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2022 SYLLABUS

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Paper-9

Operations Management & Strategic Management

25th Edition

Applicable for **June 2023** Attempt

Prof. Arun Kumar
CA (Dr.) Mohit Bahal
CS (Dr.) Himanshu Srivastava

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Students of professional courses are always short of time and therefore, unable to revise the entire syllabus before exams. Keeping this in mind, we are presenting this Scanner (2022 Syllabus). This Scanner would essentially meet the requirement of students of CMA for *Operations Management and Strategic Management*.

This Scanner broadly covers

*   How to present the answer.
*   The main contents of the answer.
*   What should be the length of answer for different marks.

Presentation of answer through tables would help the students in understanding the concepts in a clear manner.

Any further improvement in the contents of Scanner by making corrections and inclusions is keen to be achieved based on suggestions from the readers for which the author shall be obliged.

Wishing all students a great success.

Prof. Arun Kumar
CA (Dr.) Mohit Bahal
CS (Dr.) Himanshu Srivastava

In this edition

Questions	Solutions
December - 2012 to December - 2022 Duly incorporated in chapters.	December - 2012 to December - 2021 Duly incorporated in chapters.

CMA Inter Gr. II

SCANNER™

(2022 Syllabus)
Paper 9 - Operations Management and Strategic Management

Editors:

Prof. Arun Kumar
M.Com., D.Phil., AMT (AIMA),
ISO Lead-Auditor (UK),
CISA (USA)
Professor,
Motilal Nehru Institute of Research
& Business Administration
University of Allahabad,
Allahabad

CA (Dr.) Mohit Bahal
M.Com.,FCA, Ph.D, ISA (ICAI), HDISM,
UGC-NET (Commerce)
UGC-NET (Management)
CS (Dr.) Himanshu Srivastava
M.Com., D.Phil, UGC-NET, *LLB,*
NSE (Certificate in Financial Market),
ACS, Assistant Professor,
Motilal Nehru Institute of Research
& Business Administration,
University of Allahabad,
Allahabad

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Contents to Scanner

Paper - 9 _____ Operations Management and Strategic Management

Dedicated To _____

My Cute Daughters

Sumedha and Kamakshi

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*Dedicated To*_____

My Sweet Daughters

Saanvi and Gaurvi

CS (Dr.) Himanshu Srivastava

UNIQUE FEATURES OF THIS EDITION

→ An **Examination Trend Analysis** for question paper based contents of last five examinations before the paper.

→ Questions are arranged according to the **subject/topic** in ascending order of examinations/years.

→ **Graph** for every chapter, showing marks allotment for last twenty examinations amongst Short Notes, Distinguish Between, Descriptive Questions and Practical Questions.

→ Line Chart Showing Relative Importance of Chapters.

→ Table Showing Marks of **Compulsory Questions** at the end of every chapter.

→ Analytical Classification of every Chapter in **Four** Categories:
   (1) Short Notes,
   (2) Distinguish Between,
   (3) Descriptive Questions and
   (4) Practical Questions.

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Chatar Singh Kalra, Punjab

Section - A

Operations Management

Syllabus

The syllabus in this module comprises the following topics and study weightage:

Module No.	Module Description	Weight
	Section A: Operation Management	60%
1.	Operations Management – Introduction	5%
2.	Operations Planning	5%
3.	Designing of Operational Systems and Control	5%
4.	Production Planning and Control	20%
5.	Productivity Management and Quality Management	5%
6.	Project Management	15%
7.	Economics of Maintenance and Spares Management	5%
	Section B: Strategic Management	40%
8.	Introduction	10%
9.	Strategic Analysis and Strategic Planning	10%
10.	Formulation and Implementation of Strategy	10%
11.	Digital Strategy	10%

Examination Trend Analysis

Paper 9
Operations Management and Strategic Management

Question Paper Based Contents of Last Five Examinations

9.5

9.7

Operations Management & Strategic Management
Line Chart Showing Relative Importance of Chapters

9.10
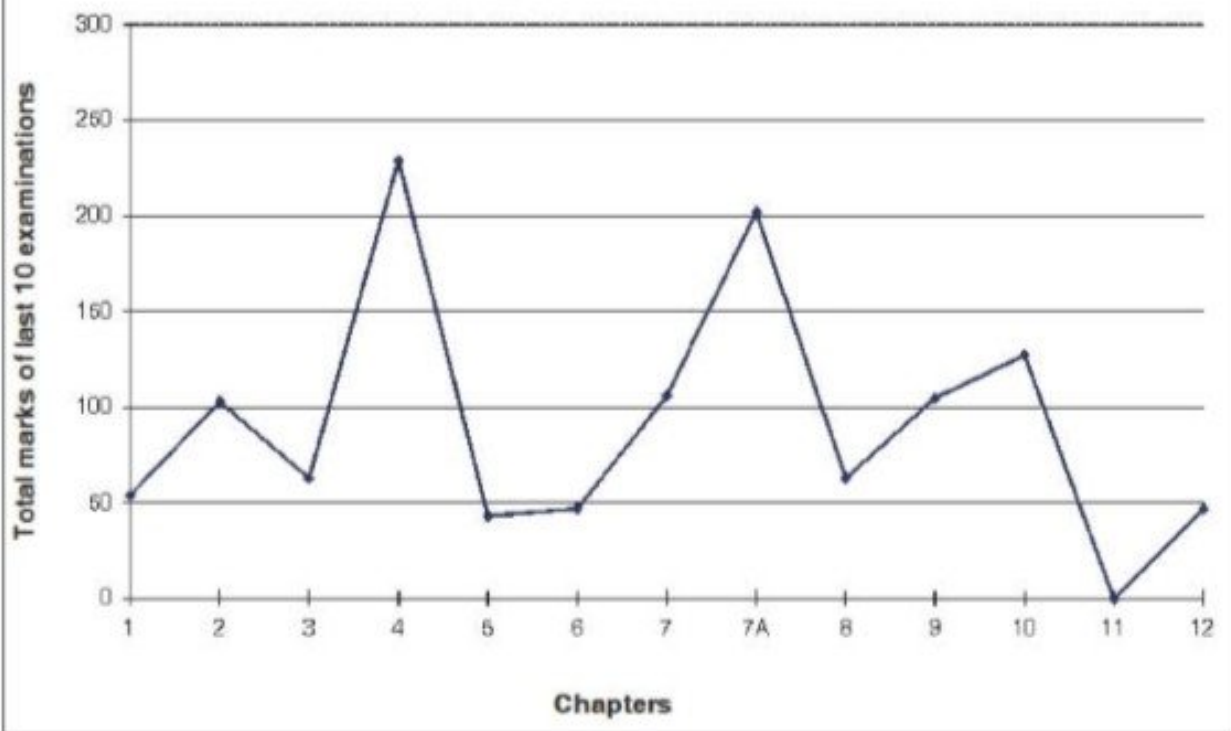
Frequency Table Showing Distribution of Marks

Chap. No.	Chapter Name	16 June	16 Dec.	17 June	17 Dec.	18 June	18 Dec.	19 June	19 Dec.	21 Dec.	22 Dec.	Total	Ave.
1.	Operations Management-Introduction	5	2	6	7	6	6	6	7	1	8	54	5.4
2.	Operations Planning	6	7	10	9	10	10	10	9	24	8	103	10.3
3.	Designing of Operational Systems and Control			6	7	8	6	6	8	15	7	63	6.3
4.	Application of Operation Research – Production Planning and Control	13	13	26	25	32	26	36	16	17	25	229	22.9
5.	Productivity Management and Quality Management	14	9						8	12		43	4.3
6.	Project Management, Monitoring and Control	6	2	6	6		6		6	5	10	47	4.7
7.	Economics of Maintenance and Spares Management	13	24	10	10	8	10	6	10	9	6	106	10.6
7A.	Objective Questions Operations Management	11	9	22	22	22	22	22	22	28	22	202	20.2
8.	Strategic Management -Introduction			12	10	4	12	8	8	3	6	63	6.3
9.	Strategic Analysis and Strategic Planning	2		10	16	16	14	14	14	3	16	105	10.5
10.	Formulation and Implementation of Strategy		2	18	14	20	14	18	18	5	18	127	12.7
11.	Digital Strategy												
12.	Objective Questions Strategic Management			6	6	6	6	6	6	5	6	47	4.7

9.11

1 OPERATIONS MANAGEMENT- INTRODUCTION

THIS CHAPTER INCLUDES

- Scope
- Characteristics of Modern Operations Functions

- Recent Trends in Production and Operations Management

Marks of Objective, Short Notes, Distinguish Between, Descriptive & Practical Questions

Legend

⬚ Objective ⬚ Short Notes ⬚ Distinguish ⬚ Descriptive ⬚ Practical
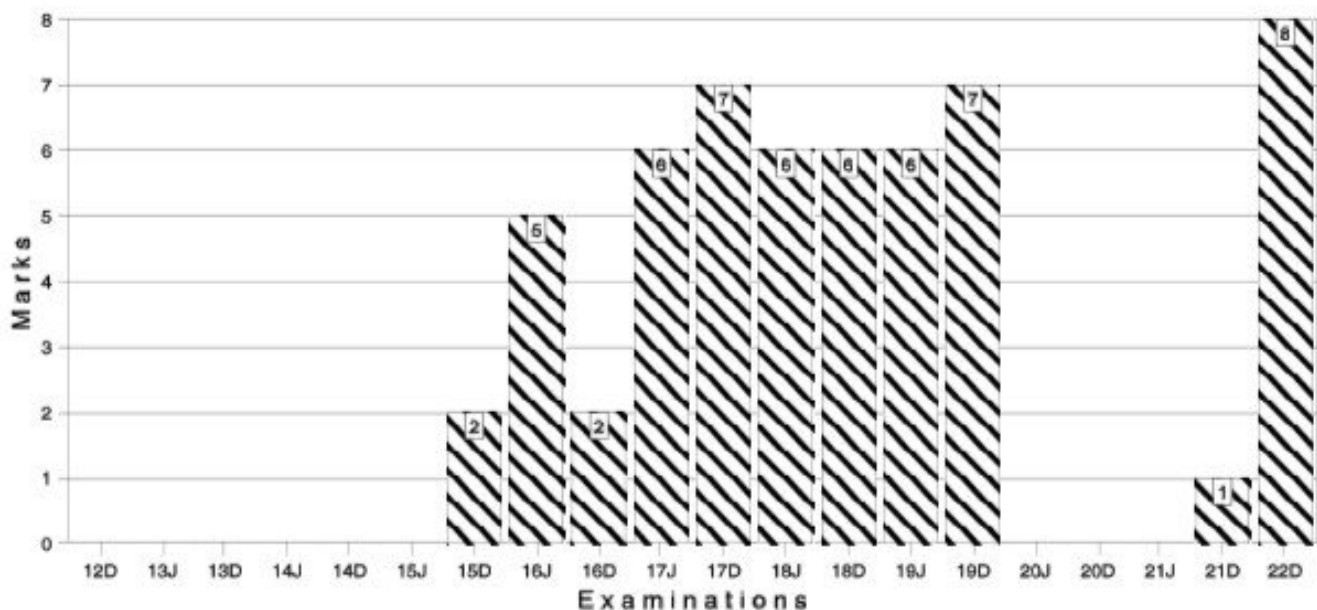
CHAPTER AT A GLANCE

1. Operations Management- Introduction

Operations management is the management of that part of an organization that is responsible for producing goods and/or services. There are examples of these goods and services all around you. Every book you read, every video you watch, every e-mail you send, every telephone conversation you have, and every medical treatment you receive involves the operations function of one or more organizations. So does everything you wear, eat, travel in, sit on, and access the internet with.

2. Objectives of Operations Management

 (i) Customer service
(ii) Resource Utilization

3. Scope of Operation Management

1. Location of facilities.
2. Plant layouts and Material Handling.
3. Product Design.
4. Process Design.
5. Production and planning control.
6. Quality control.
7. Materials management.
8. Maintenance management.

4. Characteristic of Modern Operations Function

1. Manufacturing as Competitive Advantage
2. Services Orientation
3. Disappearance of Smokestacks
4. Small has become beautiful

5.	Recent Trends in Production/Operations Management

1. Global Market Place
2. Production/Operations Strategy
3. Total Quality Management (TQM)
4. Flexibility

DESCRIPTIVE QUESTIONS

2015 - Dec [1] Answer the question:

(a) Identify four principal functions of an operating system with reference to Operation Management. **(2 marks)**

Answer:

An Operating System is defined as a configuration of resources combined for the provision of goods or services.

The function of an operating system is a reflection of the purpose it serves for its customers. The following four principal functions identified below also relate to the basic four operations done in any organization:

1.	**Manufacture**	Manufacturing function is the one which involves some physical transformation, or a change in the form utility of the resources. Something is physically created and the output consists of goods which differ physically (e.g., in terms of form, content etc.) from those materials input to the system.
2.	**Transport**	This function of operating system provides a change in the place utility of something or someone in order to satisfy customer. The customer, or something belonging to the customer, is moved from place to place and thus results in the change in location. There is no major change in the form of resources.

3.	**Supply**	This function provides a change in the possession utility of a resource, i.e., the ownership or possession of goods in changed. Unlike manufacture, outputs of the system are physically same as the inputs.
4.	**Service**	This function primarily results in a change in the state utility of a resource. The principal common characteristic is the treatment or accommodation of something or someone. The state or condition of the physical outputs will differ from the inputs as they have undergone same kind of treatment.

—— Space to write important points for revision ——

2016 - June [II] Answer the question:
1. (b) 'Operations management is responsible for producing goods and/or services.' In this context, define 'Operating System' and state the principal functions of an operating system. **(1+4 = 5 marks)**

Answer:
Please refer 2015 - Dec [1] (a) on page no. 15
—— Space to write important points for revision ——

2016 - Dec [1] (d) List categories of processes in a production system.
(2 marks) [Sec. A]
Answer:
Basically, processes can be categorised as:
  (i) **Conversion processes:** i.e., converting the raw materials into finished products (for example, converting iron ore into iron and then to steel). The conversion processes could be metallurgical or chemical or manufacturing or construction processes.
  (ii) **Manufacturing processes:** Can be categorised into (a) Forming processes, (b) Machining processes and (c) Assembly processes.
  (iii) **Testing processes:** Which involve inspection and testing of products (sometimes considered as part of the manufacturing processes.)
—— Space to write important points for revision ——

2017 - June [2] (a) 'An important objective of Operations Management is Resource Utilization'. Enumerate. Also list the scope of Operations Management. **(3 + 3 = 6 marks)**

Answer:

Resource Utilization

Another major objective is to utilize resources for the satisfaction of customer wants effectively, i.e., customer service must be provided with the achievement of effective operations through efficient use of resources. Inefficient use of resources or inadequate customer service leads to commercial failure of an operating system.

Operations management is concerned essentially with the utilization of resources, i.e., obtaining maximum effect from resources or minimizing their loss, under utilization or waste. The extent of the utilization of the resources' potential might be expressed in terms of the proportion of available time used or occupied, space utilization, levels of activity, etc. Each measure indicates the extent to which the potential or capacity of such resources is utilized. This is referred as the objective of resource utilization.

Operations management is also concerned with the achievement of both satisfactory customer service and resource utilization. An improvement in one will often give rise to deterioration in the other. Often both cannot be maximized, and hence a satisfactory performance must be achieved on both objectives. All the activities of operations management must be tackled with these two objectives in mind, and many of the problems will be faced by operations managers because of this conflict. Hence, operations managers must attempt to balance these basic objectives.

