000	7,68,000	6,72,000
Set-up Cost			
(Number of set-ups × Rate per set-up)	21,00,000	24,00,000	15,00,000
Purchase Cost			
(Number of purchase orders × Rate per order)	18,00,000	13,50,000	4,50,000
	66,60,000	65,78,000	33,82,000
Profits (Revenues – Total Cost)	13,40,000	30,22,000	(1,82,000)

Problem 11 (Problem on calculation of Cost and profits for different customers under Traditional Costing System and Activity Based Costing System)

Fairdeal produces a product specially for its three customers: P,Q and R, requiring 20,000 units, 15,000 units and 10,000 units respectively per annum.

The data in 2017-18 about the product are:Production Cost₹48 per unitSale Price (net)₹90 per unitOverhead not connected with production (for the year):Quality Inspection₹2,62,500Delivery₹2,55,600Salesmen₹74,000After-sales Service₹93,720

Fairdeal apportions these Non-production Overhead Costs on the basis of Production Costs. The CEO is unhappy about this and asks you for an analysis upon ABC Method.

You fund the following activity volumes for the period.

	Р	Q	R
Number of inspections	8330	420	0
Number of deliveries	2080	40	10
Number of salesmen visits	160	20	5
After-sale visits	160	84	40

Re-work the apportionment of non-Production Overheads to find the comparative cost of sales.

Solution

A. Under Traditional System

Total Non-Production Overheads = ₹2,62,500 + ₹2,55,600 + ₹74,000 + ₹93,720 = ₹6,85,820 Calculation of Production Cost:

P: 20000 units × ₹48 per unit = ₹9,60,000

Q: 15000 units × ₹48 per unit = ₹7,20,000

R: 10000 units × ₹48 per unit = ₹4,80,000

So, the ratio of production cost for customers P, Q and R is

9,60,000 : 7,20,000 : 4,80,000 or 4:3:2

Calculation of Cost of Sales under Traditional System

	Customer		
	Р	Q	R
Production Cost	9,60,000	7,20,000	4,80,000
Non-production Cost ₹6,85,820 apportioned in the ratio of 4:3:2	3,04,809	2,28,607	1,52,404
Total Cost	12,64,809	9,48,607	6,32,404
Profits (Balancing figure)	5,35,191	4,01,393	2,67,596
Sales (@ ₹90 per unit)	18,00,000	13,50,000	9,00,000
$Profitability = (Profits/Sales) \times 100$	29.73%	29.73%	29.73%

B. Under Activity Based Costing System

Step 1: Calculation of Cost Driver Rate for each Cost Pool

$$Cost Driver Rate = \frac{Cost Pool}{Volume of Cost Driver}$$

The Cost Driver Rate for each Activity is given as follows:

Activity	Cost Pool (₹)	Total Cost Driver Volume	Cost Driver Rate
Quality Inspection	2,62,500	8750 inspections (8330 + 420 + 0)	₹ 30 per inspection
Delivery	2,55,600	2130 deliveries (2080 + 40 + 10)	₹120 per delivery
Salesmen	74,000	185 salesmen visits (160 + 20 + 5)	₹400 per salesman visit
After-sale Service	93,720	284 after-sale visits (160 + 84 + 40)	₹330 per after-sale visit

	Customer		
	Р	Q	R
Production Cost	9,60,000	7,20,000	4,80,000
Non-production Cost			
Quality inspection			
(Number of inspections × Rate per inspection)	2,49,900	12,600	0
Delivery			
(Number of deliveries × Rate per delivery)	2,49,600	4,800	1,200
Salesmen			
(Number of Salesmen visits × Rate per visit)	64,000	8,000	2,000
After-sales service			
(Number of after-sale visits × Rate per visit)	52,800	27,720	13,200
Total Cost	15,76,300	7,73,120	4,96,400
Profits (Balancing figure)	2,23,700	5,76,880	4,03,600
Sales (@ ₹90 per unit)	18,00,000	13,50,000	9,00,000
$Profitability = (Profits/Sales) \times 100$	12.43%	42.73%	44.84%

Calculation of Cost of Sales under Activity Based Costing System

Problem 12 (Problem on calculation of Cost for different products under Traditional Costing System

and Activity Based Costing System)

A company manufactures three types of products viz., P, Q and R. The data relating to a period are as follows:

	Products		
	Р	Q	R
Machine Hours per unit	10	18	14
Direct Labour Hours per unit @ ₹20	4	12	8
Direct Material per unit (₹)	90	80	120
Production (units)	3000	5000	20000

Currently, the company uses Traditional Costing Method and absorbs all Production Overheads on the basis of Machine Hours. The Machine Hour Rate of Overheads is ₹6 per hour.

The company proposes to use Activity Based Costing System and the Activity Analysis is as follows:

	Products		
	Р	Q	R
Batch size (units)	150	500	1000
Number of purchase orders per batch	3	10	8
Number of inspections per batch	5	4	3

The total Production Overheads are analysed as follows:

Machine Set-up Costs	20%
Machine Operation Costs	30%
Inspection Costs	40%
Material Procurement related Costs	10%

Required:

- (i) Calculate Cost per unit of each product using Traditional Method of absorbing all Production Overheads on the basis of Machine Hours.
- (ii) Calculate the Cost per unit of each product, using Activity Based Costing Principles.

Solution

A. Calculation of Total Cost and cost per unit under Traditional System

	Products		
	P (3000 Units) (₹)	Q (5000 Units) (₹)	R (20000 Units) (₹)
Direct Material Cost			
(Number of units × Material Cost per unit)	2,70,000	4,00,000	24,00,000
Direct Labour Cost			
(Number of units \times Number of hours per unit $\times \gtrless 20$)	2,40,000	12,00,000	32,00,000
Production Overheads			
(Number of units \times Number of machine hours per unit $\times \gtrless 6$)	1,80,000	5,40,000	16,80,000
	6,90,000	21,40,000	72,80,000
Cost per unit	₹230	7178	₹264
(Total Cost/Number of units)	(230	(428	(304

B. Calculation of Total Cost and cost per unit under Activity Based Costing System Total Production Overheads = ₹1,80,000 + ₹5,40,000 + ₹16,80,000 = ₹24,00,000 Analysis of Production Overheads

Machine Set-up Costs (20% × ₹24,00,000)	=₹4,80,000
Machine Operating Costs (30% × ₹24,00,000)	=₹7,20,000
Inspection Costs (40% × ₹24,00,000)	=₹9,60,000
Material Procurement related costs ($10\% \times ₹24,00,000$)	=₹2,40,000
	₹24,00,000

Identification of Cost Driver and ascertainment of Cost Driver Volume

Activity	Cost Driver	Cost-Driver Volume			Cost Driver Volume		
Activity		Р	P Q R				
Machine Set-up	Number of set-ups (or batches) (Production Units/Batch Size)	3000/150 = 20	5000/500 = 10	20000/1000 = 20	50 set-ups		
Machine Operations	Number of Machine Hours (Production Units × Machine hours per unit)	3000 × 10 = 30000	5000 × 18 = 90000	20000 × 14 = 280000	400000 machine hours		
Inspections	Number of Inspections (Number of batches × Number of inspections per batch)	20 × 5 = 100	$10 \times 4 = 40$	$20 \times 3 = 60$	200 inspections		
Material Procurement	Number of purchase orders (Number of batches × Number of purchase orders per batch)	$20 \times 3 = 60$	$10 \times 10 = 100$	20 × 8 = 160	320 purchase orders		

Activity	Cost Pool (₹)	Cost Driver	Total Cost Driver Volume	Cost Driver Rate (₹)
Machine set-up	4,80,000	Number of set-ups	50 set-ups	₹9,600 per set-up (i.e., per batch)
Machine operations	7,20,000	Number of machine hours	400000 machine hours	₹1.80 per machine hour
Inspection	9,60,000	Number of inspections	200 inspections	₹4,800 per inspection
Material procurement	2,40,000	Number of purchase orders	320 purchase orders	₹750 per purchase order

Calculation of Cost Driver Rate

Calculation of Total Cost and Per-Unit Cost

	Products			
	P (3000 Units) (₹)	Q (5000 Units) (₹)	R (20000 Units) (₹)	
Direct Material Cost				
(Number of units × Material Cost per unit)	2,70,000	4,00,000	24,00,000	
Direct Labour Cost				
(Number of units × Number of hours per unit × ₹20)	2,40,000	12,00,000	32,00,000	
Production Overheads				
Machine Set-up Costs				
(Number of batches × ₹9,600 per batch)	1,92,000	96,000	1,92,000	
Machine Operation Costs				
(Number of machine hours × ₹1.80 per machine hour)	54,000	1,62,000	5,04,000	
Inspection				
(Number of inspections × ₹4,800 per inspection)	4,80,000	1,92,000	2,88,000	
Material Procurement				
(Number of purchase orders × ₹750 per purchase order)	45,000	75,000	1,20,000	
	12,81,000	21,25,000	67,04,000	
Cost per unit (Total Cost/Number of units)	₹427	₹425	₹335.20	

Problem 13 (Problem on calculation of Cost and profit for different products under Traditional Costing System and Activity Based Costing System)

Fruitolay had decided to increase the size of the store. It wants the information about the profitability of the individual product lines: Lemon, Grapes and Papaya. It provides the following data for 2017 for each product line:

	Lemon	Grapes	Papaya
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 placed	36	84	36
Number of deliveries received	30	219	66
Hours of shelf-stocking time	54	540	270
Items sold	12600	110400	30600

Activity	Description of Activity	Total Cost (₹)	Cost Allocation Basis
Bottle returns	Returning of empty bottles to the store	1,200	Direct tracing to product line
Ordering	Placing of orders of purchase	15,600	156 purchase orders
Delivery	Physical delivery and the receipts of merchandise	25,200	315 deliveries
Shelf-stocking	Stocking of merchandise on store shelves and on- going restocking	17,280	864 hours of time
Customer support	Assistance provided to customers including bagging and checkout	30,720	1,53,600 items sold

Fruitolay also provides the following information for the year 2017:

Required:

- (i) Fruitolay currently allocates store support costs (all costs other than the Cost of Goods Sold) to the product line on the basis of Cost of Goods Sold of each product line. Calculate the Operating Income and Operating Income as the Percentage of Revenue of each product line.
- (ii) If Fruitolay 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 a Percentage of Revenue of each product line.
- (iii) Compare both the systems.