Scope of Operation Management

Operations Management concern with the conversion of inputs into outputs, using physical resources, so as to provide the desired utilities to the customer while meeting the other organizational objectives of effectiveness, efficiency and adoptability. It distinguishes itself from other functions such as personnel, marketing, finance, etc. by its primary concern for 'conversion by using physical resources'. Following are the activities, which are listed under

Production and Operations Management Functions:
1. Location of facilities
2. Plant Layouts and Material Handling
3. Product Design
4. Process Design
5. Production and Planning Control
6. Quality Control
7. Materials Management
8. Maintenance Management

—— Space to write important points for revision ——

2017 - Dec [2] (a) Briefly explain the characteristics of the modern production system. **(7 marks)**

Answer:

'The production management of today presents certain characteristics which make it look totally different from what it was during the past as follows:

1. **Manufacturing as Competitive Advantage:** In the past production was considered to be like any other function in the organisation. When the demand was high and production capacities were inadequate, the concern was to somehow muster all inputs and use them to produce goods which would be grabbed by market. But today's scenario is contrasting. Plants have excess capacities, competition is mounting and firms look and gain competitive advantage to survive and succeed. Production system offers vast scope to gain competitive edge and firms intend to exploit the potential. Total Quality Management (TQM), Time-Based Competition, Business Process Re-engineering (BPRE), Just-in-Time (JIT), Focused Factory, Flexible Manufacturing Systems (FMS), Computer Integrated Manufacturing (CIM), and The Virtual Corporation are some techniques which the companies are employing to gain competitive advantage.

2. **Services Orientation:** Service sector is gaining greater relevance these days. The production system, therefore, needs to be organised keeping in mind the peculiar requirements of the service component. The entire manufacturing needs to be geared to serve (i) intangible and perishable

nature of the services, (ii) constant interaction with clients or customers, (iii) small volumes of production to serve local markets, and (iv) need to locate facilities to serve local markets. There is increased presence of professionals on the production, instead of technicians and engineers.

3. **Disappearance of Smokestacks:** Protective labour legislation, environmental movement and gradual emergence of knowledge based organisations have brought total transformation in the production system. Today's factories are aesthetically designed and built, environment friendly - in fact, they are homes away from homes. Going to factory every day is no more excruciating experience, it is like holidaying at a scenic spot.

4. **Small has Become Beautiful:** It was E.F. Schumacher who, in his famous book Small is Beautiful, opposed giant organisations and increased specialisation. He advocated instead, intermediate technology based on smaller working units, community ownership, and regional workplaces utilising local labour and resources. For him, small was beautiful. Businessmen, all over the world, did not believe in Schumacher's philosophy. Inspired by economies of scale, industrialists went in for huge organisations and mass production systems.

——— Space to write important points for revision ———

2018 - June [2] (a) Categorise the objectives of operations management and discuss about each category. **(2 + 4 = 6 marks)**

Answer:

Operations management is also concerned with the achievement of both satisfactory customer service and resource utilization. An improvement in one will often give rise to deterioration in the other. Often both cannot be maximized, and hence a satisfactory performance must be achieved on both objectives. All the activities of operations management must be tackled with these two objectives in mind, and many of the problems will be faced by operations managers because of this conflict. Hence, operations managers must attempt to balance these basic objectives.

- **Resource Utilization** Another major objective is to utilize resources for the satisfaction of customer wants effectively, i.e., customer service must be provided with the achievement of effective operations through

efficient use of resources. Inefficient use of resources or inadequate customer service leads to commercial failure of an operating system. Operations management is concerned essentially with the utilization of resources, i.e., obtaining maximum effect from resources or minimizing their loss, under utilization or waste. The extent of the utilization of the resources' potential might be expressed in terms of the proportion of available time used or occupied, space utilization, levels of activity, etc. Each measure indicates the extent to which the potential or capacity of such resources is utilized. This is referred as the objective of resource utilization.

- **Customer Service** an operations objective reflects how fast the firm can respond to customer requests. The more enhanced operations cycles, the faster the firm can respond, the higher customer satisfaction then the more likely they will buy again. The aim is to speed up response, ensure dependability of delivery, and reduce costs through minimizing total inventory across the whole system. Fast operations cycles reduce the time between customer request and product delivery and hence increase the overall revenue of the firm.

—— Space to write important points for revision ——

2018 - Dec [2] Answer the following question:
(a) Explain the concept of Operating System in order to have a clear idea of Operations Management. **(6 marks)**

Answer:

In order to have a clear idea of Operations Management, one must have an idea of 'Operating Systems'.

An Operating System is defined as a configuration of resources combined for the provision of goods or services.

Retail organizations, hospitals, bus and taxi services, tailors, hotels and dentists are all examples of operating systems. Any operating system converts inputs, using physical resources, to create outputs, the function of which is to satisfy customers wants. The creation of goods or services involves transforming or converting inputs into outputs.

Various inputs such as capital, labour, and information are used to create goods or services using one or more transformation processes (e.g., storing, transporting, and cutting). To ensure that the desired output are obtained, an organization takes measurements at various points in the transformation process (feedback) and then compares with them with previously established standards to determine whether corrective action is needed (control).

It is important to note that goods and services often occur jointly. For example, having the oil changed in your car is a service, but the oil that is delivered is a good. Similarly, house painting is a service, but the paint is a good.

The goods-service combination is a continuum. It can range from primarily goods, with little service, to primarily service, with few goods. Because there are relatively few pure goods or pure services, companies usually sell product packages, which are a combination of goods and services. There are elements of both goods production and service delivery in these product packages. This makes managing operations more interesting, and also more challenging.

—— Space to write important points for revision ——————

2019 - June [2] (a) List down various activities lying under Production and Operations Management function.   **(6 marks)**
Answer:
Various Activities lying under Production and Operations Management functions:
   (i)   Location of Facilities.
   (ii) Plant layouts and Material Handling.
   (iii) Product Design.
   (iv) Process Design.
   (v)   Production Planing and Control.
   (vi) Quality Control.
   (vii) Materials Management.
   (viii) Maintenance Management.
   —— Space to write important points for revision ——————

2019 - Dec [2] (a) Enumerate the characteristics of a modern operations function. **(7 marks)**

Answer:

Please refer 2017 - Dec [2] (a) on page no. 18.

—— Space to write important points for revision ——

2021 - Dec [19] To provide the "right thing at the right price at the right time" can be closely associated with which objective of Operations Management? **(1 mark) [Sec. B - SAQ]**

Answer:

Customer service

—— Space to write important points for revision ——

2022 - Dec [2] (a) (i) Enumerate what are the Activities which are listed under the production and Operations Management functions. **(4 marks)**

2022 - Dec [2] (a) (ii) Recent trends in production/operations management relate to Global Competition and the impact it has on manufacturing firms. In this context list down what are the recent trends in production/operations management. **(4 marks)**

—— Space to write important points for revision ——

No.	Repeatedly Asked Questions	
	Question	**Frequency**
1	Descriptive Question of: 15 - Dec [1] (a), 16 - June [II] 1. (b)	2 Times
2	Enumerate the characteristics of a modern operations function. 17 - Dec [2] (a), 19 - Dec [2] (a)	2 Times

2 | *OPERATIONS PLANNING*

THIS CHAPTER INCLUDES

- Demand Forecasting
- Capacity Planning
- Facility Location and Layout
- Resource Aggregate Planning
- Material Requirements Planning
- Manufacturing Resource Planning
- Economic Batch Quantity

Marks of Objective, Short Notes, Distinguish Between, Descriptive & Practical Questions

Legend

Objective | Short Notes | Distinguish | Descriptive | Practical
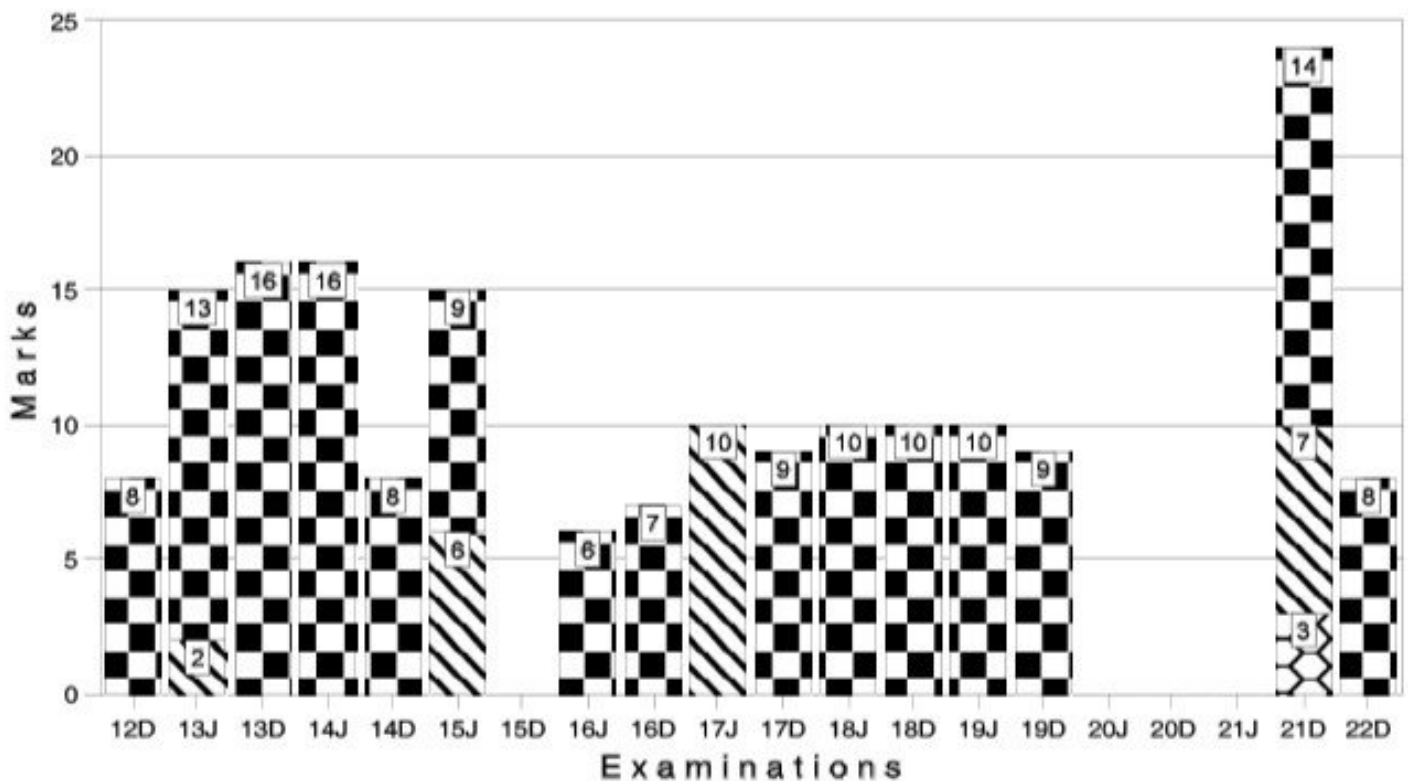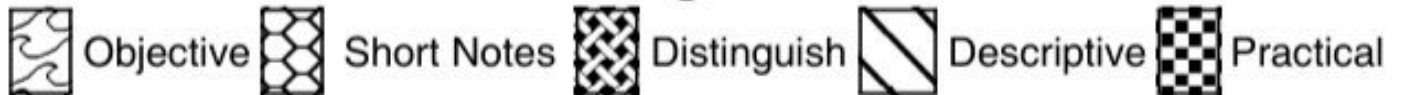
CHAPTER AT A GLANCE

1. Demand Forecasting

Forecasting means peeping into the future. As future is unknown and is anybody's guess but the business leaders in the past have evolved certain systematic and scientific methods to know the future by scientific analysis based on facts and possible consequences. Thus, this systematic method of probing the future is called forecasting in this way forecasting of sales refers to an act of making prediction about future sales followed by a detailed analysis of facts related to future situations and forces which may affect the business as a whole.

2. Steps in Forecasting

(a) Determine the objective of forecast.
(b) Select the period over which the forecast will be made?
(c) Select the method you want to use for making the forecast.
(d) Gather information to be used in the forecast.
(e) Make the forecast.

3. Forecasting Methods

1. Survey of buyer's inventions or the user's expectation method.
2. Collective opinion or sales force composite method.
3. Group executive judgement or executive judgement method.
4. Experts' opinions.
5. Market test method.
6. Trend projection method.
7. Moving average method.
8. Criteria of a good forecasting method.

4. Capacity Planning

The effective management of capacity is the most important responsibility of production and operations management. The objective of capacity management i.e., planning and control of capacity is to match the level of operations to the level of demand.

Capacity planning is required for the following:
- Sufficient capacity is required to meet the customers demand in time,
- Capacity affects the cost efficiency of operations,
- Capacity affects the scheduling system,
- Capacity creation requires an investment,
- Capacity planning is the first step when an organisa tion decides to produce more or new products.

5. Capacity Requirement Planning

Capacity Requirement Planning (CRP) is a technique which determines what equipment and labour/personnel capacities are required to meet the production objectives (i.e., volume of products) as per the master production schedule and Material Requirement Planning (MRP-I).

6. Factors Influencing Effective Capacity

- Forecasts of demand
- Plant and labour efficiency
- Subcontracting
- Multiple shift operation
- Management policy

7. Facility Location

Plant location may be understood as the function of determining where the plant should be located for maximum operating economy and effectiveness. The selection of a place for locating a plant is one of the problems, perhaps the most important, which is faced by an entrepreneur while launching a new enterprise. A selection on pure economic considerations will ensure an

easy and regular supply of raw materials, labour force, efficient plant layout, proper utilisation of production capacity and reduced cost of production. An ideal location may not, by itself, guarantee success; but it certainly contributes to the smooth and efficient working of an organisation.

8. Steps in Location Selection

1. Deciding on Domestic or International Location
2. Selection of Region
   (i) Availability of Raw Materials
   (ii) Nearness to the Market
   (iii) Availability of Power
   (iv) Transport Facilities
   (v) Suitability of Climate
   (vi) Government Policy
3. Selection of Community
   (i) Availability of Labour
   (ii) Civic Amenities for Workers
   (iii) Existence of Complementary and Competing Industries
   (iv) Availability of Water and Fire-fighting Facilities
4. Selection of the Site

9. Facility Layout

Plant Layout, also known as layout of facility refers to the configuration of departments, work-centres and equipment and machinery with focus on the flow of materials or work through the production system.

Plant layout or facility layout means planning for location of all machines, equipments, utilities, work stations, customer service areas, material storage areas, tool servicing areas, tool cribs, aisles, rest rooms, lunch rooms, coffee/tea bays, offices, and computer rooms and also planning for the patterns of flow of materials and people around, into and within the buildings. Layout planning involves decisions about the physical arrangement of economic activity centres within a facility.

10. Factors Influencing Layout Choices

- Location
- Machinery and Equipments
- Managerial Policies
- Materials
- Product

11. Plant Layout-Principles

- Principle of Minimum Travel
- Principle of Sequence
- Principle of Usage
- Principle of Compactness
- Principle of Safety and Satisfaction
- Principle of Flexibility

12. Importance of Layout

- Avoidance of Bottlenecks
- Avoidance of Unnecessary and Costly Changes
- Better Production Control
- Better Supervision
- Economies in Handling
- Effective Use of Available Area
- Improved Employee Morale
- Improved Quality Control

13. Material Requirements Planning

Material Requirement Planning (MRP) refers to the basic calculations used to determine component requirements from end item requirements. It also refers to a broader information system that uses the dependence relationship to plan and control manufacturing operations.

MRP is a technique of working backward from the scheduled quantities and needs dates for end items specified in a master production schedule to determine the requirements for components needed to meet the master production schedule. The technique determines what components are needed, how many are needed, when they are needed and when they should be ordered so that they are likely to be available as needed.

14. MRP Objectives

1. Inventory reduction
2. Reduction in the manufacturing and delivery lead times
3. Realistic delivery commitments
4. Increased efficiency.

15. Manufacturing Resources Planning

Manufacturing Resource Planning (MRP II) has been developed by manufacturing merger to address the planning and controlling of a manufacturing process and all of its related support functions. It encompasses logically correct planning and control activities related to materials, capacity, finance, engineering, sales and marketing. MRP II is universally applicable to any manufacturing organization regardless of its size, location, product or process.

16. Enterprise Resources Planning

ERP is a software package developed for optimum use of resources of an enterprise in a planned manner. ERP integrates the entire enterprise starting from the supplier to the customer, covering logistics, financial and human resources. This will enable the enterprise to increase productivity by reducing costs. ERP is a package for cost saving. Once the ERP is implemented, a single solution addresses the information needs of the whole organisation.

17. Economic Batch Quantity

Production managers often have to decide what quantity of output must be produced in a batch (known as lot size or batch size). The products are manufactured in lot sizes against the anticipated demand for the products. Often the quantity produced may exceed the quantity which can be sold. (i.e., production rates exceed demand rates). the optimum lot size which is known as economic lot size or economic batch quantity or economic manufacturing quantity is that quantity of output produced in one batch, which is most economical to produce, i.e., which results in lowest average cost of production.

SHORT NOTES

2021 - Dec [1] Write short notes on Aggregate Planning
(3 marks) [Sec. C - Six LAQ]

Answer:
- It is an intermediate-term planning decision. It is the process of planning the quantity and timing of output over the intermediate time horizon (3 months to one year).
- Within this range, the physical facilities are assumed to be fixed for the planning period. Therefore, fluctuations in demand must be met by varying labour and inventory schedule.
- Aggregate planning seeks the best combination to minimise costs. It is called "Aggregate Planning" because the demand on facilities and available capacities is specified in aggregate quantities.
- For Instance, aggregate quantities of number of Automobile vehicles, Aggregate number of soaps etc. Intermediate Planning or Aggregate Planning, which is in between long range and short-term planning, which is concerned in generally acceptable planning, taking the load on hand and the facilities available into considerations.
- In aggregate planning the management formulates a general strategy by which capacity can be made to satisfy demand in a most economical way during a specific moderate time period, say for one year.

DESCRIPTIVE QUESTIONS

2013 - June [2] (c) How do the variables of the production system help to constitute aggregate planning strategies? **(2 marks)**

Answer:

Aggregate planning	Production planning in the intermediate range of time is known as aggregate planning. It is called aggregate planning because the demand on facilities and available capacities is specified in

	aggregate quantities. For example aggregate quantity of thousands of liters of paint, number of automobiles etc. In other words we can say that the total demand is measured without considering the product mix.
Steps of aggregate planning	**Step 1:** To make a sales forecast of demand for the intermediate range. **Step 2:** Based on sales forecast develop the aggregate production strategy. **Step 3:** Alternative production plans have to be made and most economical plan is to be selected. **Step 4:** Other production plans which closely follow peaks and valleys in the production requirements.

Types of costs relevant in the context of aggregate planning are as follows-		
1.	**Over time and under time cost**	Marginal cost of overtime can be calculated but under time cost is difficult to calculate.
2.	**Hiring cost and lay off cost**	Hiring cost includes the cost of selection, the cost of training and the cost of maintaining additional records.
3.	**Carrying cost of inventories to meet the peak demands**	The cost of inventory includes the capital cost for carrying the inventory, the cost of obsolescence, taxes and insurances etc.
4.	**Cost of sub contracting to other companies**	Cost of sub contracting is the amount by which the sub contracting cost is greater than the manufacturing cost at the higher level of production
	Stock out costs	The stock out costs are the costs due to lost sale or the loss of goodwill of the customer.

2015 - June [2] (c) (ii) What do you mean by 'layout' in a production planning system? Name the various types of layout. **(1 + 5 = 6 marks)**

Answer:

Layout: A plant layout refers to the arrangement of machinery, equipment and other industrial facilities – such as receiving and shipping departments, tools rooms, maintenance rooms, employee amenities, etc., - for the purpose of achieving the quickest and smoothest production at the least cost.

Types of Layout:

The types of layout are:

 (i)   Process layout;

 (ii) Product layout;

 (iii) Fixed position layout;

 (iv) Cellular Manufacturing (CM) layout;

 (v)   A combination of the above.

—— Space to write important points for revision ———————

2017 - June [2] (b) Briefly explain various methods of sales forecasting.

(10 marks)

Answer:

Sales Forecasting Methods:

Methods or techniques of sales forecasting: Different authorities on marketing and production have devised several methods or techniques of sales or demand forecasting. The sales forecasts may be result of what market people or buyers say about the product or they may be the result of statistical and quantitative techniques. The most common methods of sales forecasting are:

1. **Survey of buyer's inventions or the user's expectation method:** Under this system of sales forecasting actual users of the product of the concern are contacted directly and they are asked about their intention to buy the company's products in an expected given future usually a year. Total sales forecasts of the product then estimated on the basis of advice and willingness of various customers. This is most direct method of sales forecasting. The chief advantages of this method are:

   (i) Sales forecast under this method is based on information received or collected from the actual users whose buying actions will really decide the future demand. So, the estimates are correct.

  (ii) It provides a subjective feel of the market and of the thinking behind the buying intention of the actual uses. It may help the development of a new product in the market.

 (iii) This method is more appropriate where users of the product are numbered and a new product is to be introduced for which no previous records can be made available.

 (iv) It is most suitable for short-run forecasting.

2. **Collective opinion or sales force composite method:** Under this method, views of salesmen, branch manager, area manager and sales manager are secured for the different segments of the market. Salesmen, being close to actual users are required to estimate expected sales in their respective territories and sections. The estimates of individual salesmen are then consolidated to find out the total estimated sales for the coming session. These estimates are then further examined by the successive executive levels in the light of various factors like proposed changes in product design, advertising and selling prices, competition etc. before they are finally emerged for forecasting.

3. **Group executive judgement or executive judgement method:** This is a process of combining, averaging or evaluating, in some other way, the opinions and views of top executives. Opinions are sought from the executives of different fields i.e. marketing; finance; production etc. and forecasts are made.

4. **Experts' opinions:** Under this method, the organisation collects opinions from specialists in the field outside the organisation. Opinions of experts given in the newspapers and journals for the trade, wholesalers and distributors for company's products, agencies or professional experts are taken. By analysing these opinions and views of experts, deductions are made for the company's sales, and sales forecasts are done.

5. **Market test method:** Under this method seller sells his product in a part of the market for sometimes and makes the assessment of sales for the full market on the bases of results of test sales. This method is quite appropriate when the product is quite new in the market or good estimators are not available or where buyers do not prepare their purchase plan.

6. **Trend projection method:** Under this method, a trend of company's or industry's sales is fixed with the help of historical data relating to sales which are collected, observed or recorded at successive intervals of time. Such data is generally referred to as time series.

7. **Moving average method:** This is another statistical method to calculate the trend through moving averages. It can be calculated as follows:
An appropriate period is to be determined for which the moving average is calculated. While determining the period for moving averages, the normal cycle time of changes in the values of series should be considered so that short-term fluctuations are eliminated. As far as possible, the period for moving averages should be in odd numbers such as period of 3, 5 or 7 years. The period in even numbers will create a problem in centralising the values of averages. The calculated values of moving averages present the basis for determining the expected amount of sale.

8. **Criteria of a good forecasting method:** It cannot be said which method of sales forecasting is the best because everyone has merits and demerits of its own. The suitability of a method depends on various factors such as nature of the product, available time and past records, wealth and energy, degree of accuracy and the forecaster etc. of an enterprise.

—— Space to write important points for revision ——

2021 - Dec [12] Which type of capacity plan takes into account workforce size, overtime budgets, inventories, etc. **(1 mark) [Sec. B - SAQ]**
Answer:
Short-term capacity plan.

—— Space to write important points for revision ——

2021 - Dec [1] Explain the various factors to be considered while determining the Economic Lot size for manufacturing.

(6 marks) [Sec. C - Two LAQ]

Answer:

(i) Usage rate: The rate of production of parts should match with the rate of usage of these parts in the assembly line.

(ii) Manufacturing cost: Higher the lot size, lower will be the cost per unit produced because of distribution of set up costs for setting up production or machines and preparing paper work (production orders). But the carrying cost (handling and storing costs) will increase with increase in lot size.

(iii) Cost of deterioration and obsolescence: Higher the lot size, higher will be the possibility of loss due to deterioration (items deteriorating)

—— Space to write important points for revision ————————

PRACTICAL QUESTIONS

2012 - Dec [2] (a) A defence contractor is evaluating its machine shops current process layout. The figure below shows the current layout and the table shows the trip matrix for the facility. Health and safety regulations require departments E and F to remain at their current positions.

E	B	F
A	C	D

Current Layout

From/To	A	B	C	D	E	F
A		8	3		9	5
B		—		3		
C			—		8	9
D				—		3
E					—	3
F						—

Can layout be improved? Also evaluate using load distance (ld) score.

(5 marks)

Answer :

Do not change the department E and F from the current location. Because C should be as close as possible to E and F , put C between them. Place E directly above A and F directly above D, all the heavy traffic concerns have been accommodated. Department C is located in the remaining place. The proposed layout will be as follows.

E	C	F
A	B	D

The load distance scores for the existing and proposed layout

Dept pair	No. of trips (1)	Existing plan		Proposed plan	
		Distance (2)	Load × Distance [(1) × (2)]	Distance (3)	Load x Distance [(1) × (3)]
A-B	8	2	16	1	8
A-C	3	1	3	2	6
A-E	9	1	9	1	9
A-F	5	3	15	3	15
B-D	3	2	6	1	3
C-E	8	2	16	1	8
C-F	9	2	18	1	9
D-F	3	1	3	1	3
E-F	3	2	6	2	6
Total			**92**		**67**

From the proposed layout we can conclude that load distance score for proposed layout is less. Hence proposed layout indicates improvement over existing layout.

—— Space to write important points for revision ——

2012 - Dec [4] (c) A manufacturing company has a product line consisting of five work stations in series. The individual workstation capacities are given. The actual output of the line is 440 units per shift.

Workstation No.	1	2	3	4	5
Capacity/shift	550	650	700	650	600

Calculate (i) System capacity (ii) Efficiency of the production line.

(1+2 = 3 marks)

Answer:

(i)   Workstation decides the capacity of the system with minimum capacity/ shift, i.e., the bottleneck. In the given question, the work station '1' is having a capacity of 550 units/ shift which is minimum. Therefore, the system capacity = 550 units/shift.

(ii) The actual output of the line = 440 units/shift.

Therefore, the system efficiency $= \dfrac{\text{Actual Output}}{\text{System Capacity}} \times 100$

$$= \dfrac{440}{550} \times 100 = 80\%$$

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2013 - June [2] (d) Location A would result in annual fixed cost of ₹ 3,00,000, variable costs of ₹ 63 per unit and revenue ₹ 68 per unit. Annual fixed cost at Location B is ₹ 8,00,000, variable costs are ₹ 32 per unit and revenues are ₹ 68 per unit. Sales volume is estimated to be 25,000 units/year. Which location is attractive? **(3 marks)**

Answer:

Location A : BEP (units) $\dfrac{3,00,000}{68 - 63} = 60,000$

Location B : BEP (units) $\dfrac{8,00,000}{68 - 32} = 22,222$

If demand of 25000 units is expected, profits (loss) for the alternative are :

Alternative	A(₹)	B(₹)
Revenue	17,00,000	17,00,000
Variable Cost	15,75,000	8,00,000

Fixed Cost	3,00,000	8,00,000
Total Cost	18,75,000	16,00,000
Profit /(Loss)	(1,75,000)	1,00,000

If we opt location A there is loss and if we opt Location B we get profit. Hence Location B is most attractive ,even though annual fixed costs are much higher than A.

—— Space to write important points for revision ——

2013 - June [3] (c) Empire Glass Company can produce a certain insulator on any three machines which have the following charges shown below. The firm has an opportunity to accept an order for either (1) 50 units at ₹ 20/unit or (2) 150 units at ₹ 12/unit.

Machine	Fixed cost (₹)	Variable cost (₹)
A	50	4/unit
B	200	2/unit
C	400	1/unit

(i) Which machine should be used if 50 units order is accepted and how much profit will result?

(ii) Which machine should be used if the 150 units order is accepted and what will be the resultant profit?

(iii) What is the break even volume for machine B when the price is ₹ 12/unit?

(iv) Suppose the fixed cost for machine A is a stepped function with ₹ 50 up to 40 units and ₹ 100 thereafter. Will the answers to (i) and (ii) above vary? If so, what will be the revised answer? **(2 × 4 = 8 marks)**

Answer:

(i) Calculation of profit for various machines, for 50 units order at ₹ 20/unit

Machine	₹	Profit	₹
Machine A	50 + 50 × 4 = 250	1,000 - 250	750
Machine B	200 + 50 × 2 = 300	1,000 - 300	700
Machine C	400 + 50 × 1 = 450	1,000 - 450	550

It is quite clear that machine A gives the highest profit i.e. ₹ 750. Hence, machine A should be used.

(ii) Calculation of profit for various machines, for 150 units order at ₹ 12/unit

Machine	₹	Profit	₹
Machine A	50 + 150 × 4= 650	1,800 - 650	1,150
Machine B	200 + 150 × 2 = 500	1,800 - 500	1,300
Machine C	400 + 150 × 1= 550	1,800 - 550	1,250

Machine B gives the highest profit i.e. ₹ 1300. Hence, machine B should be used.

(iii) Breakeven Volume for Machine B at ₹12/unit.

Let X be the No. of units to be produced.

Total costs at 'X' units = 200 + 2x

Total revenue at 'X' units = 12x.

At BEP

200 + 2x = 12x

i.e. 10 x = 200

Hence, 20 units is the Breakeven Volume.

(iv) The fixed cost for machine A being a stepped function with ₹ 50 to 40 and ₹ 100.

The total cost of manufacturing of 50 units with machine A = ₹ (100 + 50 ×4) = ₹ 300

This is equal to the cost of production with machine B. Any machine out of A and B could be chosen to produce 50 units.

In the second case the total cost at machine A will be ₹ [100 + (150 × 4)] = ₹ 700.

Answer in this case will not vary because cost of production on A is higher than machine B.

—— Space to write important points for revision ——

2013 - June [4] (d) S. K. Timber Workshops use forklift trucks to transport lumber from factory to a storage area 0.3 km away. The lift trucks can move three loaded pallets per trip and travel at an average speed of 8 km. per hour (allowing for loading, unloading, delays and travel). If 640 pallet loads must be moved during 8 hours shift, how many lift trucks are required? Assume single shift working and 300 working days in a year. **(2 marks)**

Answer:

Total distance travelled by fork lift truck per trip = $(0.3 + 0.3)$ km = 0.6 km (up and down)

No. of trips that can be made by the truck per shift = 8km / 0.6km × 8hrs = 106.66 trips/shift

No. of pallet loads carried per shift by each truck = $106.66 × 3 = 319.98$ = 320

Total no. of fork lift trucks required for 640 pallet loads = 640/320 = 2 fork lift trucks.