Solution

A. Calculation of Profitability under Traditional System

Total store support cost: ₹1,200 + ₹15,600 + ₹25,200 + ₹17,280 + ₹30,720 = ₹90,000 Ratio of Cost of Goods Sold of three products = 60000:150000:90000 = 2:5:3

Statement of Cost and Profits

	Product Line		
	Lemon (₹)	Grapes (₹)	Papaya (₹)
Revenues	79,350	2,10,060	1,20,990
Costs Cost of Goods Sold Store support cost (₹90,000 allocated in the ratio of 2:5:3)	60,000 <u>18,000</u> 78,000	1,50,000 <u>45,000</u> 1 95 000	90,000
Profits or Operating Income (Revenues – Total Cost)	1,350	1,55,000	3,990
Operating Income as a Percentage of Revenue	1.70%	7.17%	3.30%

B. Calculation of Profitability under Traditional System Step 1: Calculation of Cost Driver Rate

Activity	Cost Pool (₹)	Cost Driver	Total Cost Driver Volume	Cost Driver Rate (₹)
Bottle returns	1,200	Direct tracing to product line	-	-
Ordering	15,600	Number of purchase orders	156 orders	₹100 per purchase order
Delivery	25,200	Number of deliveries	315 deliveries	₹80 per delivery
Shelf-stocking	17,280	Number of hours	864 hours	₹20 per hour
Customer support	30,720	Number of items sold	1,53,600 items	₹0.20 per item

	Product Line		
	Lemon (₹)	Grapes (₹)	Papaya (₹)
Revenues	79,350	2,10,060	1,20,990
Costs			
Cost of goods sold	60,000	1,50,000	90,000
Store support cost			
Bottle Returns			
(only for Lemon – specified in the problem)	1,200	-	-
Ordering			
(Number of Purchase Orders × Rate per Purchase Order)	3,600	8,400	3,600
Delivery			
(Number of deliveries received × Rate per delivery)	2,400	17,520	5,280
Shelf-stocking			
(Number of hours of shelf-stocking time × Rate per hour)	1,080	10,800	5,400
Customer Support			
(Number of items sold × Rate per item)	2,520	22,080	6,120
Total Cost	70,800	2,08,800	1,10,400
Profits or Operating Income (Revenues – Total Cost)	8,550	1,260	10,590
Operating Income as a Percentage of Revenue	10.78%	0.60%	8.75%

Step 2: Calculation of Cost and Profit

Statement	of	Cost	and	Profits
Statement	UI.	CUSL	anu	I I UIILS

C. Comparison of the outcome under both the systems

- (i) Under Traditional System, Grapes have a relatively higher profitability. However, under Activity Based Costing System, it is the least profitable and is barely able to meet its costs.
- (ii) Under Traditional System, Lemon appeared to be having the least profitability. However, under Activity Based Costing System, it enjoys the highest rate of profitability.

Problem 14 (Problem on calculation of Cost for different products under Traditional Costing System and Activity Based Costing System)

XYZ Ltd. manufactures four products viz., A, B, C and D, using the same plant and process. The following information relates to a production period:

	Α	В	С	D
Output in units	720	600	480	504
Cost per unit:				
- Materials	₹42	₹45	₹40	₹48
- Labour	₹10	₹9	₹7	₹8
Machine Hours per unit	4 hours	3 hours	2 hours	1 hour

The four products are similar and are usually produced in production runs of 24 units and sold in batches of 12 units. The company presently uses Machine Hour Rate for absorbing Production Overheads. Total Overheads incurred by the company for the period are:

Particulars	Amount (₹)
Machine operation and maintenance cost	63,000
Set-up Costs	20,000
Stores receiving	15,000
Inspection	10,000
Material Handling and Dispatch	2,592
	1,10,592

During the period, the following Cost Drivers are to be used for the Overhead Cost:

Cost	Cost Driver
Set-up	Number of production runs
Stores receiving	Requisitions raised
Inspection	Number of production runs
Material handling	Orders executed

It is also determined that:

- Machine operation and maintenance cost should be apportioned between set-up cost, stores receiving and inspection activity in the ratio of 4:3:2.
- Number of requisitions raised on stores is 50 for each product and the number of orders executed is 192, each order being for a batch of 12 of a product.

Required:

- (i) Calculate the Total Costs for each product if all Overhead Costs are absorbed on a Machine Hour basis.
- (ii) Calculate the Total Costs for each product using Activity Based Costing System.
- (iii) Comment briefly on the differences disclosed between Overhead traced by present system and those traced by ABC.

Solution

(a) Calculation of Total Cost under Traditional System

Total Overhead Cost = ₹1,10,592

Total Machine Hours

Product	Number of Units	Machine Hours per unit	Total Machine Hours
А	720	4 hours	2880 hours
В	600	3 hours	1800 hours
С	480	2 hours	960 hours
D	504	1 hour	504 hours
Total Machine Hours			6144 hours

Calculation of Machine Hour Rate

Machine Hour Rate = $\frac{\text{Total Overhead Cost}}{\text{Total Machine Hours}} = \frac{\overline{11,10,592}}{6144 \text{ hours}} = \overline{18} \text{ per hour}$

5.32 Cost Management

Calculation of Total and Per-Unit Cost

	Product			
	A (720 units) (₹)	B (600 units) (₹)	C (480 units) (₹)	D (504 units) (₹)
Direct Material Cost				
(Number of Units × Material Cost per unit)	30,240	27,000	19,200	24,192
Direct Labour Cost				
(Number of Units × Labour Cost per unit)	7,200	5,400	3,360	4,032
Overhead Cost				
(Number of Machine Hours × Machine Hour Rate)	51,840	32,400	17,280	9,072
	89,280	64,800	39,840	37,296
Cost per unit	₹124	₹100	70 2	₹71
Total Cost/Number of Units	(124	(108	(0)	₹/4

Statement of Cost

(b) Calculation of Total Cost under Activity Based Costing System Step 1: Calculation of Cost Driver Rate

Only 4 activities must be considered for calculating Cost Driver Rate since Machine Operation and Maintenance Cost must be apportioned between set-up cost, stores receiving and inspection activity in the ratio of 4:3:2.

Activity	Cost Pool (₹)	Cost Driver	Total Cost Driver Volume	Cost Driver Rate (₹)
Set-up	20,000 + (4/9 × 63,000) = 48,000	Number of production runs	96 production runs (See Note 1)	₹ 500 per run
Stores-receiving	$15,000 + (3/9 \times 63,000) = 36,000$	Requisitions received 200 requisition (See Note 2)		₹180 per requisition
Inspection	10,000 + (2/9 × 63,000) = 24,000	Number of production runs	96 production runs (See Note 1)	₹ 250 per run
Material handling and dispatch	2,592	Orders executed	192 orders (given)	₹13.50 per order

Notes:

- 1. The problem states that "the four products are similar and are usually produced in production runs of 24 units...". The total production is 2304 units (i.e., 720 + 600 + 480 + 504). In each production run 24 units are produced. Hence, Number of production runs = 2304/24 units = 96.
- 2. The problem states that "number of requisitions raised on stores is 50 for each product...". Hence, the total number of requisitions are 50×4 products = 200.

	Product			
	Α	В	С	D
Output	720 units	600 units	480 units	504 units
Number of production runs [at the rate of 24 units per production run (i.e., Output/24 units)]	720/24 = 30 runs	600/24 = 25 runs	480/24 = 20 runs	504/24 = 21 runs
Number of requisitions	50	50	50	50
Number of orders executed [at the rate of 12 units per order (i.e., Output/12 units)]	720/12 = 60 orders	600/12 = 50 orders	480/12 = 40 orders	504/12 = 42 orders

Step 2: Ascertainment of Cost Driver Volume for each Product

Calculation of Total and Per-Unit Cost

Statement of Cost

	Product			
	A (720 units) (₹)	B (600 units) (₹)	C (480 units) (₹)	D (504 units) (₹)
Direct Material Cost			()	(1)
(Number of Units × Material Cost per unit)	30,240	27,000	19,200	24,192
Direct Labour Cost				
(Number of Units × Labour Cost per unit)	7,200	5,400	3,360	4,032
Overhead Cost				
Set-up Costs				
(Number of Production Runs × Rate per run)	15,000	12,500	10,000	10,500
Stores Receiving				
(Number of requisitions × Rate per requisition)	9,000	9,000	9,000	9,000
Inspection				
(Number of production runs × Rate per run)	7,500	6,250	5,000	5,250
Material handling and dispatch				
(Number of orders executed × Rate per order)	810	675	540	567
	69,750	60,825	47,100	53,541
Cost per unit	₹06 875	₹101 375	₹08 152	₹106 222
(Total Cost/Number of Units)	190.073	101.375	190.123	100.232

(c) Difference in costs between the two systems

	Product					
	A B C D					
Cost per unit under Traditional System	₹124	₹108	₹83	₹74		
Cost per unit under ABC System	₹96.875	₹101.375	₹98.125	₹106.232		
Effect	Overstatement of cost by ₹27.125	Overstatement of cost by ₹6.625	Understatement of cost by ₹15.125	Understatement of cost by ₹32.232		

Problem 15 (Problem on calculation of Cost of rendering services under Activity Based Costing System)

DEF Bank operated for years under the assumption that increasing Rupee Volumes increases the profitability. But that has not been the case. Cost Analysis has revealed the following:

Activity	Activity Cost (₹)	Activity Driver	Activity Capacity
Providing ATM Service	1,00,000	Number of transactions	2,00,000
Computer processing	10,00,000	Number of transactions	25,00,000
Issuing statements	8,00,000	Number of statements	5,00,000
Customer inquiries	3,60,000	Telephone minutes	6,00,000

The following annual information on three products was also made available:

	Checking Accounts	Personal Loans	Gold Visa
Units of product	30,000	5,000	10,000
ATM transactions	1,80,000	0	20,000
Computer transactions	20,00,000	2,00,000	3,00,000
Number of statements	3,00,000	50,000	1,50,000
Telephone minutes	3,50,000	90,000	1,60,000

Required:

- 1. Calculate rates for each activity.
- 2. Using the rates computed in (1), calculate the cost of each product.