—— Space to write important points for revision ——

2013 - Dec [1] {C} (c) A department of a company has to process a large number of components/month. The process equipment time required is 30 minutes/component and the manual skilled manpower required is 10 minutes/component. The following additional data is available:

	availability/month	efficiency of utilization
Equipment hour	400	80%
Skilled manpower hours	250	65%

What is the maximum possible production under the current conditions?

(d) In a firm, there are four workstations: A, B, C, & D working in series and their individual capacities in units per day are 400, 380,350 and 410 respectively. The raw materials are fed to Machine A and the system output is obtained from Machine D. If the actual output is 320 units per day, what is the system efficiency?

(g) Solve the game by dominance property:

9	2
8	6
6	4

(h) Calculate EBQ from the details: Monthly demand - 2000 units, Setting up costs per batch ₹ 100, cost of manufacture per unit – ₹ 30, rate of interest – 10% p.a. **(4 marks)**

Answer :

(c) Actual Equipment Hrs. used = $400 \times \dfrac{80}{100}$ = 320 Hrs.

Possible output = $320 \times \dfrac{60}{30}$ = 640 Components

Skilled manpower Hrs. used = $250 \times \dfrac{65}{100}$ = 162.5 Hrs.

Possible output = $162.5 \times \dfrac{60}{10}$ = 975 Components.

The bottle-neck capacity = 640 Components.
Hence, Maximum possible production under the given conditions = 640 Components.

Answer:

(d) The work center having the minimum capacity is C i.e. 350 (Bottle neck center)
System capacity i.e. the capacity of the bottle neck center is 350 units.
System efficiency = $\dfrac{\text{Actual output}}{\text{System Capacity}}$ = $\dfrac{320}{350} \times 100$ = 91.43%

Answer:

(g) Here, it is assumed that Player A is playing vertically while Player B is playing horizontally.
Then matrix becomes

$$
\begin{array}{cc}
 & \begin{array}{c}\text{Player B}\\ B_1\ B_2\end{array}\\
\text{Player A}\quad
\begin{array}{c}A_1\\A_2\\A_3\end{array} &
\begin{bmatrix} 9 & 2\\ 8 & 6\\ 6 & 4\end{bmatrix}
\end{array}
$$

Here, B1 is dominated by B2. So, we exclude the first column from our pay-off matrix.

$$
\begin{array}{c}A_1\\A_2\\A_3\end{array}
\begin{bmatrix} 2\\ 6\\ 4\end{bmatrix}
$$

We see that player A will adopt A2. Thus we get [6]. So, saddle point = (A2, B2) and value of the game = 6.

Answer:

(h) Economic Batch Quantity (EBQ) = $\sqrt{\dfrac{2 \times \text{Annual demand} \times \text{Setup cost}}{\text{Annual cost of carrying one unit}}}$

$$= \sqrt{\dfrac{2 \times 2{,}000 \times 1{,}200}{30 \times 0.10}} = \sqrt{1600000} = 1{,}264.91$$

——— Space to write important points for revision ———

2013 - Dec [3] (b) A solicitor's firm employs typists on hourly piece-rate basis for daily work. There are four typists and their charges and speed are different. It has been agreed that only one job will be given to one typist and the typist is paid for a full hour even when he works for a fraction of an hour. Find the least cost allocation for the following data:

Typist	Rate/hour	Number of pages typed/ hour	Job	No. of pages
A	4	8	P	102
B	3	10	Q	135
C	5	11	R	110
D	3	9	S	85

(10 marks)

Answer :

Using the given information, we first obtain the cost matrix, when different jobs are performed by different typists.

Total Cost Matrix

Typist	Job P	Job Q	Job R	Job S
A	102/8 =12.75 i.e. 13 × 4 = 52	135/8 = 16.88 i.e. 17 × 4 =68	110/8=13.75 i.e. 14×4=56	85/8=10.63 i.e. 11×4=44
B	102/10 = 10.2 i.e. 11× 3 = 33	135/10 = 13.5 i.e. 14 × 3 =42	110/10=11 i.e. 11×3=33	85/10=8.5 i.e. 9×3=27
C	102/11 = 9.27 i.e. 10 × 5 = 50	135/11=12.27 i.e. 13 × 5 =65	110/11=10 i.e. 10×5= 50	85/11=7.72 i.e. 8×5=40
D	102/9 = 11.33 i.e. 12 × 3 = 36	135/9 = 15 i.e. 15 × 3 =45	110/9=12.22 i.e. 13×3=39	85/9=9.44 i.e. 10×3=30

On subtracting the minimum element of each row from all its elements, we obtain:

Reduced Cost Table 1

Typist	Job P	Job Q	Job R	Job S
A	8	24	12	0
B	6	15	6	0
C	10	25	10	0
D	6	15	9	0

On subtracting the minimum element of each column from all the elements, we obtain:

Reduced Cost Table 2

Typist	Job P	Job Q	Job R	Job S
A	2	9	12	0
B	0	0	0	0
C	4	10	4	0
D	0	0	3	0

Here, the minimum number of lines to cover all zeros is equal to 3, which is smaller than order 4, of the given matrix. The revised table is prepared by considering the least uncovered value, 2, and adjusting it with uncovered cell values and those lying at the intersection of lines.

Reduced Cost Table 3

Typist	Job P	Job Q	Job R	Job S
B	0	0	0	2
A	0	7	4	0
C	2	8	2	0
D	0	0	3	2

The minimum number of lines to cover all zeros equal 4, which matches with the order of the matrix. Assignment can be made as follows:

Typist	Job	Cost
A	P	52
B	Q	33
C	R	40
D	S	45
	Total	170

—— Space to write important points for revision ——

2013 - Dec [4] (c) If a firm sells 5000 units, its loss is ₹ 10,000. But if it sells 9000 units, its profit is ₹10,000. Calculate its (i)Fixed Cost; (ii) BEP2.

(2 marks)

Answer :

(i) Change in quantity of output = 9000 - 5000 = 4000 units

Change in profit = ₹ 10,000 - (- ₹ 10,000) = ₹ 20,000

Unit contribution = $\dfrac{\text{Change in profit}}{\text{Change in output}} = \dfrac{20,000}{4,000} = ₹ 5$

So, when output is 9000 units

Total Contribution = Fixed cost + Profit = ₹ (5 × 9000) = ₹ 45,000 but given Profit, P = ₹ 10,000

Therefore, Fixed Cost = Total Contribution - Profit = ₹ 45,000 − ₹ 10,000 = ₹ 35,000

(ii) Break - even point (units) = $\dfrac{\text{Fixed cost}}{\text{Unit contribution}} = \dfrac{35,000}{5} = 7,000$ units

—— Space to write important points for revision ——

2014 - June [2] (e) A steel plant has a design capacity of 50,000 tons of steel per day, effective capacity of 40,000 tons of steel per day and an actual output of 36,000 tons of steel per day. Compute the efficiency of the plant and its utilisation.

(2 marks)

Answer :

Efficiency of the plant $= \dfrac{\text{Actual Output}}{\text{Effective Capacity}} = \dfrac{36,000}{40,000} \times 100 = 90\%$

Utilisation $= \dfrac{\text{Actual Output}}{\text{Design Capacity}} = \dfrac{36,000}{50,000} \times 100 = 72\%$

—— Space to write important points for revision ——

2014 - June [3] (c) Two alternative set-ups, A and B are available for the manufacture of a component on a particular machine, where the operating cost per hour is ₹ 20.

Particulars	Set up A	Set up B
Components / Set up	4000 pieces	3000 pieces
Set up cost / year	₹ 300	₹ 1500
Production rate / hour	10 pieces	15 pieces

Which of these set-ups should be used for long range and economic production? **(6 marks)**

Answer :

Considering one set-up

	Set-up A	Set-up B
Set-up cost per year	₹ 300/-	₹ 1500/-
Operating hours / set-up	4,000/10 = 400 hours	3,000/15= 200 hours
Operating cost	400x20 = ₹ 8,000	200 x 20 = ₹ 4,000
Total manufacturing cost	300 + 8,000 = ₹ 8,300	1,500 + 4,000= ₹ 5,500
Manufacturing cost per piece	8,300/4,000 = ₹ 2.075	5,500/3,000 = ₹ 1.8333

Assuming that the machine is used for production for one year having 2,000 hours of working. For annual production:

	Set-up A	Set-up B
No. of set-ups	2,000/400 = 5	2,000/200 = 10
Set-up cost per year	5 x 300 = ₹ 1,500	10 x 1,500 = ₹ 15,000

No. of units produced per year	2,000 x 10 = ₹ 20,000	2,000 x 15 = ₹ 30,000
Total annual manufacturing cost	1,500 + 40,000 = ₹ 41,500	15,000 + 40,000 = ₹ 55,000
Total annual manufacturing cost	8,300/4,000 = ₹ 2.075	5,500/3,000 = ₹ 1.8333

Since the manufacturing cost for set-up B is less, use set-up B for long range and economic production.

—— Space to write important points for revision ——

2014 - June [4] (b) Monthly demand for a component is 1000 units. Setting-up cost per batch is ₹ 120. Cost of manufacture per unit is ₹ 20. Rate of interest may be considered at 10% p.a. Calculate the EBQ. **(2 marks)**

Answer :

Annual output = 1,000 units per month for 12 months = 48,000 units;

Setup cost = ₹120 and

Annual Carrying cost (i.e., holding cost) of one unit of component for one year = 10% of ₹ 20 = ₹ 2

Economic Batch Quantity (EBQ) = $\sqrt{\dfrac{2 \times \text{Annual output} \times \text{setup cost}}{\text{Annual cost of one unit}}}$

$$= \sqrt{\frac{2 \times 12,000 \times 120}{₹2}} = 1200 \text{ units}$$

—— Space to write important points for revision ——

2014 - June [5] (a) The following data on the exports of an item by a company during the various years fit a straight line, (for the time being, assume that a straight line gives a good fit). Give a forecast for the years 2013 and 2014.

Year	No. of items ('000)
2004	13
2005	20

2006	20
2007	28
2008	30
2009	32
2010	33
2011	38
2012	43

(6 marks)

Answer :

Let 'X' represent year and 'T' represent export. In order to use the normal equations for the least square line, we need ΣX, Σy, ΣXy and ΣX^2. To simplify the calculation arrange X in such a way that $\Sigma X = 0$.

Therefore, we call the year 2008 as 0, 2007 as -1 and 2009 as + 1 and likewise for the other years in the data. The rearrangement is shown in the table as follows:

X	Y	X^2	XY
-4	13	16	-52
-3	20	9	-60
-2	20	4	-40
-1	28	1	-28
0	30	0	0
1	32	1	32
2	33	4	66
3	38	9	114
4	43	16	172
$\Sigma X = 0$	$\Sigma Y = 257$	$\Sigma X^2 = 60$	$\Sigma XY = 204$

The normal equations are:

$\Sigma y \quad = \quad a_0 N + a_1 \Sigma X$

$\Sigma XY \quad = \quad a_0 X + a_1 \Sigma X^2$

$\Sigma X \quad = \quad 0$ and $\Sigma y = a_0 N$ and $\Sigma XY = a_1 \Sigma X^2$

Therefore,

$$a_0 \quad = \quad \frac{\Sigma Y}{N} = \frac{257}{9} = 28.56$$

$$a_1 \quad = \quad \frac{\Sigma XY}{\Sigma X^2} = \frac{204}{60} = 3.4$$

The equation of a straight line fitting the data is:

$\quad$ Y $\quad = \quad 28.56 + 3.4\, X$

(a) Forecast for 2013, (i.e., X = 5): Y = 28.56 + 3.4(5) = 45.56

(b) Forecast for 2014, (i.e., X = 6): X = 28.56 + 3.4(6) = 48.96

—— Space to write important points for revision ——

2014 - Dec [2] (b) Answer the question:

(i) XYZ manufacturing company planning to start its production activities has to decide on the location of the plant. Three locations are being considered:

Location A, B and C. The following data are available:

	LocationA	Location B	Location C
Fixed costs (₹ Lakhs per annum)	35	55	30
Variable cost (₹ per annum)	350	250	400

The expected sales price of the product is ₹ 750 per unit. Find out:

(A) The range of annual production/sales volume for which each location is most suitable, and

(B) Which one of the three is the best location at the production/sales volume of 22,000 units?

Clearly mention the assumptions, if any. **(8 marks)**

Answer:

(b) (i) (Amount in Lakh)

	Location A			Location B			Location C		
Units	F.C.	V.C.	T.C.	F.C.	V.C.	T.C.	F.C.	V.C.	T.C.
5000	35	17.5	52.5	55	12.5	67.5	30	20	50
10000	35	35.0	70.0	55	25.0	80.0	30	40	70
15000	35	52.5	87.5	55	37.5	92.5	30	60	90
20000	35	70.0	105.0	55	50.0	105.0	30	80	110
22000	35	77.0	112.0	55	55.0	110.0	30	88	118
25000	35	87.5	122.5	55	62.5	117.5	30	100	130

(A) Up to 10000 units most suitable location is **Location C**.
Between 10000 to 20000 units most suitable location is **Location A**.
Above 20000 units most suitable location is **Location B**.

(B) At a volume of production/sales of 22000 **Location B** is best to choose as it has least cost ₹ 110 lakh.

—— Space to write important points for revision ——

2015 - June [1] (b) Calculate the number of components that can be produced in a month when available equipment hours are 480 per month, efficiency of utilization is 85%, and it takes 36 minutes of processing time in the equipment for each component. **(2 marks)**

Answer:

Available equipment hour per month	= 480 hours
If the utilization is 75% then number of hours worked	= 480 × 0.85
	= 408 hours.
Or	= 24480 Minutes
Number of components can be produced in a month	= $\dfrac{24480}{36}$
	= 680 Nos.

—— Space to write important points for revision ——

2015 - June [2] (b) (ii) A department works on 8 hours shift, 288 days a year and has the usage data of a machine, as given below:

Product	Annual Demand (units)	Processing time (Standard time a hours)
A	325	5.0
B	450	4.0
C	550	6.0

Calculate (a) Processing time needed in hours to produce products A, B and C, (b) Annual production capacity of one machine in standard hours, and (c) Number of machines required. **(3 + 2 + 2 = 7 marks)**

Answer:

Product	Annual demand (units)	Standard Processing time per unit (hrs.)	Processing time needed (hrs.)
A	325	5.0	325 x 5 = 1,625
B	450	4.0	450 x 4 = 1,800
C	550	6.0	550 x 6 = 3,300
			Total = 6,725

Annual production capacity of one machine in standard hours
   = 8 × 288 = 2,304 hours/ year
Number of machines required
   = Work load per year/Production capacity per machine
   $= \dfrac{6,725}{2,304}$
   = 2.92 machines = 3 machines.
—— Space to write important points for revision ——

2016 - June [II] Answer the questions:
1. (a) A department works on 8 hours per day, 250 days a year and has the usage data of a machine, as given below:

Product	Annual demand (units)	Processing time (standard time in hours)
X	200	4.0
Y	300	6.0
Z	400	3.0

Determine the number of machines required. **(6 marks)**

Answer:

Product	Annual demand (units)	Standard Processing Time in hours	Processing Time Needed (hours)
X	200	4.0	800
Y	300	6.0	1,800
Z	400	3.0	1,200
Total			3,800

Annual production capacity of one machine in standard hours
$$= 8 \times 250$$
$$= 2,000 \text{ hours per year}$$

Number of machines required $= \dfrac{3,800}{2,000}$
$$= 1.9 \text{ machines}$$
$$= 2 \text{ machines.}$$

—— Space to write important points for revision ——

2016 - Dec [1] (a) Calculate the break-even point for the following:
Production Manager of a unit wants to know, from what quantity he can use automatic machine against semi-automatic machine.

Data	Automatic	Semi-Automatic
Time for the job	2 minutes	5 minutes
Set-up time	2 hours	1.5 hours
Cost per hour	₹ 20	₹ 12

(7 marks) [Sec. B]

Answer:

Let x be the break-even quantity between automatic and semi-automatic machines. This means, for volume of output x, the total cost of manufacture is the same on both automatic and semi-automatic machines.

For quantity = x units

Total manufacturing cost of automatic machines = ₹ (2.0 + 2x/60) x 20

Total manufacturing cost of semi-automatic machines = ₹ (1.5 + 5x/60) x 12

> If 'x' is the break-even quantity, then
> (2.0 + 2x/60) x 20 = (1.5 + 5x/60) x 12
> Or,   40 + 2x/3 = 18 + x
> Or,   x - 2x/3 = 40 -18 = 22
> Or,   x/3 = 22
> Or,   x = 66 units.

Therefore, for quantity upto 65, a semi-automatic machine will be cheaper. For quantity 66, both semiautomatic and automatic machines are equally costly. For quantity more than 66, automatic machine becomes cheaper than semi-automatic machine.

—— Space to write important points for revision ——

2017 - Dec [2] (b) A firm has four work centres, A, B, C & D, in series with individual capacities in units per day shown in the figure below.

Work Centres

Raw Materials	A	B	C	D	Actual output
	(400)	(310)	(370)	(340)	(260)
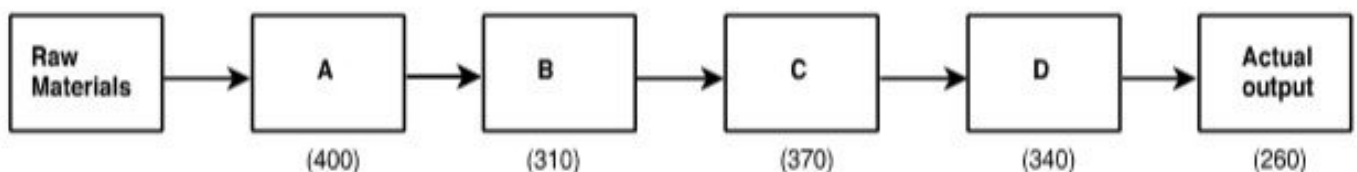
  (i)   Identify the bottle neck centre.

  (ii) What is the system capacity?

  (iii) What is the system efficiency?   **(9 marks)**

Answer:

  (i)   The bottle neck centre is the work centre having the minimum capacity. Hence, work centre 'B' is the bottleneck centre.

(ii) System capacity is the maximum units that are possible to produce in the system as a whole. Hence, system capacity is the capacity of the bottle neck centre i.e., 310 units.

(iii) System efficiency = Actual output/ System capacity

$$= (260/310) \times 100 \text{ (i.e., maximum possible output)}$$
$$= 83.87\%$$

—— Space to write important points for revision ——

2018 - June [2] (b) The monthly requirement of raw material for a company is 3200 units. The carrying cost is estimated to be 25% of the purchase price per unit, in addition to ₹ 2.5 per unit. The purchase price of raw material is ₹ 24 per unit.

The ordering cost is ₹ 28 per order.

(i) You are required to find EOQ and Total cost.

(ii) What is the total cost when the company gets a concession of 6% on the purchase price if it orders 3,200 units or more but less than 6,200 units per month?

(iii) What happens when the company gets a concession of 15% on the purchase price when it orders 6,200 units or more?

(iv) Which of the above three ways of orders the company should adopt?

(4 + 2 + 2 +2 = 10 marks)

Answer:

(i) D = 3,200 × 12 = 38,400 units per annum

$C_0 = 28$

$C_h = 2.5 + 25\%$ of $24 = 8.5$

$EOQ = \sqrt{[(2 \times 28 \times 38,400) / 8.5]} = 502.97 = 503$ units (approx.)

Total Cost = $C_o + C_{rm} + C_h$

$= [(38,400 \times 28) / 503)] + (38,400 \times 24) + [(503 \times 8.5) / 2]$

$= 2,137.57 + 9,21,600 + 2,137.75$

$= 9,25,875.32$

(ii) When the company has an option to order between 3200 and 6200 units, the EOQ should be calculated with a reduction in price by 6% (due to concession);

The purchase price = 94% of 24 = 22.56.

D = 38,400 units per annum;

C_0 = 28;

C_h = 2.5 + 25% of 22.56 = 8.14

EOQ = $\sqrt{[(2 \times 28 \times 38,400) / 8.14]}$ = 513.98 = 514 units (approx.)

Total Cost = $C_0 + C_{rm} + C_h$

= [(38,400 × 28) / 514)] + (38,400 × 22.56) + [(514 × 8.14) / 2]

= 2091.828 + 8,66,304 + 2,091.98 = 8,70,487.8

(iii) When the company orders more than 6,200 units purchase price = 85% of 24 (because 15%) concession) = 20.4;

D = 38,400 units per annum;

C_0 = 28

C_h = 2.5 + 25% of 20.4 = 7.6

EOQ = $\sqrt{[(2 \times 28 \times 38,400) / 7.6]}$ = 531.92 = 532 units (approx.)

Total Cost = $C_0 + C_{rm} + C_h$

= [(38,400 × 28) / 532)] + (38,400 × 20.4) + [(532 × 7.6) / 2]

= 2,021.052 + 7,83,360 + 2,021.6 = 7,87,402.65

(iv) Comparing these costs, we notice that the cost is minimum (7,87,402.65) for (iii) order. Therefore, the company should adopt a policy of ordering 532 units per order.

—— Space to write important points for revision ——

2018 - Dec [2] Answer the following:

(b) With the help of following data, project the trend of sales for the next 5 years:

Years	2002	2003	2004	2005	2006	2007
Sales in Lakhs of Rupees	120	130	135	140	150	165

(10 marks)

Answer:

Computation of trend values of sales:

Year	Time deviations from the middle of 2004 and 2005 assuring 5 years = 1	Sales (in lakhs of ₹)	Squares of time deviation	Product of time deviation and sales
	X	Y	X^2	XY
2002	-5	120	25	- 600
2003	-3	130	9	- 390
2004	-1	135	1	- 135
2005	+1	140	1	+ 140
2006	+3	150	9	+ 450
2007	+5	165	25	+ 825
n = 6	$\sum x = 0$	$\sum x = 840$	$\sum x^2 = 70$	$\sum XY = 290$

Regression equation of Y on X:

$\sum Y = a + bX$

To find the values of a and b:

$a = \sum Y/n = 840/6 = 140$

$b = \sum XY/\sum X^2$

$= 290/70 = 4.143$ approx.

Sales forecast for the next five years, i.e., 2008 to 2012:

$Y_{2008} = 140 + [29/7 \times (+7)] = 169$ lacs

$Y_{2009} = 140 + [29/7 \times (+9)] = 177.28$ lacs

$Y_{2010} = 140 + [29/7 \times (+11)] = 185.57$ lacs

$Y_{2011} = 140 + [29/7 \times (+13)] = 193.85$ lacs

$Y_{2012} = 140 + [29/7 \times (+15)] = 202.14$ lacs

—— Space to write important points for revision ——

2019 - June [2] (b) The present layout is shown in the figure. The manager of the department is intending to interchange the departments C and F in the present layout. The handling frequencies between the departments is given. All the departments are of the same size and configuration. The material handling cost per unit length travel between departments is same. What will be the effect of interchange of departments C and F in the layout?

A	C	E
B	D	F

From/To	A	B	C	D	E	F
A	–	0	80	150	60	10
B	–	–	90	0	90	110
C	–	–	–	40	0	5
D	–	–	–	–	160	20
E	–	–	–	–	–	60
F	–	–	–	–	–	–

(10 marks)

Answer:

(i) **The distance matrix of the present layout:**

From / To	A	B	C	D	E	F
A		1	1	2	2	3
B			2	1	3	2
C				1	1	2
D					2	1
E						1
F						-

(ii) Computation of total cost matrix (combining the inter - departmental material handling frequencies and distance matrix).

From / To	A	B	C	D	E	F	Total
A		0	80	300	120	30	530
B			180	0	270	220	670
C				40	0	10	50
D					320	20	340
E						60	60
F							-
Total							1,650

If the departments are interchanged, the layout will be represented as shown below.

A	F	E
B	D	C

(iii) The distance matrix and the cost matrix of the new layout are shown:

From / To	A	B	C	D	E	F
A		1	3	2	2	1
B			2	1	3	2
C				1	1	2
D					2	1
E						1
F						-

(iv) Total cost matrix for the modified layout:

From / To	A	B	C	D	E	F	Total
A		0	240	300	120	10	670
B			180	0	270	220	670
C				40	0	10	50
D					320	20	340
E						60	60
F							-
Total							1,790

(v) Interpretation and conclusion : The interchange of departments C and F increases the total material handling cost. Thus, it is not a desirable modification.

—— Space to write important points for revision ——

2019 - Dec [2] (b) A firm has four work centres, A, B, C and D, in series with individual capacities in units per day shown in the figure below:

Work Centres

| Raw Materials | → | A | → | B | → | C | → | D | → | Actual output |
| (350) | | (410) | | (380) | | (370) | | (310) |
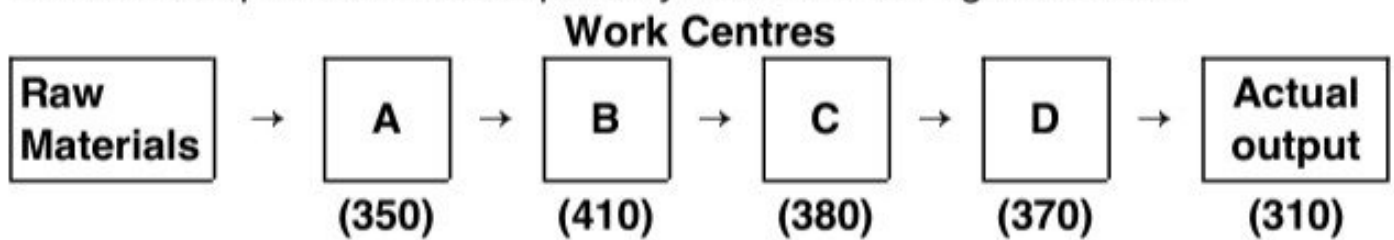
(i) Identify the bottle neck centre.
(ii) Determine the system capacity.
(iii) Determine the system efficiency. **(3 × 3 = 9 marks)**

Answer:
A firm has four work centres.
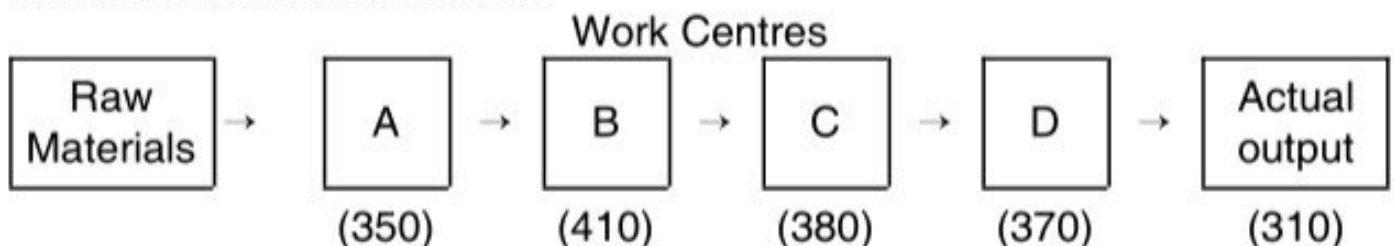
Work Centres

| Raw Materials | → | A | → | B | → | C | → | D | → | Actual output |
| (350) | | (410) | | (380) | | (370) | | (310) |

(i) the bottle neck centre is the work centre having the minimum capacity. Hence, work centre 'A' is the bottleneck centre.

(ii) System capacity is the maximum units that are possible to produce in the system as a whole. Hence, system capacity is the capacity of the bottle neck centre i.e., 350 units.

(iii) System efficiency = Actual output/ System capacity = (310/350)×100 (i.e. maximum possible output) = 88.57%.

—— Space to write important points for revision ——

2021 - Dec [1] With the help of following of following data, project the trend of sales for the next 7 years:

Years	2005	2006	2007	2008	2009	2010
Sales (In Lakhs ₹)	90	95	100	110	125	140

(8 marks) [Sec. C - One LAQ]

Answer:

Computation of trend values of sales

Year	Time deviations from the middle of 2007 and 2008 assuming 6 months = 1 unit	Sales (in lakh ₹)	Squares of time deviation	Product of time deviation and sales
	X	Y	X^2	XY
2005	-5	90	25	-450
2006	-3	95	9	-285
2007	-1	100	1	-100
2008	+1	110	1	+110
2009	+3	125	9	+375
2010	+5	140	25	+700
n = 6	$\sum X = 0$	$\sum Y = 660$	$\sum X^2 = 70$	$\sum XY = 350$

Regression equation of Y on X:

Y = a + bX

To find the values of a and b

$a = \dfrac{\sum Y}{n} = \dfrac{660}{6} = 110$

$b = \dfrac{\sum XY}{X^2} = \dfrac{350}{70} = 5$

Hence regression equation comes to Y = 110 + 5x

Sales forecast for the next years, i.e. 2010 to 2014

Y2011 = 110 + 5 (+7) = 110 + 35 = ₹ 145 lakh

Y2012 = 110 + 5 (+9) = 110 + 45 = ₹ 155 lakhs

Y2013 = 110 + 5 (+11) = 110 + 55 = ₹ 165 lakhs

Y2014 = 110 + 5 (+13) = 110 + 65 = ₹ 175 lakhs

Y2015 = 110 + 5 (+15) = 110 + 75 = ₹ 185 lakhs

Y2016 = 110 + 5 (+17) = 110 + 85 = ₹ 195 lakhs

Y2017 = 110 + 5 (+19) = 110 + 95 = ₹ 205 lakhs

―― Space to write important points for revision ――

2021 - Dec [1] XYZ Co. Ltd. is committed to supply 25,000 components per annum to M/s ABC Co. on a steady daily basis. It is estimated that it costs 15 paise as inventory holding cost per component per month and that the setup per run of component manufacture is ₹ 350/-.

(6 marks) [Sec. C - Three LAQ]

(i) What is the optimum run size for component manufacture? [2]

(ii) What should be the interval between the consecutive optimum runs? [2]

(iii) Find out the minimum inventory holding cost. [2]

Answer:

(i) Optimum Run size or Economic Batch Quantity (EBQ): = 3118 units.

(ii) Interval Between two consecutive optimum runs: = 44.8 ≈ 45 days.