Solution

Step 1: Calculation of Cost Driver Rate

Activity	Cost Pool (₹)	Total Cost Driver Volume	Cost Driver Rate
Providing ATM Service	1,00,000	2,00,000 transactions	₹0.50 per transaction
Computer processing	10,00,000	25,00,000 transactions	₹0.40 per transactions
Issuing statements	8,00,000	5,00,000 statements	₹1.60 per statement
Customer inquiries	3,60,000	6,00,000 telephone minutes	₹0.60 per minute

Step 2: Calculation of Cost of Service

Statement of Cost

	Product		
	Checking Accounts (₹)	Personal Loan (₹)	Gold Visa (₹)
Cost of providing ATM Services			
(Number of transactions × Rate per transaction)	90,000	0	10,000
Cost of Computer Processing			
(Number of transactions × Rate per transaction)	8,00,000	80,000	1,20,000
Cost of issuing Statements			
(Number of statements × Rate per statement)	4,80,000	80,000	2,40,000
Cost of Customer Inquiries			
(Number of Telephone Minutes × Rate per Minute)	2,10,000	54,000	96,000
Total Cost	15,80,000	2,14,000	4,66,000
Number of units per product	30,000	5,000	10,000
Cost per unit (Total Cost/Number of Units)	₹52.67	₹42.80	₹46.60

SUMMARY

- On the basis of identification or relation with the final product, costs are classified into two types viz., Direct Costs and Indirect Costs. Indirect Costs are also called Overheads.
- For absorbing Overheads into the cost of a product or a service, there are two systems viz., Traditional System and Activity Based Costing System.
- Activity Based Costing refers to an approach to the costing and monitoring of activities, which involves tracing resource consumption and costing final outputs. Resources are assigned to activities, and activities to cost objects, based on consumption estimates. The latter utilise Cost Drivers to attach activity costs to outputs.
- Activity Based Costing is a technique which involves identification of costs with each cost driving activity and making it as the basis of apportionment of costs over different cost objects/jobs/products/customers or services.
- Absorbing Overheads into the cost of product or service under Activity Based Costing involves the following steps:
 - Identification of various activities within the organisation.
 - Estimation of the cost of each activity.
 - Apportionment of cost of support activities across primary activities on suitable basis.
 - Determination of Activity Cost Drivers for each activity or Cost Pool.
 - Calculation of Activity Cost Driver Rate.
 - Assigning of Overheads to cost objects on the basis of Activity Cost Driver Rate.
- An activity refers to the collection of units of work or task. It is the sum total of various tasks required in completing a particular job or function or responsibility.
- Activities are of different types viz., Unit-Level Activities, Batch-Level Activities, Product-Level Activities and Facility-Level Activities. They are also classified into Primary Activities and Support Activities, and into Value-Added Activities and Non Value-Added Activities.
- The cost of each activity is called Cost Pool or Cost Bucket. Summing up or grouping all cost elements of the activity ascertains the Cost Pool. Cost element refers to the amount paid for a resource consumed by an activity. For example, Power Cost, Engineering Cost and Depreciation are cost elements in the Cost Pool for a machine activity.
- The term Cost Driver refers to any factor, which causes a change in the cost of an activity. Cost Drivers are classified into two types viz., Resource Cost Driver and Activity Cost Driver.
- Cost Object refers to any customer, product, service, contract, project or other work unit for which a separate cost measurement is desired.
- Activity Cost Driver Rate is calculated using the following formula:

Activity Cost Pool

Level or Quantity of Cost Driver

- Steps for installation of Activity Based Costing system involves the following:
 - Specification of the objective or motive or purpose for pursuing Activity Based Costing like cost minimisation, value maximisation, elimination of non value-adding activities etc.
 - Identification of costs, particularly Indirect Costs, which are not product specific.
 - Specification of the production process with the help of key members of personnel and identification of resources to be committed, processing time involved, bottlenecks etc.
 - Definition of activities involved and classifying them into primary and support activities.
 - Selection of Cost Driver for each activity.
 - Assignment of cost to each cost object.
 - Training of staff.
 - Review and follow-up.

Section B Type Questions

Problem 1

State, with a brief reason, whether you would recommend an Activity Based Costing System in each of the following independent situations:

- (i) Company K produces one product. The Overhead Costs mainly consist of depreciation.
- (ii) Company L produces 5 different products using different production facilities.
- (iii) A consultancy firm consisting of lawyers, accountants and computer engineers provides management consultancy services to clients.
- (iv) Company S produces two different labour intensive methods. The contribution per unit in both the products is very high. The BEP is very low. All the work is carried-on efficiently to meet the target cost.

[Ans: (i) Not Recommended, (ii) Recommended, (iii) Recommended and (iv) Not recommended]

Problem 2

State whether each of the following independent activities is value added or non value added.

- (i) Polishing of furniture used by a system engineer in a software firm.
- (ii) Maintenance by a software company of receivables management software for a banking company.
- (iii) Painting of pencils manufactured by a pencil factory.
- (iv) Cleaning of customers' computer keyboards by a computer repair centre.
- (v) Providing brake adjustments in cars received for service by a car service station.

[Ans: Value Added - (ii), (iii), (iv) and (v); Non Value Added - (i)]

Section C Type Questions

Problem 1

ABC Ltd. is a multi-product company manufacturing three products: A, B and C. The budgeted costs and production for the year ending 31 March 2018 are as follows:

	Α	В	С
Production Quantity	4000	3000	1600
Resources per unit			
- Direct Material (kg)	4	6	3
- Direct Labour (minutes)	30	45	60

The budgeted direct labour rate was ₹10 per hour and the budgeted Material Cost was ₹2 per kg. Production Overheads were budgeted at ₹99,450 and were absorbed to products using the direct Labour Hour Rate. ABC Ltd., followed an Absorption Costing system. It is now considering adopting Activity Based Costing system. The following additional information is made available for this purpose:

Budgeted Overheads were analysed into the following:

Material Handling	₹29,100
Storage Costs	₹31,200
Electricity	₹31,150
The Cost Drivers identified were as	follows:
Material handling	Weight of material handled
Storage costs	Number of batches of material
Electricity	Number of machine operations
Data on Cost Drivers is given as follows:

	Α	В	С
For complete production			
Batches of material	10	5	15
Per unit of production			
Number of machine operators	6	3	2

You are requested to:

- 1. Prepare a statement for the Management, showing the Unit Costs and Total Costs of each product, using Absorption Costing Method.
- 2. Prepare a statement for the Management, showing the Product Costs of each product, using the ABC approach.
- 3. What are the reasons for different Product Costs under the two approaches?

[Ans:

	Α	В	С
Under Absorption Costing			
Total Cost	86,000	96,750	52,800
Per-Unit Cost	21.50	32.25	33.00
Under Activity Based Costing			
Total Cost	1,00,360	86,940	48,256
Per-Unit Cost	25.09	28.98	30.16

Problem 2

MST Ltd. has collected the following data for its two activities. It calculates Activity Cost Rates based on Activity Driver Capacity.

Activity	Cost Driver	Capacity	Cost (₹)
Power	Kilowatt Hours	50,000 kilowatt hours	2,00,000
Quality inspections	Number of inspections	10,000 inspections	3,00,000

The company makes three products: M, S and T. For the year ended 31 March 2018, the following consumption of cost drivers was reported:

Product	Kilowatt Hours	Quality Inspections
М	10,000	3,500
S	20,000	2,500
Т	15,000	3,000

Required:

- (i) Compute the costs allocated to each product from each activity.
- (ii) Calculate the cost of unused capacity of each activity.
- (iii) Discuss the factors the management considers in choosing a capacity level to compute the Budgeted Fixed Overhead Cost Rate.

[Ans: Power: M - ₹40,000, S - ₹80,000 and T - ₹60,000; Quality Inspections: M - ₹1,05,000; S - ₹75,000 and T - ₹90,000; (ii) Power: ₹20,000; Quality Inspection: ₹30,000; (iii) Effect on Product Cost, Capacity Management, Pricing Decisions, Performance Evaluation, Regulatory Requirements, etc.]

Problem 3

ABC Ltd. manufactures two types of machinery equipment – Y and Z – and absorbs Overheads on the basis of Direct Labour Hours. The Budgeted Overheads and Direct Labour Hours for the month of December 2017 are ₹12,42,500 and 20,000 hours respectively. The information about company's products is as follows:

	Equipment Y	Equipment Z
Budgeted Production Volume	2500 units	3125 units
Direct Material Cost	₹300 per unit	₹450 per unit
Direct Labour Cost		
Y: 3 hours @ ₹150 per hour	₹450 per unit	
Z: 4 hours @ ₹150 per hour		₹600 per unit

ABC Ltd.'s Overheads of ₹12,42,500 can be identified with three major activities: Order Processing (₹2,10,000), Machine Processing (₹8,75,000) and Product Inspection (₹1,57,500). These activities are driven by the number of orders processed, the machine hours worked, and the inspection hours respectively. The data relevant to these activities is as follows:

	Orders Processed	Machine Hours Worked	Inspection Hours
Y	350	23,000	4,000
Z	250	27,000	11,000
Total	600	50,000	15,000

Required:

- (i) Assuming use of Direct Labour Hours to absorb Overheads to production, compute the Unit Manufacturing Cost of equipment Y and Z, if the Budgeted Manufacturing Volume is attained.
- (ii) Assuming use of Activity Based Costing, compute Unit Manufacturing Cost of equipment Y and Z, if the Budgeting Volume is achieved.
- (iii) ABC Ltd.'s Selling Prices are heavily based on cost. By using Direct Labour Hours as an application base, calculate the amount of Cost Distortion (under-costed or over-costed) for every equipment.

[Ans: (i) ₹936. 38 and ₹1,298.50; (ii) ₹976.80 and ₹1266.16; and (iii) Y: Under-costed, Z: Over-costed]

Problem 4

Alpha Ltd. has decided to analyse the profitability of its five new customers. It buys bottled water at ₹90 per case and sells to retail customers at a list price of ₹108 per case. The data pertaining to five customers are:

	Customers				
	Α	В	С	D	Е
Cases Sold	4,680	19,688	1,36,800	71,550	8,775
List Selling Price (₹)	108	108	108	108	108
Actual Selling Price (₹)	108	106.20	99	104.40	97.20
Number of Purchase Orders	15	25	30	25	30
Number of customer visits	2	3	6	2	3
Number of deliveries	10	30	60	40	20
Kilometres travelled per delivery	20	6	5	10	30
Number of expedited deliveries	0	0	0	0	1

Its five activities and their Cost Drivers are:

Activity	Cost Driver Rate
Order taking	₹750 per purchase order
Customer visits	₹600 per customer visit
Deliveries	₹5.75 per delivery kilometre travelled
Product handling	₹3.75 per case sold
Expedited deliveries	₹2,250 per expedited delivery

Required: Compute the customer-level operating income of each of the five retail customers now being examined (A, B, C, D and E). Comment on the results.

[Ans: A: ₹53,090; B: ₹2,23,531; C: ₹6,90,375; D: ₹7,39,757 and E: ₹274]

Problem 5

ABC Bank is examining the profitability of its Premier Account, a combined savings and cheque account. Depositors received a 5% annual interest on their average deposit. ABC bank earns an interest rate spread of 3% (the difference between the rate at which it lends money and rate it pays to depositors) by lending money for home loan purpose at 8%.

The Premier Account allows depositors unlimited use of services such as deposits, withdrawals, cheque facility, and Foreign Currency Drafts. Depositors with Premier Account, having balances of ₹50,000 or more, received unlimited free use of services.

Depositors with a minimum balance of less than ₹50,000 pay ₹1,000-a-month service fee for their Premier Account. ABC Bank recently conducted an Activity Based Costing Study of its services. The use of these services in a year by three customers is as follows:

	Activity Based Cost		Account Usage	e
	per transaction (₹)	Customer X	Customer Y	Customer Z
Deposits/Withdrawal with teller	125	40	50	5
Deposits/Withdrawal with ATM	40	10	20	16
Deposits/Withdrawal on pre-arranged monthly basis	25	0	12	60
Bank cheques written	400	9	3	2
Foreign Currency Drafts	600	4	1	6
Inquiries about Account Balance	75	10	18	9
Average Premier Account Balance for the year		₹55,000	₹40,000	₹12,50,000

Assume Customers \times and Z always maintain their balances over ₹50,000, whereas, Y always has a balance of under ₹50,000.

Required: Compute the profitability of Customers X, Y and Z's Premier Accounts at ABC Bank.

[Ans: Profits for the Bank: × - ₹10,500; Y - ₹2,700 and Z - ₹29,660]

[Hint: The income for the bank comprises of 3% spread on the average balance in the account and ₹1000 per month (i.e., ₹12,000 per annum) service fees in case of Customer Y]

Solved Question Paper

Bangalore University VI Semester B.COM Examination, May 2017 (CBCS, Semester Scheme) (2016 – 17 and Onwards) (Freshers) Commerce

Paper 6.6 (Elective Paper – IV): Cost Management

[Time: 3 hours]

Instruction: Answers should be written completely in English or in Kannada.

Section A

- 1. Answer any five sub-questions from the following.
 - (a) Give the meaning of margin of safety.
 - (b) What do you mean by variance?
 - (c) Give the meaning of business process re-engineering.
 - (d) What is a flexible budget?
 - (e) Calculate the Break-even Point in units. Fixed cost: ₹1,20,000; Variable cost per unit: ₹10; Selling price per unit: ₹16.

Solution

BEP (units) = $\frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{\overline{1,20,000}}{(16-10)} = 20,000 \text{ units}$

- (f) What is a cost driver?
- (g) A product X requires 25 units of standard material at the rate of ₹5 per unit. The actual consumption of material for the manufacture of product X is 20 units at the rate of ₹4 per unit. Calculate material cost variance.

Solution

MCV = Standard material cost for actual production - Actual material cost

= $(25 \text{ units} \times ₹5) - (20 \text{ units} \times ₹4)$ = 125 - 80= 45 (F)

 $(5 \times 2 = 10)$

[Max. Marks: 70]

Section **B**

Answer any three of the following.

 $(3 \times 6 = 18)$

- 2. Write the differences between Cost Control and Cost Reduction.
- 3. Briefly explain the limitations of Budgetary Control.
- From the following, calculate labour variances of Department A. Actual direct wages ₹2,000
 Standard hours 8,000
 Standard rate per hour 30 paisa
 Actual hours worked 8,200

Solution

LCV = Standard Labour Cost for Actual Production – Actual Labour Cost

= (8,000 hours × ₹0.30) – ₹2,000 = 2,400 – 2,000 = 400 (F)

 $LRV = (Standard Rate - Actual Rate) \times Actual Time$

$$= \left\{ ₹0.30 - \left(\frac{2,000}{8,200}\right) \right\} \times 8,200 = \{ ₹0.30 - 0.2439 \} \times 8,200 = 0.05608 \times 8,200 = 460 \text{ (F)} \right\}$$

LEV = (Standard Time for Actual Production – Actual Time) × Standard Rate = $(8,000 - 8,200) \times 0.30 = 200 \times 0.30 = 60$ (A)

5. A firm has produced and sold 20,000 units during the year 2016. The selling price was ₹50 per unit. The cost details were:

Direct material ₹6 per unit Direct labour ₹6 per unit Variable overhead ₹3 per unit Fixed expenses ₹3,50,000 Prepare a marginal cost statement to show the profit or loss for the year and also find out the Break-even Point.

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Solution

Particulars	₹	₹
Sales (20,000 × ₹50)		10,00,000
Less: Variable Cost		
Direct material (20,000 × ₹6)	1,20,000	
Direct labour (20,000 × ₹6)	1,20,000	
Variable overheads (20,000 × ₹3)	60,000	3,00,000
Contribution		7,00,000
Less: Fixed expenses		3,50,000
Profit		3,50,000

Marginal Cost Statement

BEP = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{3,50,000}{(50-15)} = \frac{3,50,000}{35} = 10,000 \text{ units}$

6. Pavithra Ltd. manufactures two products X and Y. Product X produced in four runs of 250 units and product Y in five independent runs of 200 units. Each product consumes equal direct material and direct labour content. The product overheads amount to ₹36,000 which consist line set up costs ₹18,000, product inspection cost ₹9,000 and ₹9,000 for material movement to the product line. Total cost incurred for producing 1,000 units of X and 1,000 units of product Y will be as follows:

Particulars	Amount (₹)
Direct material	30,000
Direct labour	8,000
Production overhead	40,000
Total	78,000

Calculate product-wise cost under Activity Based Costing.

Solution

Step One: Identification of Cost Drivers and Calculation of Cost Driver Rate

Activity	Cost Pool (₹)	Cost Driver	Total Cost Driver Volume	Cost Driver Rate (₹)
Line set-up	18,000	Number of Production Runs	9 Runs (4 + 5)	2,000 per run
Product Inspection	9,000	Number of Units	2,000 Units (1,000 + 1,000)	4.50 per unit
Material Movement	9,000	Number of units of material used	2,000 Units (1,000 + 1,000)	4.50 per unit

Note: Since the direct material consumption is equal for both the units, the number of units of material used is same as number of units produced.

Step Two: Calculation of Product-wise Cost

	Product	
	X (₹)	Y (₹)
Direct material cost (Equal apportionment)	15,000	15,000
Direct Labour cost (Equal apportionment)	4,000	4,000
Overheads:		
Production Line set-up		
(Number of runs × Rate per Requisition)	8,000	10,000
Product Inspection Costs		
(Number of units × Rate per unit)	4,500	4,500
Material Movement Cost		
(Number of units × Rate per unit)	4,500	4,500
Total Cost	36,000	38,000

Note: There is a mismatch in the information given in the problem. While the break-up of production overheads sum up to ₹36,000 (i.e., line set up costs ₹18,000, product inspection cost ₹9,000 and ₹9,000 for material movement to the product line) the total production overhead incurred is given as ₹40,000.

Section C

Answer any three questions.