(iii) Minimum Inventory Handling cost = ₹ 2806.2/-

―― Space to write important points for revision ――

2022 - Dec [2] (b) The productions (in thousand tones) of a fertilizer factory of ROMY Ltd. for the year 2013 through 2022 are given below:

Year	2013	2015	2016	2017	2018	2019	2022
Production (in thousand tones)	70	75	90	98	85	91	100

(Present calculation upto three decimal points.)

Required.

   (i)   Fit a straight line by the method of least squares and tabulate the trend values.
   (ii) Estimate production (in thousand tones) of fertilizer in the year 2020 and year 2025. **(6 + 2 = 8 marks)**

—— Space to write important points for revision ——

3 DESIGNING OF OPERATIONAL SYSTEMS AND CONTROL

THIS CHAPTER INCLUDES

- Production Design
- Process Design and Selection
- Product Life Cycle
- Process Planning and Selection
- Design Thinking

Marks of Objective, Short Notes, Distinguish Between, Descriptive & Practical Questions

Legend

Objective | Short Notes | Distinguish | Descriptive | Practical
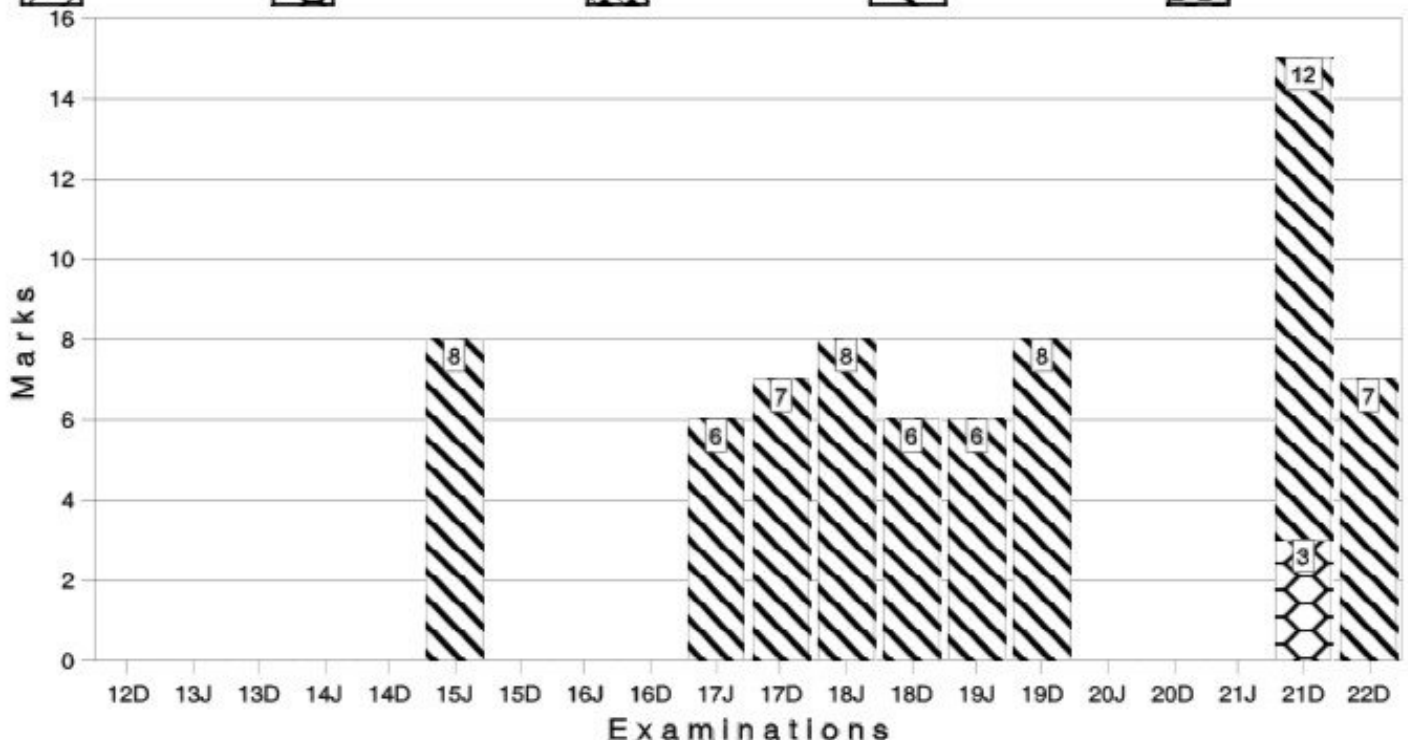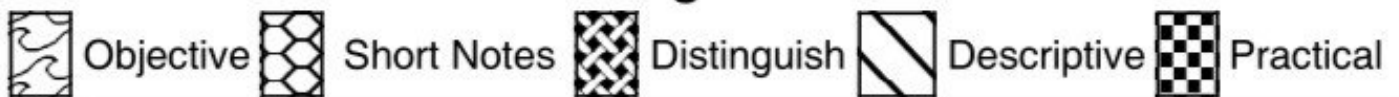
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CHAPTER AT A GLANCE

1. Importance of Product Design

Production or operations strategy is directly influenced by product design for the following reasons:

(i) As products are designed, all the detailed characteristics of each product are established.

(ii) Each product characteristic directly affects how the product can be made or produced (i.e., process technology and process design) and

(iii) How the product is made determines the design of the production system (production design) which is the heart of production and operations strategy.

2. Objectives of Product Design

(i) The overall objective is profit generation in the long run.

(ii) To achieve the desired product quality.

(iii) To reduce the development time and cost to the minimum.

(iv) To reduce the cost of the product.

(v) To ensure productibility or manufacturability (design for manufacturing and assembly).

3. Factors Influencing Product Design

(i) Customer requirements

(ii) Convenience of the operator or user

(iii) Trade off between function and form

(iv) Types of materials used

(v) Work methods and equipments

(vi) Cost/Price ratio

(vii) Product quality

(viii) Process capability.

Process Design

Process Design is concerned with the overall sequences of operations required to achieve the product specifications. It specifies the type of work stations to be used, the machines and equipments necessary to carry out the operations. The sequence of operations are determined by (a) the nature of the product, (b) the materials used, (c) the quantities to be produced and (d) the existing physical layout of the plant.

4. Characteristics of Good Product Design

- (i) Function or performance
- (ii) Appearance or aesthetics
- (iii) Reliability
- (iv) Maintainability
- (v) Availability
- (vi) Productibility
- (vii) Simplification
- (viii) Standardisation
- (ix) Specification
- (x) Safety

Process Planning

Process planning refers to the way production of goods or services is organised. It is the basis for decisions regarding capacity planning, facilities (or plant) layout, equipments and design of work systems. Process selection is necessary when a firm takes up production of new products or services to be offered to the customers.

5. Process Strategy

A process strategy is an organisation's approach to process selection for the purpose of transforming resource inputs into goods and services (outputs). The objective of a process strategy is to find a way to produce goods and services that meet customer requirement and product specification (i.e., design specifications) within the constraints of cost and

other managerial limitations. The process selected will have a long-term effect on efficiency and production as well as flexibility, cost, and quality of the goods produced. Hence it is necessary that a firm has a sound process strategy at the time of selecting the process.

6. Product Life Cycle

Products, like men, are mortal. They flourish for a time, then decline and die. The life cycle of a product has many points of similarity with the human life cycle. A product is born, grows lustily, attains a dynamic maturity, then enters its declining years. Like a human being a product that has not built up its potential during its formative years is likely to be relatively unsuccessful on its maturity. But, there are critical differences between the product and the human life cycle. For instance, every person has an average life expectancy. But the life expected of a product varies widely.

(i) Introduction Stage

The introduction stage is preceded by 'production planning and development'.This period requires greater investment. This investment should be gradually recouped as the sales pick up. The concept of life cycle would give the management an idea as to the time within which the original investment could be recouped

(ii) Growth Stage

In the growth stage, both sales and profits will begin to increase. It is here that similar other new products begin to appear in the market as substitutes and offer competition. The management, therefore, should try to change its approach by changing its strategy from "buy my product" to "try my product". At the end of this stage, the distribution arrangement is likely to get completed and the prices, if necessary, are reduced a little.

(iii) Maturity Stage

The third stage is the maturity stage. During this stage the manufacturers introduce new models or adopt methods such as trading-in, etc., to promote the sale of their brands with a view to retaining their position in the market.

The number of buyers will continue to grow, but more slowly. In economic terms this is the stage where supply exceeds demand. Some of the promotional efforts may lengthen the span of this stage but they will not offer a permanent solution.

(iv) Decline

At the final stage of decline, profit margins touch a low level, competition becomes severe and customers start using newer and better products. It is here that the story of a product ends-a natural but hard end.

7. Process Selection

Process choice determines whether resources are organised around products or processes in order to implement the flow strategy. It depends on the volumes and degree of customisation to be provided.

1. **Process Choice**
   (i) Job shop process
   (ii) Batch process
   (iii) Repetitive process
   (iv) Continuous process
   (v) Project process

SHORT NOTES

2021 - Dec [3] Write short notes on Process Planning.

(3 marks) [Sec. C - Six LAQ]

Answer:

Process Planning: Process planning refers to the way production of goods or services is organised. It is the basis for decisions regarding capacity planning, facilities (or plant) layout, equipment and design of work systems. Process selection is necessary when a firm takes up production of new products or services to be offered to the customers. Three primary questions to be addressed before deciding on process selection are:

(i) How much variety of products or services will the system need to handle?

(ii) What degree of equipment flexibility will be needed?

(iii) What is the expected volume of output?

DESCRIPTIVE QUESTIONS

2015 - June [2] (c) (i) "The design of product is crucial to success in to-day's global competition". Justify the statement by providing the features of an excellent product design. **(5 marks)**

Answer:

A good product design can improve the marketability of a product by making it easier to operate or use, upgrading its quality, improving its appearance, and/or reducing manufacturing costs.

A distinctive design may be the only feature that significantly differentiates a product. An excellent design includes usability, aesthetics, reliability, functionality, innovation, and appropriateness.

An **excellent design** provides competitive advantage to the manufacturer, by ensuring appropriate quality, reasonable cost and the expected product features. Firms of tomorrow will definitely compete not on price and quality, but on product design.

The activities and responsibilities of product design include the following:

(i) Translating customer needs and wants into product and service requirements (marketing).

(ii) Refining existing products (marketing).

(iii) Developing new products (marketing, product design and production).

(iv) Formulating quality goals (quality assurance, production).

(v) Formulating cost targets (accounting).

(vi) Constructing and testing prototype (marketing, production).

(vii) Documenting specifications (product design).

Objectives of Product Design:

(i) The overall objective is profit generation in the long run.

(ii) To achieve the desired product quality.

(iii) To reduce the development time and cost to the minimum.

(iv) To reduce the cost of the product.

(v) To ensure productibility or manufacturability (design for manufacturing and assembly).

——— Space to write important points for revision ———

2015 - June [2] (d) (i) How do you distinguish among Product Design, Process Design and Production Design? **(3 marks)**

Answer:

Product Design	Process Design	Production Design
Product design deals with conversion of ideas into reality.	Process design is a macroscopic decision-making of an overall process route for converting the raw material into finished goods.	A process converts inputs into outputs in a production system.

——— Space to write important points for revision ———

2017 - June [3] (a) Discuss the term 'Process Strategy'. What does it involve? **(3 + 3 = 6 marks)**

Answer:

Process Strategy

A **process strategy** is an organisation's approach to process selection for the purpose of transforming resource inputs into goods and services (outputs). The objective of a process strategy is to find a way to produce goods and services that meet customer requirement and product specification (i.e., design specifications) within the constraints of cost and other managerial limitations. The process selected will have a long-term effect on efficiency and production as well as flexibility, cost, and quality of the goods produced. Hence, it is necessary that a firm has a sound process strategy at the time of selecting the process.

Key aspects in process strategy include:

Make or buy decisions refer to the extent to which a firm will produce goods or provide services in-house or go for outsourcing (buying or subcontracting). Capital intensity refers to the mix of equipment and labour which will be used by the firm.

Process Flexibility refers to the degree to which the system can be adjusted to changes in processing requirements due to such factors as changes in product or service design, changes in volume of products produced and changes in technology.

Three process strategies: Virtually every good or service is made by using some variation of one of three process strategies. They are: **(i) process focus (ii) repetitive focus and (iii) product focus**.

—— Space to write important points for revision ——————

2017 - Dec [3] (a) Discuss about the following process types to be implemented by a Production Manager as a strategy:

   (i)   Batch Process,
   (ii) Repetitive Process.   **(3 + 4 = 7 marks)**

Answer:

   (i)   **Batch process:** Batch processing is used when a moderate volume of goods or services is required and also a moderate variety in products or services. A batch process differs from the job process with respect to volume and variety. In batch processing, volumes are higher because same or similar products or services are repeatedly provided, examples of products produced in batches include paint, ice cream, soft drinks, books and magazines.

   (ii) **Repetitive process:** This is used when higher volumes of more standardised goods or services are needed. This type of process is characterised by slight flexibility of equipment (as products are standardised) and generally low labour skills. Products produced include automobiles, home appliances, television sets, computers, toys etc. Repetitive process is also referred to as line process as it includes production lines and assembly lines in mass production. Resources are organised around a product or service and materials

move in a line flow from one operation to the next according to a fixed sequence with little work-in- progress inventory. This kind of process is suitable to "manufacture-to-stock" strategy with standard products held in finished goods inventory. However, "assemble-to-order" strategy and "mass customisation" are also possible in repetitive process.

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2018 - June [3] (a) "Virtually all goods or services are made by using some variation of one of three process Strategies". Discuss about each of the three process strategies. Also state the situation during the decline stage of a product life cycle. **[(2 × 3) + 2 = 8 marks]**

Answer:

A process strategy is an organisation's approach to process selection for the purpose of transforming resource inputs into goods and services (outputs). The objective of a process strategy is to find a way to produce goods and services that meet customer requirement and product specification (i.e., design specifications) within the constraints of cost and other managerial limitations. The process selected will have a long-term effect on efficiency and production as well as flexibility, cost, and quality of the goods produced. Three process strategies: Virtually every good or service is made by using some variation of one of three process strategies. They are: (i) process focus (ii) repetitive focus and (iii) product focus

(a) **Process focus in a factory**; these processes might be departments devoted to welding, grinding, and painting. In an office the processes might be accounts payable, sales, and payroll. In a restaurant, they might be bar, grill, and bakery. The process focuses on low volume, high variety products are also called job shop. These facilities are process focus in terms of equipment, layout, and supervision.

(b) **Repetitive focus**; falls between the product and process focus. The repetitive process is a product-oriented production process that uses modules. Modules are parts or components of a product previously manufactured or prepared, often in a continuous process. Fast-food firms are an example of repetitive process using modules.

(c) **Product focus**; are high volume, low variety processes; also called continuous processes. Products such as light bulbs, rolls of paper, beer, and bolts are examples of product process. This type of facility requires a high fixed cost, but low costs. The reward is high facility utilization.

Many products at some point will enter the decline stage. The decline stage is a significant reduction in sales volumes. Typically this occurs for two main reasons:

1. There is a new product category in the market that provides a better solution and has provided enough incentive for consumers to switch on a widespread basis.

2. There has been a significant change in consumer lifestyles and that particular product is no longer relevant.

Most products into the decline phase due to "replacement" products being offered, primarily through enhanced technology or unique design. As mentioned above, the Apple iPod is a good example, where the smart phone technology includes a music player and has easier access to the Internet and is a more visual device. Therefore, provides significant usage and relative advantages over the iPod.