 $(3 \times 14 = 42)$

7. From the following information prepare a flexible budget and estimate profit at 60% and 80% capacity.

Capacity	50%
Volume	10,000 units
Selling price per unit	₹200

SQP.4 ← Cost Management

Material per unit	₹100
Labour per unit	₹30
Factory overheads per unit	₹30 (₹12 fixed)
Administration overhead per unit	₹20 (₹10 fixed)
At 600/ comparity motorial cost par 1	nit increased by 20

At 60% capacity, material cost per unit increased by 2% and selling price per unit falls by 2%. At 80% capacity material cost per unit increases by 5% and selling price per units falls by 5%.

Solution

	50% Capacity 10,000 units		60% Capacity 12,000 units		50% Capacity 60% Capacity 80% Capacity 10,000 units 12,000 units 16,000 units		apacity) units
	Per unit (₹)	Total (₹)	Per unit (₹)	Total (₹)	Per unit (₹)	Total (₹)	
Material	100	10,00,000	102	12,24,000	105	16,80,000	
Labour	30	3,00,000	30	3,60,000	30	4,80,000	
Factory overheads							
- Fixed	12	1,20,000	10	1,20,000	7.5	1,20,000	
- Variable	18	1,80,000	18	2,16,000	18	2,88,000	
Administration overheads							
- Fixed	10	1,00,000	8.33	1,00,000	6.25	1,00,000	
- Variable	10	1,00,000	10	1,20,000	10	1,60,000	
Total Cost	180	18,00,000	178.33	21,40,000	176.75	28,28,000	
Profit	20	2,00,000	17.67	2,12,000	13.25	2,12,000	
Sales	200	20,00,000	196	23,52,000	190	30,40,000	

Flexible Budget for 50%, 60% and 80% Capacity

8. An industry reports the following information for two consecutive years.

Particulars	31-03-2016	31-03-2017
Sales	₹8,10,000	₹9,00,000
Profits	₹18,000	₹45,000

Calculate:

(a) P/V Ratio

(b) Fixed cost

(c) Sales to earn a profit of ₹3,00,000

(d) Break Even Point in rupees

(e) Margin of safety at a profit of ₹72,000

(f) Profit when sales are ₹10,00,000

Solution

P/V Ratio =
$$\frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100 = \frac{(18,000 - 45,000)}{(8,10,000 - 9,00,000)} \times 100 = \frac{27,000}{90,000} \times 100 = 30\%$$

Contribution during the year 2016

Sales \times P/V Ratio = 8,10,000 \times 30% = 2,43,000

Fixed Cost = Contribution during 2016 – Profit during 2016

= 2,43,000 - 18,000 = 2,25,000

Sales required to earn a profit of ₹3,00,000 $= \frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{Profit Volume Ratio}} = \frac{(2,25,000+3,00,000)}{30\%} = 17,50,000$ Break Even Point (in rupees) = $\frac{\text{Fixed Cost}}{\text{P/V Ratio}} = \frac{2,25,000}{30\%} = 7,50,000$ Margin of safety at a profit of ₹72,000 Margin of safety = Total sales - Break even sales = 9.90.000 - 7.50.000= 2,40,000Note: Sales when the profit is ₹72,000 $= \frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{Profit Volume Ratio}} = \frac{(2,25,000+72,000)}{30\%} = 9,90,000$ Profit when sales are ₹10,00,000 Profit Volume Ratio = $\frac{\text{Fixed Cost} + \text{Profit}}{\text{Fixed Cost} + \text{Profit}}$ Sales $30\% = \frac{(2,25,000 + \text{Profit})}{10,00,000}$ $10,00,000 \times 30\% = 2,25,000 + Profit$ 3,00,000 = 2,25,000 + ProfitProfit = 3,00,000 - 2,25,000Profit = 75,000

9. The standard mix to produce one unit of product is as follows:

Material A	60 units at ₹15 per unit	₹900
Material B	80 units at ₹20 per unit	₹1,600
Material C	100 units at ₹25 per unit	₹2,500
Total	240 units	₹5,000

During the month of April 100 units were actually produced and consumption was as follows:

Material A	6,400 units at ₹17.50 per unit	₹1,12,000
Material B	9,500 units at ₹18 per unit	₹1,71,000
Material C	8,700 units at ₹27.50 per unit	₹2,39,250
Total	24,600 units	₹5,22,250

Calculate all material variances.

Solution

(a) Ascertainment of Inputs

Standard Quantity for Actual Production

- A $60 \times 100 = 6,000$ units
- B $80 \times 100 = 8,000$ units
- C $100 \times 100 = 10,000$ units

Total 24,000 units

Standard Material Cost

A $6,000 \text{ units} \times \mathbb{Z}15 = 90,000$

- B 8,000 units × ₹20 = 1,60,000
- C 10,000 units $\times \gtrless 25 = 2,50,000$

Revised Standard Quantity

 $= \frac{\text{Total Actual Quantity}}{\text{Total Standard Quantity}} \times \text{Standard Quantity of each material}$

A
$$\frac{24,600}{24,000} \times 6,000 = 6,150$$
 units

- B $\frac{24,600}{24,000} \times 8,000 = 8,200$ units
- C $\frac{24,600}{24,000} \times 10,000 = 10,250$ units

(b) Calculation of Variances

Material Cost Variance = Standard Material Cost for Actual Production - Actual Material Cost

- A 90,000 1,12,000 = 22,000 (A)
- B 1,60,000 1,71,000 = 11,000 (A)
- C 2,50,000 2,39,250 = 10,750 (F)

Total 10,750 - 22,000 - 11,000 = 22,250 (A)

Material Price Variance = (Standard Price per unit of material – Actual Price per unit of material)

× Actual Quantity of Material used

A $(15 - 17.50) \times 6,400 = 16,000$ (A)

B $(20-18) \times 9,500 = 19,000 (F)$

C $(25 - 27.50) \times 8,700 = 21,750$ (A)

Total 19,000 - 16,000 - 21,750 = 18,750

Material Usage Variance = (Standard Quantity for Actual Production – Actual Quantity used)

× Standard Price per unit of material

A $(6,000 - 6,400) \times 15 = 6,000$ (A)

B $(8,000 - 9,500) \times 20 = 30,000$ (A)

C $(10,000 - 8,700) \times 25 = 32,500 (F)$

Total 32,500 - 6,000 - 30,000 = 3,500 (A)

Material Mix Variance = (Revised Standard Quantity – Actual Quantity) × Standard Price

- A $(6,150-6,400) \times 15 = 3,750$ (A)
- B $(8,200 9,500) \times 20 = 26,000$ (A)
- C $(10,250 8,700) \times 25 = 38,750$ (F)

Total 38,750 - 3,750 - 26,000 = 9,000 (F)

Material Yield Variance = (Standard Quantity for Actual Production – Revised Standard Quantity)

× Standard Price

A $(6,000 - 6,150) \times 15 = 2,250$ (A)

- B $(8,000 8,200) \times 20 = 4,000$ (A)
- C $(10,000 10,250) \times 25 = 6,250$ (A)
- Total 2,250 + 4,000 + 6,250 = 12,500 (A)

Cost Pool	Budgeted Overhead	Cost driver	Budgeted Volumes
Material procurement	57,200	No. of orders	100
Material handling	24,000	No. of movements	60
Set-up	40,000	No. of set-ups	50
Maintenance	90,000	Maintenance hours	900
Quality control	18,000	No. of inspections	80
Machinery	72,000	No. of machine hours	2,400

10. The budgeted overheads and cost driver volumes of XYZ Ltd. are as follows:

The company has produced a batch of 250 components of product X. The material cost was \gtrless 60,000 and labour cost was \gtrless 1,00,000. The usage activities of the said batch are as follows:

Material orders	10
Maintenance hours	320
Material movement	10
Inspection	15
Set-ups	13
Machine hours	800

Calculate cost drivers rates and ascertain the cost of the batch of components of product X using Activity Based Costing.

Solution

Step One: Calculation of Cost Driver Rate for each Cost Pool

Cost Driver Rate = $\frac{\text{Cost Pool}}{\text{Volume of Cost Driver}}$

The Cost Driver Rate for each Activity is as below:

Material Purchase: $\frac{\overline{\xi}57,200}{100 \text{ orders}} = \overline{\xi}572 \text{ per order}$ Material Handling: $\frac{\overline{\xi}24,000}{60 \text{ movements}} = \overline{\xi}400 \text{ per movement}$ Set-up: $\frac{\overline{\xi}40,000}{50 \text{ set-ups}} = \overline{\xi}800 \text{ per set-up}$ Maintenance: $\frac{\overline{\xi}90,000}{900 \text{ hours}} = \overline{\xi}100 \text{ per hour}$ Quality Control: $\frac{\overline{\xi}18,000}{80 \text{ inspections}} = \overline{\xi}225 \text{ per inspection}$ Machinery: $\frac{\overline{\xi}72,000}{2400 \text{ machine hours}} = \overline{\xi}30 \text{ per machine hour}$

	(₹)
Material Cost (given)	60,000
Labour Cost (given)	1,00,000
Overheads	
Material Purchase (10 orders × ₹572 per order)	5,720
Material handling (10 movements × ₹400 per movement)	4,000
Set-up (13 set-ups × ₹800 per set-up)	10,400
Maintenance (320 hours × ₹100 per hour)	32,000
Quality Control (15 inspections × ₹225 per inspection)	3,375
Machinery (800 hours × ₹30 per hour)	24,000
Total cost for batch of 520 components	2,39,495

Step Two: Calculation of cost for a batch of 250 components

11. (A) Prepare a cash budget from the following for the period April to June 2016 from the following information.

Month	Credit Sales (₹)	Purchases (₹)	Wages (₹)
February	1,80,000	1,24,800	12,000
March	1,92,000	1,44,000	14,000
April	1,08,000	2,43,000	11,000
May	1,74,000	2,46,000	10,000
June	1,26,000	2,68,000	15,000

50% of the credit sales are realized in the month following the sales and the remaining 50% in the second month following. Creditors are paid in the month following the month of purchases. Wages are paid in the same month. Cash in hand was ₹25,000 on April 2016.

Solution

Basic workings

- 1. Collection from debtors in the month of April, 2016
 - = 50% of credit sales of February + 50% of credit sales of March
 - = 90,000 + 96,000
 - = 1,86,000
- 2. Collection from debtors in the month of May, 2016
 - = 50% of credit sales of March + 50% of credit sales of April
 - = 96,000 + 54,000
 - = 1,50,000
- 3. Collection from debtors in the month of June, 2016
 - = 50% of credit sales of April + 50% of credit sales of May
 - = 54,000 + 87,000
 - = 1,41,000
- 4. Payment to creditors in the month of April, 2016 Credit purchases of March ₹1,44,000
- Payment to creditors in the month of May, 2016 Credit purchases of April, 2016 ₹2,43,000
- Payment to creditors in the month of June, 2016 Credit purchases of May, 2016 ₹2,46,000 Cash budget for the period April to June 2016

Particulars	April (₹)	May (₹)	June (₹)
Opening Balance	25,000	56,000	(47,000)
Add: Receipts from debtors	1,86,000	1,50,000	1,41,000
	2,11,000	2,06,000	94,000
Less: Payment to creditors	1,44,000	2,43,000	2,46,000
Payment of wages	11,000	10,000	15,000
	56,000	(47,000)	(1,67,000)

(B) Using the following information, calculate:

- (a) Labour Cost Variance
- (b) Labour Rate Variance
- (c) Labour Efficiency Variance

Standard hours	4,000
Actual hours	5,000
Standard wage rate	₹3 per hour
Actual wage rate	₹2.50 per hour

Solution

Labour Cost Variance

- = (Standard Labour Cost for Actual Production Actual Labour Cost)
- $= (4,000 \times 3) (5,000 \times 2.50)$

= 12,000 - 12,500

= 500 (A)

Labour Rate Variance

- = (Standard Rate Actual Rate) × Actual time taken
- $=(3-2.5)\times 5,000$
- = 2,500 (F)

Labour Efficiency Variance

= (Standard time for Actual Production – Actual time) \times Standard Rate

 $= (4,000 - 5,000) \times 3$

= 3,000 (A)

Verification

LCV = LRV + LEV

500 (A) = 2,500 (F) + 3,000 (A)

Model Question Paper 1

VI Semester B.COM

Paper AC 6.6 – Cost Management

[Time: 3 hours]

Section A

- 1. Answer any five sub-questions. Each question carries two marks.
 - a. What do you understand by Cost Control and Cost Reduction? Explain the scope of Cost Reduction.
 - b. What is Value Engineering?
 - c. Explain the concept of Angle of Incidence.
 - d. Explain the meaning of Efficiency Variances.
 - e. State any four limitations of Budgetary Control.
 - f. What are the reasons for Material Usage Variance?
 - g. What is a Cost Driver?

Section **B**

Answer any three questions. Each question carries six marks.

 $(3 \times 6 = 18)$

- 2. Explain in detail the various tiers of Assessing Competitive Advantage under Value Chain Analysis.
- 3. Ascertain the amount of contribution and profit from the following:

Particulars	Amount
Direct Materials	₹2,00,000
Direct Wages	₹1,60,000
Overheads	
Fixed	₹60,000
Variable	₹1,00,000
Production	5,000 units
Sales	4,500 units at ₹200 per unit

[Ans: ₹4,86,000 and ₹4,26,000]

4. A manufacturing concern, which has adopted Standard Costing, furnishes the following information:

Standard	Actual
Material for 70 kg finished product: 100 kg	Output: 2,10,000 kg
Price of material: ₹1 per kg	Materials used: 2,80,000 kg
	Cost of materials: ₹2,52,000

[Max. Marks: 70]

 $(5 \times 2 = 10)$

MQP.2 Cost Management

Calculate: (a) Material Usage Variance (b) Material Price Variance and (c) Material Cost Variance [Ans: (a) ₹20,000 (F), (b) ₹28,000 (F), and (c) ₹48,000 (F)]

5. Prepare a Flexible Budget for production of 90% (9,000 units) on the basis of following information:

Particulars	Amounts
Production at 50% capacity	5,000 units
Raw Materials	₹75 per unit
Direct Labour	₹45 per unit
Direct Expenses	₹20 per unit
Factory Expenses	₹60,000 (40% fixed)
Administrative Expenses	₹40,000 (50% variable)

[Ans: At 50% capacity, Total Cost: ₹8,00,000 at ₹160 per unit; At 90% capacity, Total Cost: ₹14,04,800 at ₹156.09 per unit]

- 6. State, with a brief reason, whether you would recommend an Activity-Based Costing System in each of the following independent situations:
 - a. Company K produces one product. The Overhead Costs mainly consist of Depreciation.
 - b. Company L produces 5 different products using different production facilities.
 - c. A consultancy firm consisting of lawyers, accountants and computer engineer provides management consultancy services to clients.
 - d. Company S produces two different Labour Intensive methods. The contribution per unit in both the products is very high. The BEP is very low. All the work is carried on efficiently to meet the target cost.

[Ans: (a) Not Recommended, (b) Recommended, (c) Recommended and (d) Not recommended]

Section C

Answer any three questions. Each question carries fourteen marks.

 $(3 \times 14 = 42)$

- 7. MNP Ltd. sold 2,75,000 units of its product at ₹37.50 per unit. Variable Costs are ₹17.50 per unit (Manufacturing Costs of ₹14 and Selling Costs of ₹3.50 per unit). Fixed Costs are incurred uniformly throughout the year and amount to ₹35,00,000 (including depreciation of ₹15,00,000). There are no beginning or ending inventories. Required:
 - a. Estimated Break-even Sales quantity and Cash Break-even Sales quantity.
 - b. Estimate the P/V Ratio.
 - c. Estimate the number of units that must be sold to earn an income (EBIT) of ₹2,50,000.
 - d. Estimate the sales level to achieve an after-tax income of ₹2,50,000. Assume 40% corporate Income Tax Rate.

[Ans: (a) 1,75,000 units and 1,00,000 units (b) 53.33% (c) 1,87,500 units and (d) 1,95,833 units]

8. Vishnu Ltd. produces an article by blending two basic raw materials. It operates a Standard Costing System and the following standards have been set for raw materials:

Materials	Standard Mix	Standard price per kg (₹)
А	40%	4.00
В	60%	3.00

The standard loss in process is 15%.

During January 2018, the company produced 1700 kg of finished output. The position of stocks and purchases for the month of January 2018 is given as follows:

Matarials	Stock on 01.01.2018	Stock on 31.01.2018	Purchased during January 2018		
Water lais	kg kg		kg	Cost (₹)	
А	35	5	800	3400	
В	40	50	1200	3300	

Calculate Material Cost Variances.

Ans:

Variance	Material A	Material B
Material Cost Variance	₹327.50 (A)	₹327.50 (F)
Material Price Variance	₹207.50 (A)	₹297.50 (F)
Material Usage Variance	₹120.00 (A)	₹30.00 (F)
Material Mix Variance	₹88.00 (A)	₹66.00 (F)
Material Yield Variance	₹32.00 (A)	₹36.00 (A)

9. Calculate all possible Labour Variances from the following data:

Particulars	Skilled	Unskilled
Standard time (hours)	500	500
Actual time (hours)	400	700
Standard Rate per hour (₹)	15	10
Actual Rate per hour (₹)	20	15

Ans:

Variance	Skilled	Unskilled
Labour Cost Variance	₹500 (A)	₹5,500 (A)
Labour Rate Variance	₹2,000 (A)	₹3,500 (A)
Labour Efficiency Variance	₹1,500 (F)	₹2,000 (A)
Labour Mix Variance	₹2,250 (F)	₹1,500 (A)
Labour Yield or Sub-efficiency Variance	₹750 (A)	₹500 (A)

10. From the following particulars, prepare Cash Budget for January to April 2018.

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Month	Credit Sales	Credit Purchases	Wages	Mfg. Expenses	Admin. Expenses	Selling Expenses
Nov. 2017	30,000	15,000	3,000	1,150	1,060	500
Dec. 2017	35,000	20,000	3,200	1,225	1,040	550
Jan. 2018	25,000	15,000	2,500	990	1,100	600
Feb. 2018	30,000	20,000	3,000	1,050	1,150	620
Mar. 2018	35,000	22,500	2,400	1,100	1,220	570
Apr. 2018	40,000	25,000	2,600	1,200	1,180	710

Additional information:

a. Balance of cash in hand on 1 January 2018 is ₹15,000.

b. The customers are allowed a credit period of 2 months.

- c. Creditors are allowing a credit period of 2 months.
- d. Wages are paid on the 5th of next month.
- e. Lag in the payment of other expenses is one month.
- f. Dividend of ₹10,000 is payable in April 2018.
- g. Plant purchased on 1 January 2018 for ₹5,000.
- h. Building purchased on 1 March 2018 for ₹20,000 but the payment is agreed to be made in monthly installments of ₹2,000. The first instalment is paid immediately on the purchase of building.

[Ans: Closing Cash Balance in the month of January: ₹18,985; February: ₹28,795; March: ₹30,975 and April: ₹23,685]

11. MST Ltd. has collected the following data for its two activities. It calculates Activity Cost Rates based on Activity Driver Capacity.