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2018 - Dec [3] (a) What are the various activities and responsibilities of product design? **(6 marks)**

Answer:

Various activities & responsibilities of Product design have been discussed below:

(i) Translating customer needs and wants into product and service requirements (marketing).

(ii) Refining existing products (marketing).

(iii) Developing new products (marketing, product design and production).

(iv) Formulating quality goals (quality assurance, production).

(v) Formulating cost targets (accounting).

(vi) Constructing and testing prototype (marketing, production).

(vii) Documenting specifications (product design).

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2019 - June [3] (a) Examine the following types of Process decisions:
  (i) Job Shop Process
  (ii) Project Process   **(6 marks)**
Answer:
Examination of the following types of Process decisions:
  (i) **Job Shop Process:** It is used in job shops when a low volume of high-variety goods are needed. Processing is intermittent, each job requires somewhat different processing requirements. A job shop is characterised by high customisation (made to order), high flexibility of equipment and skilled labour and low volume. A tool and die shop is an example of job shop, where **job process** is carried out to produce one-of-a kind of tools. Firms having job shops often carry out job works for other firms. A job shop uses a flexible flow strategy, with resources organised around the process.

  (ii) **Project Process:** It is characterised by high degree of job customisation, the large scope for each project and need for substantial resources to complete the project. Examples of projects are building a shopping centre, a dam, a bridge, construction of a factory, hospital, developing a new product, publishing a new book etc. Projects tend to be complex, take a long time and consist of a large number of complex activities. Equipment flexibility and labour skills can range from low to high depending on the type of projects.

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2019 - Dec [3] (a) What do you understand by Process Design and Selection?   **(3 + 5 = 8 marks)**
Answer:
Process Design is related to the overall sequences of operations required to achieve the product specifications. It specifies the type of work stations to be used, the machines and equipment necessary to carry out the operations. The sequence of operations is determined by (i) the nature of the product, (ii) the materials used, (iii) the quantities to be produced, and (iv) the existing physical layout of the plant.

The process design is related to the following:
  (i)   Characteristics of the product or service offered to the customers.
  (ii) Expected volume of output.
  (iii) Kinds of equipments and machines available in the firm.
  (iv) Whether equipments and machines should be of special purpose or general purpose.
  (v)   Cost of equipments and machines needed.
  (vi) Kind of labour skills available, amount of labour available and their wage rates.
  (vii) Expenditure to be incurred for manufacturing processes.
  (viii) Whether the process should be capital-intensive or labour-intensive.
  (ix) Make or buy decision.
  (x)   Method of handling materials economically.

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2021 - Dec [6] What is the first and foremost reason for Product design?
(1 mark) [Sec. B - SAQ]

Answer:
To offer new products to remain competitive in the market

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2021 - Dec [17] What is the term "Aesthetics?   (1 mark) [Sec. B - SAQ]
Answer:
This includes style, colour, look, feel, etc. which appeals to the human sense and adds value to the product.

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2021 - Dec [2] State the reasons, why Production or Operations Strategy is directly influenced by product design?   (4 marks) [Sec. C - One LAQ]
Answer:
  (i) As products are designed, all the detailed characteristics of each product are established.

(ii) Each product characteristic directly affects how the product can be made or produced and

(iii) How the product is made determines the design of the production system (production design) which is the heart of production and operations strategy.

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2021 - Dec [2] Briefly describe four stages of Product Life Cycle.

(6 marks) [Sec. C - Two LAQ]
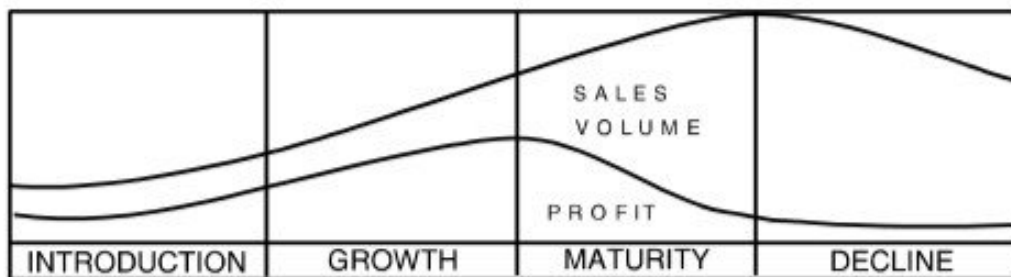
Answer:

* The introduction stage is preceded by "production planning and development." This period requires greater investment. This investment should be gradually recouped as the sales pick up.
* The concept of life cycle would give the management an idea as to the time within which the original investment could be recouped.
* After testing, a product enters the introduction stage and the product will then become available in the national market.
* Sales would begin gradually as potential buyers learn of the product through advertising and other selling techniques.
* But the profits will be low as part of the investment is to be recouped besides heavy expenditure on selling.
* In the growth stage, both sales and profits will begin to increase. It is here that similar other new products begin to appear in the market as substitutes and offer competition.
* The management, therefore, should try to change its approach by changing its strategy from "buy my product" to "try my product".

- At the end of this stage, the distribution arrangement is likely to get completed and the prices, if necessary, are reduced a little. The third stage is the maturity stage.
- During this stage the manufacturers introduce new models or adopt methods such as trading-in, etc., to promote the sale of their brands with a view to retaining their position in the market.
- The number of buyers will continue to grow, but more slowly. In economic terms this is the stage where supply exceeds demand.
- Some of the promotional efforts may lengthen the span of this stage but they will not offer a permanent solution.
- At the final stage of decline, profit margins touch a low level, competition becomes severe and customers start using newer and better products. It is here that the story of a product ends-a natural but hard end.

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2022 - Dec [3] (a) **State in brief** what are the characteristics of Good Product Design (*any seven*). **(1 × 7 = 7 marks)**

4 APPLICATION OF OPERATION RESEARCH - PRODUCTION PLANNING AND CONTROL

THIS CHAPTER INCLUDES

- Introduction
- Production Planning and Control
- Control Measures -Time & Motion Study, Method Study, Work Study
- Optimum Allocation of Resources - LLP

- Transportation
- Job Evaluation, Job Allocation - Assignment
- Scheduling and Queuing Models
- Simulation and Line Balancing
- Lean Operations
- Just-In-Time (JIT)

Marks of Objective, Short Notes, Distinguish Between, Descriptive & Practical Questions

Legend

Objective   Short Notes   Distinguish   Descriptive   Practical
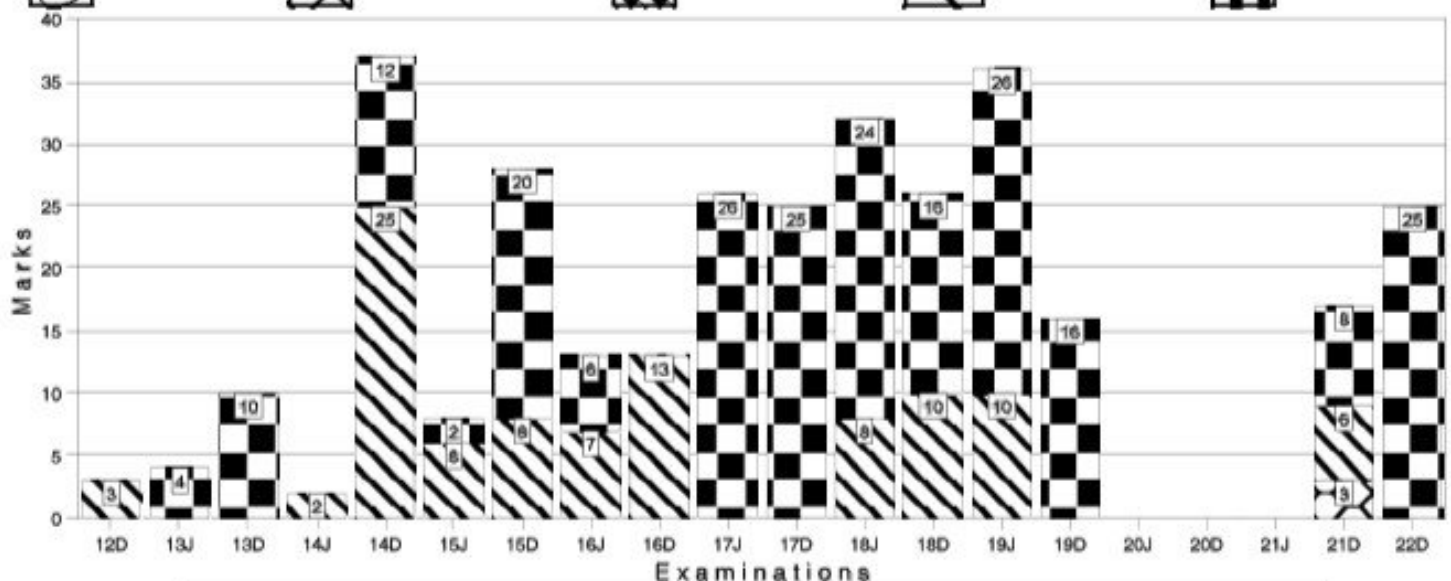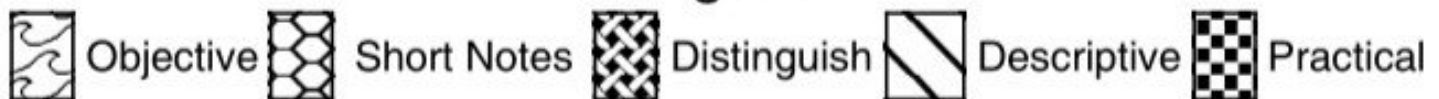
For detailed analysis Login at *www.scannerclasses.com*
for registration and password see first page of this book.

CHAPTER AT A GLANCE

1. Production Planning and Control Introduction

Production planning control can be viewed as the nervous system of a production operation. The primary concern of production planning and control is the delivery of products to customers or to inventory stocks according to some predetermined schedule. All the activities in the manufacturing or production cycle must be planned, coordinated, organised, and controlled to achieve this objective. From a long-term point of view (usually from seven to ten years or more) production planning largely deals with plant construction and location and with product-line, design and development. Short-range planning (from several months to a year) focuses on such areas as inventory goals and wage budgets.

2. Objectives of Production Planning and Control

The ultimate objective of production planning and control is to contribute to the profits of the enterprise. This is accomplished by keeping the customers satisfied through the meeting of delivery schedules. Further, the specific objectives of production planning and control are to establish the routes and schedules for work that will ensure the optimum utilisation of raw materials, labourers, and machines to provide the means for ensuring the operation of the plant in accordance with these plans. Production planning and control is essentially concerned with the control of work-in-process.

3. Basic Types of Production Control

  (i)   Block control
  (ii) Flow control
  (iii) Load control
  (iv) Order control
  (v) Special project control
  (vi) Batch control

4. Time Study, Work Study, Method Study, Job Evaluation
Time study is defined to be a searching scientific analysis of the methods and equipment used or planned in doing a piece of work, development in practical detail of the best manner of doing it and determination of the time required. Operation analysis is the study of the entire process to determine whether operations can be eliminated, combined or the sequence changed. Operation analysis aims to determine the one best way and can be applied to method, materials, tools equipment layout, working conditions and human requirements of each operation.
5. Work Study
It is a general term for the techniques: methods study and work measurement which are used in the examination; of human work in all its contexts and systematically investigate all factors leading to improvement of efficiency. Work study aims at finding the best and most efficient way of using the available resources—men, materials, money and machinery. Once the method study has developed an improved procedure for doing a work the work measurement or time study will study the time to complete a job.
6. Method Study
It is the systematic investigation of the existing method of doing a job in order to develop and install an easy, rapid, efficient, effective and less fatiguing procedure for doing the same job and at minimum cost. This is achieved by eliminating unnecessary motions involved in a certain operation or by changing the sequence of operation or the process itself.
7. Job Evaluation
Job evaluation is the ranking grading, and weighing of essential work characteristics of all jobs in order to find out or rate the worth of jobs. it is a systematic approach to ascertain the labour worth of each job and is a very important concern of all employers.

8. Point Rating Method

  (i) Straight Point Method
 (ii) Weighted Point Method
(iii) Direct to Money Methods

9. Assignment Technique

Assignment is a special linear programming problem. There are many situations where the assignment of people or machines etc. may be called for. Assignment of workers to machines, clerks to various check-out counters, salesmen to different sales areas are typical examples of these. The assignment is a problem because people possess varying abilities for performing different jobs and therefore the costs of performing jobs by different people are different.

10. Scheduling

'Scheduling' is the next important function of production planning and control after 'Routing'. It determines the starting and the completion timings for each of the operations with a view to engage every machine and operator of the system for the maximum possible time and; without imposing unnecessary burden over them. Scheduling is the determination of the time that should be inquired to perform each operation and also the time that should be required to perform the entire series as routed.

11. Principles of Scheduling

(a) The principle of optimum task size
(b) The principle of the optimum production plan
(c) The principle of the optimum operation sequence

Queuing Models
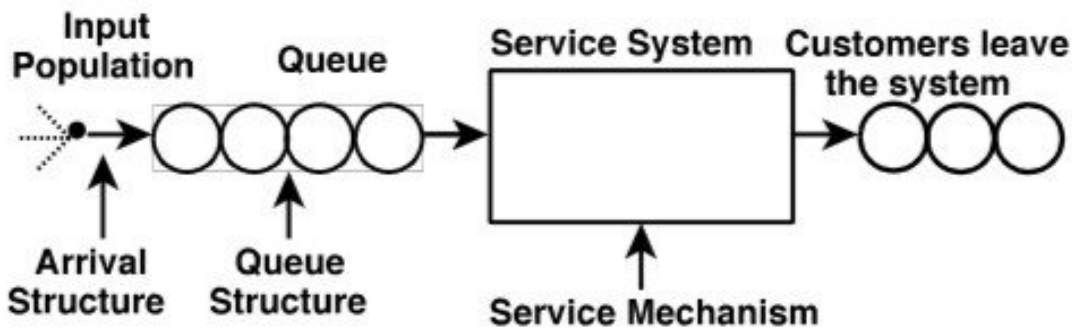
12. Simulation

In the earlier chapters, we have absent analyse the characteristics of a given system. Such models are useful for determining optimal solutions. Especially the techniques of LPP, Transportation, and assignment are used for such optimization. However, all the business situations can not be solved with the above techniques only. There may be some complex situations, where numbers of assumptions are also necessary. It may be quite often possible to simulate the given system and study the behavior.

13. Line Balancing

Line balancing is arranging a production line so that there is an even flow of production from one work station to the next, i.e. so that there are no delays at any work station that will leave the next work station with idle time. Line balancing is also defined as "the apportionment of sequential work activities into work stations in order to gain a high utilization of labour and equipment and therefore minimize idle time." Balancing may be achieved by rearrangement of the work stations or by adding machines and / or workers at some of the stations so that all operations take about the same amount of time.

14. Lean Operations

Lean operation has its roots in the Toyota Automobile Co., of Japan, where waste was to be avoided at all costs:
  (i) the waste in time caused by having to repair faulty products
 (ii) the waste of investment in keeping high inventories and
(iii) the waste of having idle workers.