Activity	Cost Driver	Capacity	Cost (₹)
Power	Kilowatt hours	50,000 kilowatt hours	2,00,000
Quality inspections	Number of inspections	10,000 inspections	3,00,000

The company makes three products M, S and T. For the year ended 31 March 2018, the following consumption of Cost Drivers was reported.

Product	Kilowatt Hours	Quality Inspections
М	10,000	3,500
S	20,000	2,500
Т	15,000	3,000

Required:

- a. Compute the costs allocated to each product from each activity.
- b. Calculate the cost of unused capacity of each activity.
- c. Discuss the factors the management considers in choosing a capacity level to compute the budgeted fixed overhead cost rate.

[Ans: Power: M – ₹40,000, S – ₹80,000 and T – ₹60,000; Quality Inspections M – ₹1,05,000; S – ₹75,000 and T – ₹90,000; (ii) Power – ₹20,000; Quality Inspection – ₹30,000; (iii) Effect on Product Cost, Capacity Management, Pricing Decisions, Performance Evaluation, Regulatory Requirements, etc.]

Model Question Paper 2

VI Semester B.COM

Paper AC 6.6 – Cost Management

[Time: 3 hours]

Section A

1. Answer any **five** sub-questions. Each question carries **two** marks.

- a. Define Business Process Re-engineering.
- b. What is Cost Leadership?
- c. List any six tools of cost control and reduction.
- d. What is Margin of Safety? How can it be ascertained?
- e. What is Idle Time? How can Idle Time Variance be measured?
- f. What is Budgetary Control? List out any four advantages of budgetary control.
- g. List the types of activities as classified by Cooper and Kaplan.

Section B

Answer any three questions. Each question carries six marks.

- 2. What is Target Costing? Explain the steps involved in Target Costing.
- 3. DEF Bank operated for years under the assumption that increasing Rupee Volumes increases the profitability. But that has not been the case. Cost Analysis has revealed the following:

Activity	Activity Cost (₹)	Activity Driver	Activity Capacity
Providing ATM Service	1,00,000	Number of transactions	2,00,000
Computer processing	10,00,000	Number of transactions	25,00,000
Issuing statements	8,00,000	Number of statements	5,00,000
Customer inquiries	3,60,000	Telephone minutes	6,00,000

The following annual information on three products was also made available:

	Checking Accounts	Personal Loans	Gold Visa
Units of product	30,000	5,000	10,000
ATM transactions	1,80,000	0	20,000
Computer transactions	20,00,000	2,00,000	3,00,000
Number of statements	3,00,000	50,000	1,50,000
Telephone minutes	3,50,000	90,000	1,60,000

 $(5 \times 2 = 10)$

[Max. Marks: 70]

 $(3 \times 6 = 18)$

Required:

- 1. Calculate rates for each activity.
- 2. Using the rates computed in (1), calculate the cost of each product.

[Ans: ₹52.67, ₹42.80 and ₹46.60]

4. Sales for January, February & March 2018 are ₹1,40,000; ₹1,80,000 & ₹2,20,000 respectively. Of the sales, 25% is on cash basis and a credit period of one month is allowed to debtors. A cash discount of 2% is allowed on cash sales. You are required to calculate the amount of cash received during February and March.

[Ans: ₹34,300, ₹1,49,100 and ₹1,88,900]

5. The standard time and the rate for producing one unit of component A is given below:

Standard Hours per unit:	30 hours
Standard Rate:	₹8 per hour
The actual data along with related information are as fo	
Actual Production:	1000 units
Actual Hours:	30,600 hours
Actual Rate:	₹7.80 per hour

Calculate all possible Labour Variances.

Ans:

Labour Cost Variance	₹1,320 (F)
Labour Rate Variance	₹6120 (F)
Labour Efficiency	₹4800 (A)
Labour Yield Variance	₹4,800 (A)

6. The Fixed Cost amounts to ₹1,00,000 and the portion of Variable Cost to sales is given to be 2/3. If sales at 100% capacity amounts to ₹6,00,000, find out the BEP and the percentage of sales when it occurred. Also determine the profit at 80% capacity.

[Ans: ₹3,00,000, 50% and ₹60,000]

Section C

Answer any three questions. Each question carries fourteen marks.

 $(3 \times 14 = 42)$

 Alpha Ltd. has decided to analyse the profitability of its five new customers. It buys bottled water at ₹90 per case and sells to retail customers at a list price of ₹108 per case. The data pertaining to five customers are:

	Customers				
	Α	В	С	D	Е
Cases sold	4,680	19,688	1,36,800	71,550	8,775
List Selling Price (₹)	108	108	108	108	108
Actual Selling Price (₹)	108	106.20	99	104.40	97.20
Number of purchase orders	15	25	30	25	30
Number of customer visits	2	3	6	2	3
Number of deliveries	10	30	60	40	20
Kilometers travelled per delivery	20	6	5	10	30
Number of expedited deliveries	0	0	0	0	1

Its five activities and their Cost Drivers are as follows:

Activity	Cost Driver Rate
Order taking	₹750 per purchase order
Customer visits	₹600 per customer visit
Deliveries	₹5.75 per delivery kilometer travelled
Product handling	₹3.75 per case sold
Expedited deliveries	₹2,250 per expedited delivery

Required: Compute the customer-level operating income of each of five retail customers now being examined (A, B, C, D and E). Comment on the results.

[Ans: A: ₹53,090; B: ₹2,23,531 C: ₹6,90,375; D: ₹7,39,757 and E: ₹274]

 Prepare a Cash Budget for three months commencing from 1 June when the Cash Balance was ₹1,56,400. (All figures in ₹)

Month	Sales	Purchases	Wages	Factory Expenses	Selling Expenses
April	80,000	41,000	5,600	3,900	10,000
May	76,000	40,000	5,400	4,200	14,000
June	78,000	38,000	5,400	5,100	15,000
July	90,000	37,000	4,800	5,100	17,000
August	95,000	35,000	4,700	6,000	13,000

Additional information:

- a. 20% of sales is on cash basis.
- b. Customers are allowed two months of credit.
- c. Suppliers allow one month of credit.
- d. Lag in payment of wages is one month.
- e. Lag in payment of factory expenses is 1/2 month.
- f. Lag in payment of selling expenses is ¹/₄ month.

[Ans: Closing Balance: ₹1,71,200, ₹1,85,000, ₹2,05,050]

9. The following information at 50% capacity is given. Prepare a Flexible Budget and forecast the profit or loss at 60%, 70% and 90% capacities.

	Expenses at 50% capacity (₹)
Fixed Expenses	
Salaries	50,000
Rent and taxes	40,000
Depreciation	60,000
Administration Expenses	70,000
Variable Expenses	
Materials	2,00,000
Labour	2,50,000
Others	40,000
Semi-variable Expenses	
Repair	1,00,000
Indirect Labour	1,50,000
Others	90,000

It is estimated that Fixed Expenses will remain constant at all capacities. Semi-variable Expenses will not change between 45% and 60% capacities, will rise by 10% between 60% and 75% capacities, and a further increase of 5% when capacity crosses 75%.

Estimated sales at various levels of capacity 60% capacity – Sales: ₹11,00,000 70% capacity – Sales: ₹13,00,000 90% capacity – Sales: ₹15,00,000

[Ans: At 50% capacity, Total Cost: ₹10,50,00; At 60% capacity, Total Cost: ₹11,48,000, Loss: ₹48,000; At 70% capacity, Total Cost: ₹12,70,000, Profit: ₹30,000; At 90% capacity, Total Cost: ₹14,93,000, Profit: ₹7,000]

10. From the following data of A Co. Ltd., relating to budgeted and actual performance for the month of March 2018, compute Direct Materials and Direct Labour Cost Variances:

Budgeted data for March	
Units to be manufactured	1,50,000
Units of direct material required (based on standard rates)	4,95,000
Planned purchase of raw materials (units)	5,40,000
Average Unit Cost of Direct Material	₹8
Direct Labour Hours per unit of finished goods	3/4hour
Direct Labour Cost (Total)	₹29,92,500

Actual Data at the end of March	
Units actually manufactured	1,60,000
Direct Material Cost (Purchase Cost based on units actually issued)	₹43,41,900
Direct Material Cost (Purchase Cost based on units actually purchased)	₹45,10,000
Average Unit Cost of Direct Material	₹8.20
Total Direct Labour Hours for March	1,25,000
Total Direct Labour Cost for March	₹33,75,000

Ans:

Variance	(₹)
Material Cost Variance	1,17,900 (A)
Material Price Variance	1,05,900 (A)
Material Usage Variance	12,000 (A)
Labour Cost Variance	1,83,000 (A)
Labour Rate Variance	50,000 (A)
Labour Efficiency Variance	1,33,000 (A)

11. Madhav & Co. sells five different types of ball pens with identical Purchase Cost and Selling Prices. The company is trying to find out possibility of opening another store, which will have the following expenses and revenue:

Selling Price	₹30.00 per pen
Variable Cost	₹19.50 per pen
Salesmen Commission	₹1.50 per pen
Annual Fixed Expenses were	
Rent	₹60,000
Salaries	₹2,00,000
Advertising	₹80,000
Other Fixed Expenses	₹20,000

Required:

- a. Calculate the annual Break-even Point in units and in value. Also, determine the profit or loss if 35,000 ball pens are sold.
- b. The Sales Commission is proposed to be discontinued, but instead a fixed amount of ₹90,000 is to be incurred as fixed salaries. A reduction in Selling Price of 5% is also proposed. What will be the Break-even Point in units?
- c. Is it proposed to pay ₹0.50 per ball pen as further commission? The Selling Price is also proposed to be increased by 5%. What will be the Break-even Point in units?
- d. Refer to the original data. If the store manager were to be paid ₹0.30 commission on each ball pen sold in excess of Break-even Point, what would be the store's net profit if 50,000 ball pens were sold?

(Note: Consider each part of the question separately).

[Ans: (a) 40,000 units, ₹12,00,000 and ₹45,000 (b) 50,000 units (c) 36,000 units and (d) ₹87,000]

Model Question Paper 3

VI Semester B.COM

Paper AC 6.6 – Cost Management

[Time: 3 hours]

Section A

- 1. Answer any five sub-questions. Each question carries two marks.
 - a. State any four differences between Traditional System and Activity-Based Costing System of Absorbing Overheads.
 - b. State the different bases for classification of budgets.
 - c. Explain the meaning of Variable Overhead Cost Variance. What are the reasons for this variance?
 - d. What is Break-even Analysis? List any four assumptions underlying Break-even Analysis.
 - e. Write a short note on Vertical Linkage Analysis.
 - f. What is Segmentation Analysis? State its purpose.
 - g. List any four principles of Business Process Re-engineering.

Section B

Answer any three questions. Each question carries six marks.

2. Explain the meaning of Value Analysis and Value Engineering and list out the various issued addressed by these techniques.

3. Fixed Expenses: ₹1,80,000 Variable Cost per unit: ₹9 Selling Price per unit: ₹12 Find out: a. P/V Ratio.

- b. Break-even Sales with the help of P/V Ratio.
- c. Sales required to earn a profit of ₹9,00,000.

[Ans: (a) 25%, (b) ₹7,20,000 and (c) ₹43,20,000]

4. Calculate all possible Labour Variances from the following data:

Particulars	Skilled	Unskilled
Standard Time (Hours)	500	500
Actual Time (Hours)	400	700
Standard Rate per hour (₹)	15	10
Actual Rate per hour (₹)	20	15

[Max. Marks: 70]

 $(5 \times 2 = 10)$

 $(3 \times 6 = 18)$

Ans:

Variance	Skilled	Unskilled
Labour Cost Variance	₹500 (A)	₹5,500 (A)
Labour Rate Variance	₹2,000 (A)	₹3,500 (A)
Labour Efficiency Variance	₹1,500 (F)	₹2,000 (A)
Labour Mix Variance	₹2,250 (F)	₹1,500 (A)
Labour Yield or Sub-efficiency Variance	₹750 (A)	₹500 (A)

5.	Fixed Expenses:	₹1,49,500
	Variable Expenses at 50% capacity:	₹2,67,000
	Semi-variable Expenses at 50% capacity:	₹89,500
	Semi-variable Expenses are constant betwee	n 40% and 70% capacities and increase by 10% between 70% and
	85% capacities, and by 15% between 85% at	nd 100% capacities. Sales:
	At 50% capacity:	₹5,75,000
	At 60% capacity:	₹6,40,000
	At 80% capacity:	₹7,90,000
	Prepare Flexible Budget at 60% and 80% cap	pacities.

[Ans: At 50% capacity, Total Cost: ₹5,06,000, Profit: ₹69,000; At 60% capacity, Total Cost: ₹5,59,400,

Profit: ₹80,600; At 80% capacity, Total Cost: ₹6,75,150, Profit: ₹1,14,850]

6. The following are the Activities and their Cost Pool in a manufacturing organisation.

Primary Activities	
Material Procurement:	₹1,00,000
Equipment Maintenance:	₹70,000
Product Testing:	₹50,000
Support Activity	
Canteen Services:	₹60,000
The canteen services are used by employees of each	ch activity and the following are the number of employees
associated with each primary activity:	
Material Procurement:	40 employees
Equipment Maintenance:	15 employees
Product Testing:	5 employees
Calculate the revised Cost Pool of each activity afte	r apportioning the cost of support activity.

[Ans: ₹1,40,000, ₹85,000 and ₹55,000]

Section C

Answer any three questions. Each question carries fourteen marks.

7. VRK Ltd. and RKS Ltd. produce and sell the same type of product in the same market. The forecasted P & L Statement is as follows:

Particulars	VRK Ltd. (₹)		RKS Ltd. (₹)	
Sales		3,00,000		3,00,000
Less: Variable cost	2,00,000	2,50,000	2,25,000	2,50,000
Fixed cost	50,000		25,000	
Profit		50,000		50,000

You are required to calculate:

a. P/V Ratio, Break-even Point and Margin of Safety for each company.

b. State the volume at which each business will earn a profit of ₹80,000.

 $(3 \times 14 = 42)$

MQP.12 + Cost Management

c. Explain with reasons, which company is likely to earn a greater profit in the condition of (i) Heavy demand for the product and (ii) Low demand for the product

[Ans: (a) 33.33%, 25%, ₹1,50,000 and ₹1,00,000, ₹1,50,000 and ₹2,00,000 (b) ₹3,90,000 and ₹4,20,000 (c) (i) VRK Ltd. (ii) RKS Ltd.]

- 8. SSMR Ltd. has invested ₹20,00,000 in a business. The desired return on investment is 15%. From the analysis of recent cost figures, it is found that the Variable Cost is 60% and Fixed Cost is ₹8,00,000. Show workings to answer the following questions:
 - a. What sales volume should be achieved to break even?
 - b. What sales volume should be achieved to get 15% return on investment?
 - c. It is estimated that even if the business operations are stopped, an amount of ₹2,50,000 would be incurred as expenses. What sales should be maintained to recover such expenses?

[Ans: (a) ₹20,00,000, (b) ₹27,50,000 and (c) ₹6,25,000]

9. The following data relates to a factory:

Particulars	Skilled	Unskilled
Number in standard gang	20	10
Standard rate per hour	₹1	₹0.60
Number in actual gang	16	14
Actual Rate per hour	₹0.90	₹0.70

48 hours a week was worked and the actual output was 1,200 Standard Hours.

Compute Labour Variances assuming that:

- a. There is no abnormal Idle Time
- b. Abnormal Idle Time is one hour per employee

Ans:

	When there	is no idle time	In case of idle time	
Variance	Skilled (₹)	Unskilled (₹)	Skilled (₹)	Unskilled (₹)
Labour Cost Variance	108.80 (F)	230.40 (A)	108.80 (F)	230.40 (A)
Labour Rate Variance	76.80 (F)	67.20 (A)	76.80 (F)	67.20 (A)
Labour Efficiency Variance	32 (F)	163.20 (A)	32 (F)	163.20 (A)
Labour Mix Variance	192 (F)	115.20 (A)	188 (F)	112.80 (A)
Labour Yield or Sub-efficiency Variance	160 (A)	48 (A)	140 (A)	42 (A)
Labour idle-time Variance	-	_	16 (A)	8.40 (A)

10. From the following particulars, prepare Cash Budget for April, May and June 2018 and estimate the amount of overdraft facility to be sought from the bankers of the company.

				(All figures in ₹)
Month	Sales	Purchases	Wages	Other Expenses
February 2018	1,20,000	84,000	10,000	7,000
March 2018	1,30,000	1,00,000	12,000	8,000
April 2018	80,000	1,04,000	8,000	6,000
May 2018	1,16,000	1,06,000	10,000	12,000
June 2018	88,000	80,000	8,000	6,000

Additional information:

- a. Cash Balance on 1 April 2018 is ₹5,000.
- b. Interest on investment of ₹5,000 per quarter falls due in April.
- c. 20% of sales is realized in the month of sales, on which 2% of cash discount is allowed and the balance is realized equally in two subsequent months.
- d. Payment for purchases is made in the following month.
- e. 25% of wages is paid in the following month.
- f. Other expenses are paid in the following month.
- g. Rent is paid quarterly in advance at ₹1,000 per month and it is due in April 2018.
- h. First Installment of Advance Income Tax becomes payable before 15 June 2018.

[Ans: Closing Cash Balance in the month of April ₹5,680; May ₹7,084 (Overdraft) and June ₹62,936 (Overdraft)]

11. ABC Bank is examining the profitability of its Premier Account, a combined Savings and Cheque Account. Depositors received a 5% annual interest on their average deposit. ABC bank earns an interest rate spread of 3% (the difference between the rate at which it lends money and the rate it pays to depositors) by lending money for home loan purpose at 8%.

The Premier Account allows depositors unlimited use of services such as deposits, withdrawals, cheque facility, and foreign currency drafts. Depositors with Premier Account balances of ₹50,000 or more received unlimited free use of services.

Depositors with minimum balance of less than ₹50,000 pay ₹1,000-a-month service fee for their Premier Account. ABC Bank recently conducted an activity-based costing study of its services. The use of these services in a year by three customers is as follows-

	Activity-Based Cost	Account Usage		
	per transaction (₹)	Customer X	Customer Y	Customer Z
Deposits/Withdrawal with teller	125	40	50	5
Deposits/Withdrawal with ATM	40	10	20	16
Deposits/Withdrawal on prearranged monthly basis	25	0	12	60
Bank cheques written	400	9	3	2
Foreign currency drafts	600	4	1	6
Inquiries about account balance	75	10	18	9
Average Premier Account balance for the year		₹55,000	₹40,000	₹12,50,000

Assume Customers X and Z always maintain balances above ₹50,000, whereas, Y always has a balance below ₹50,000.

Required: Compute the profitability of the Customers X, Y and Z's Premier Accounts at ABC Bank.

[Ans: Profits for the Bank: X – ₹10,500, Y – ₹2,700 and Z – ₹29,660]

[**Hint:** The income for the bank comprises of 3% spread on the average balance in the account and ₹1000 per month (i.e., ₹12,000 per annum) service fees in case of Customer Y]