15. Just-In-Time (JIT)

Objectives of JIT manufacturing : The specific goal of JIT manufacturing is to provide /the right quality level at the right place. Customer demand always determines what is right. JIT tries to build only what internal and external customers want and when they want it. The more focussed objectives of JIT are:
  (i) Produce only the products (goods or services) that customers want.
 (ii) Produce products only as quickly as customers want to use them.
(iii) Produce products with perfect quality.
(iv) Produce in the minimum possible lead times.
 (v) Produce products with features that customers want and no others.
(vi) Produce with no waste of labour, materials or equipment, designate a purpose for every movement to leave zero idle inventory.

16. Overview of JIT Manufacturing

  (i) Inventory reduction
 (ii) Quality improvement
(iii) Lead time reduction
(iv) Vendor control/Performance improvement
 (v) Continuous Improvement
(vi) Total Preventive Maintenance
(vii) Strategic gain

17. Transportation Model

Transportation models deals with the transportation of a product manufactured at different plants or factories (supply origins) to a number of different warehouses (demand destinations). The objective is to satisfy the

destination requirements within the plants capacity constraints at the minimum transportation cost. Transportation models thus typically arise in situations involving physical movement of goods from plants to warehouses, warehouses to wholesalers, wholesalers to retailers and retailers to customers.

18. Linear Programming Technique

Linear Programming is an optimization technique. It is "a technique for specifying how to use limited resources or capacities of a business to obtain a particular objective, such as least cost, highest margin or least time, when those resources have alternate uses".

SHORT NOTES

2021 - Dec [5] Write short notes on Scheduling.

(3 marks) [Sec. C - Six LAQ]

Answer:

Scheduling

- "Scheduling" is the next important function of production planning and control after "Routing".
- It determines the starting and the completion timings for each of the operations with a view to engage every machine and operator of the system for the maximum possible time and without imposing unnecessary burden over them.
- Scheduling is the determination of the time that should be required to perform each operation and also the time that should be required to perform the entire series as routed. Scheduling involves establishing the amount of work to be done and the time when each element of the work will start or the order of the work.
- Scheduling technique is an important technique of determining the starting and the completion timings of each operation and that of the total manufacturing process so that the man and machines can be utilized to the maximum.

DESCRIPTIVE QUESTIONS

2012 - Dec [4] (e) What are the three methods mainly used for finding the optimal solution for a given linear programming problem? **(3 marks)**

Answer:

There is a number of ways of finding the optimal solution for a given linear programming problems. The following three methods are mainly used for this purpose:

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

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2014 - June [2] (d) List down various phases of the simulation process.

(2 marks)

Answer :
Phases of the simulation process:
  (i)   Definition of the problem and statement of objectives.
  (ii) Construction of an appropriate model.
  (iii) Experimentations with the model constructed.
  (iv) Evaluations of the results of simulations.
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2014 - Dec [1] Answer the question:
(e) What are the main functions of production planning?   (2 marks)
Answer:
Functions of Production Planning:
There are four main functions of production planning:
  (i)   Estimating
  (ii) Routing
  (iii) Scheduling
  (iv) Loading
─── Space to write important points for revision ───

2014 - Dec [2] Answer the question:
(a) (ii) List the advantages of Method Study.   (6 marks)
(b) (iii) Write a sentence or two on each of the various methods applied for finding the optimal solution for a given linear programming problem. What is 'non-negativity condition'?   (4 + 1 = 5 marks)
(c) (i)   Classify the functions of Production Planning & Control. **(9 marks)**
(d) (i)   What are the managerial considerations in Scheduling? **(3 marks)**
Answer:
(a) (ii) Advantages of Method Study:
     1. Work simplification.
     2. Improved working method.
     3. Improvement of quality of the products.
     4. The improvement of factory, shop and workplace layout.
     5. The improvement of the design of plant and equipment.
     6. Better working conditions/environment.

7.   Better material handling and lesser material handling cost.
8.   The improvement of processes and procedures.
9.   Improvements in the use of materials, machines and manpower.
10. Less fatigue to operator.
11. Optimum utilization of all resources.
12. Higher safety to workmen.
13. Shorter production cycle time.
14. The improvement of the design of plant and equipment.
15. Economy in human effort and the reduction of unnecessary fatigue.
16. Higher job satisfaction for workmen.
17. The development of a better physical working environment.
18. Reduced material consumption and wastages.
19. Reduced manufacturing cost and higher productivity.

Answer:

(b) (iii) Methods of finding the optimal solution for a given linear programming problems:

1.	**Graphical Method**	Linear programming which involves two or three variables can be solved graphically. Any feasible solution which maximises or minimises the objective function is optimal feasible solution.
2.	**Simplex Method**	Any problem can be solved by this method which satisfies the conditions of linearity and certainty irrespective of the number of variables. In case of simplex method optimal solution is reached when net evaluation row contains either zeros or positive values in case of minimisation problem and in case of simplex method optimal solution is reached when net evaluation row contains either zeros or negative values in case of maximisation problem.

Non-negativity Condition	The linear inequalities $x \geq 0$ and $y \geq 0$. These are included because x and y are usually the number of items produced and one cannot produce a negative number of items the smallest number of items one can produce is zero.

(c) (i) Classification of Production Planning and Control Functions:
The functions of Production Planning and Control can be classified under the following:

Materials	Raw materials, spare parts and components which must be available in the correct quantities and specifications at the right time.
Methods	Choosing the best method from several alternatives. It involves deciding the best sequence of operations for manufacturing the parts, building up subassemblies and major assemblies which in turn will make up the finished product, within the limitations of existing layout and workflow.
Machines and Equipments	Production processes or methods have a relationship to the production facilities (machines and equipments) available. Production Planning and Control is concerned with selection of machines and equipments and also with maintenance policy, procedure and schedules, replacement policy and tooling. (Design and manufacture of tools).
Routing	Routing prescribes the flow of work in the plant and is related to consideration of layout of temporary storage locations for raw materials, components and semi processed parts, and of material handling systems. Routing is a basic PPC function.
Estimating	The processing times (both set up time and operation time per piece) required for the parts to be manufactured in-house are estimated and the standard time (both machine time and labour time) is established as performance standard.

Loading and Scheduling	Machines have to be loaded according to their capacity and capability. Machine loading is carried out in conjunction with routing (as indicated in process layouts or operations analysis and routing sheets) to ensure smooth workflow and the prescribed feeds, speeds of machines are adhered to as well as the estimated time (standard time which is the allowed time to do a job).
Scheduling	Determines the utilisation of equipment and manpower and hence the efficiency of the plant. Scheduling determines the starting time and completion time for each and every operation for each and every part to be manufactured and sub-unit to be assembled so that the finished product is ready to be shipped to the customer as per the predetermined delivery schedules.
Dispatching	This is concerned with the execution of planning functions. Production orders and instructions are released according to the schedule, sequences indicated in route sheets, and machine loading schedules are adhered to an authorisation is given for release of materials and tools to the operators to carry-out the work.
Expediting or Progressing	This means follow-up or keeping track of the progress made in completing the production as per schedules. This follows dispatching function logically. Dispatching initiates action on the shop floors whereas expediting ensures that the schedules are adhered to. It keeps a close liaison with the manufacturing work centres to provide a feed back to the PPC manager for prompt review of targets and schedules.
Inspection	This function relates to checking the quality in production and of evaluating the efficiency of the processes, methods and workers so that improvements can be made to achieve the desired level of quality.

| Evaluating or Controlling | The objective of evaluation or controlling is to improve performance. Methods and facilities are evaluated to improve their performance. To sum up, we can state that PPC is a management tool, employed for the direction of the manufacturing operations and their co-ordination with other activities of the firm. In the production system, which is primarily defined by the dimensions of quantity, quality, time and price, the functions of PPC comprise. |

Answer:

(d) (i)

Managerial Considerations in Scheduling	• Scheduling is essentially the short-term execution plan of a production planning model. Production scheduling consists of the activities performed in a manufacturing company in order to manage and control the execution of a production process.
	• A schedule is an assignment problem that describes in details (in terms of minutes or seconds) which activities must be performed and how the factory's resources should be utilized to satisfy the plan.
	• In all these scheduling tasks, different criteria may be used in deciding which of several schedules is best.
	• Criteria could be ranked from applying simple rules to determine which job has to be processed next at which work-centre or to the use of advanced optimizing methods that try to maximize the performance of the given environment.
	• Those criteria may relate to the amount of time the machine or equipment might be idle. In general there are six criteria that may be used in evaluating different possible schedules. They are:

	(i) Providing the product or service when the customer wants it. (ii) Minimising the length of time taken to produce that product or service. (iii) Minimising the level of work-in-progress (WIP) inventories. (iv) Minimising the amount of idle time of equipment or machine. (v) Minimising the amount of idle time of employees; and (vi) Minimising costs.

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2015 - June [2] (d) (ii) With reference to Time Study, define the terms (a) Relaxation Allowance, (b) Contingency Allowance, (c) Process Allowance by providing appropriate examples.   **(2 × 3 = 6 marks)**

Answer:

With reference to time study definition of the following terms is as follows:

(i)	Relaxation Allowance (RA)	This allowance is given to the worker to overcome the fatigue due to physical exertion, posture, concentration, working condition and personal needs such as going to toilet, drinking water, etc., it usually varies from 10% to 20% of normal or basic time.
(ii)	Contingency Allowance (CA)	This allowance is given for infrequent or non-repetitive activities such as obtaining special materials from stores, sharpening of tools, getting a special tool from the tool stores, and consultation with the supervisor. It is usually about 5% of normal or basic time.

| (iii) | Process Allowance (PA) | Allowance given to the worker to compensate himself for enforced idleness due to the nature of a process or operation; for e.g., working on automatic machine, electroplating etc., during which the worker is forced to be idle during a part of the work cycle. |

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2015 - Dec [2] Answer the question:

(b) (iii) Define simulation and identify its four phases.　　(3 + 2 = 5 marks)

Answer:

Simulation: Simulation involves developing a model of some real phenomenon and then performing experiments on the model evolved. It is a descriptive and not optimizing technique. To simulate is to initiate. In simulation, a given system is copied and the constants associated with it are manipulated in that artificial environment to examine the behaviour of the system.

Phases of the simulation process:
　(i)　Definition of the problem and statement of objectives
　(ii)　Construction of an appropriate model
　(iii)　Experimentations with the model constructed
　(iv)　Evaluations of the results of simulations.

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2015 - Dec [2] Answer the question:

(d) (iii) (a) Define Work Measurement　　　　　　　　　　(3 marks)

Answer:

Work Measurement: It is defined as the application of techniques designed to establish the work content of a specified task by determining the time required for carrying out the task at a defined standard of performance by a qualified worker. The application of techniques designed to establish the time for a qualified worker to carry out a specified job at a defined level of performance.

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2016 - June [I] Answer the question:

(f) Name the activity denoted by the following standard symbols used in Process Charting:

(i) ○ (ii) ⇒   **(2 marks)**

Answer:

(i) Operation

(ii) Transportation or movement

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2016 - June II. [4] (b) Define Motion Study.

'The principles of motion economy are divided into three groups.' List the three groups.   **(2 + 3 = 5 marks)**

Answer:

Motion Study:

Motion study is the science of eliminating wastefulness resulting from using unnecessary; ill-directed and inefficient motion. The aim of motion study is to find and perpetuate the scheme of least waste methods of labour.

The principles of motion economy are divided into three groups, viz.,

(a) Effective use of the operator

(b) Arrangement of the workplace

(c) Tools are equipment.

——— Space to write important points for revision ———————————

2016 - Dec [1] (b) Describe the areas of Production Planning and Control.

(8 marks) [Sec. B]

Answer:

Production Planning and Control encompasses the following areas:

(i) **Materials**	Planning for procurement of raw materials, components and spare parts in the right quantities and specifications at the right time from the right source at the right price. Purchasing, storage, inventory control, standardisation, variety reduction, value analysis and inspection are the other activities associated with materials.

(ii) **Methods**	Choosing the best method of processing from several alternatives. It also includes determining the best sequence of operations (process plans) and planning for tooling, jigs and fixtures etc.
(iii) **Machines and Equipments**	Manufacturing methods are related to production facilities available in the production system. It involves facilities planning, capacity planning, allocation and utilization of plant and equipments, machines etc.
(iv) **Manpower**	Planning for man power (labour, supervisory and managerial levels) having appropriate skills and expertise.
(v) **Routing**	Determining the flow of work, material handling in the plant, and sequence of operations or processing steps. This is related to considerations of appropriate shop layout and plant layout, temporary storage locations for raw materials, components and semi finished goods, and of materials handling system.
(vi) **Estimating**	Establishing operation times leading to fixation of performance standards both for workers and machines.
(vii) **Loading and Scheduling**	Machine loading is allocation of jobs to machines in conjunction with routing and with due consideration for capacity of machines and priority for jobs in order to utilize the machines to the maximum possible extent. Scheduling ensures that parts, sub assemblies and finished products are completed as per required delivery dates.
(viii) **Dispatching**	This is concerned with the execution of the planning functions. It gives necessary authority to start a particular work which has already been planned under routing and scheduling functions.

(ix) **Expediting**	Means chasing, follow up or progressing which is done after dispatching function. It keeps a close liaison with scheduling in order to provide an efficient feedback and prompt review of targets and schedules.
(x) **Inspection**	This function is related to maintenance of quality in production and of evaluating the efficiency of the processes, methods and labour so that improvements can be made to achieve the quality standards set by product design.
(xi) **Evaluating**	The objective of evaluation is to improve performance. Performance of machines, processes and labour is evaluated to improve the same.
(xii) **Cost Control**	Manufacturing cost is controlled by wastage reduction, value analysis, inventory control and efficient utilization of all resources.

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2016 - Dec [4] (a) List the objectives of scheduling in an organisation.

(5 marks) [Sec. B]

Answer:

Objectives of Scheduling are given below:

(i) To prevent unbalanced use of time among departments and work centres or to evenly load all machines.

(ii) To utilise machines and labour in such a way that the output is produced within the established lead time so as to:
   (a) deliver the products/services in time and
   (b) complete production in the shortest cycle time possible at minimum total cost of production.

(iii) To reduce idle time of labour and machines, which might be caused due to waiting for materials, waiting for movement, waiting for inspection and waiting for want of work.

(iv) To fix up delivery dates for various manufacturing activities and for the finished products.

(v) To increase the efficiency of production or productivity.

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2018 - June [3] (b) Discuss the principles of scheduling. Explain briefly the relationship between routing and scheduling. **(6 + 2 = 8 marks)**

Answer:

'Scheduling' is the next important function of production planning and control after 'Routing'. It determines the starting and the completion timings for each of the operations with a view to engage every machine and operator of the system for the maximum possible time and; without imposing unnecessary burden over them. Scheduling is the determination of the time that should be inquired to perform each operation and also the time that should be required to perform the entire series as routed.

Principles of Scheduling

1. **The principle of optimum task size:** Scheduling tends to achieve maximum efficiency when the task sizes are small, and all tasks of same order of magnitude.

2. **Principle of optimum production plan:** The planning should be such that it imposes an equal load on all plants.

3. **Principle of optimum sequence:** Scheduling tends to achieve the maximum efficiency when the work is planned so that work hours are normally used in the same sequence.

   The first principle has a tendency when applied, not only give good results but also to be self-correcting if it is ignored. **For example,** if in a functional batch production machine shop the loads imposed by different operations vary greatly in length it is possible that it will be necessary to break many of the long operations into one or more small batches, in order to get the other orders completed by due date. In effect, this principle only repeats the known advantage of maintaining a high rate of stock turn over, and of single phase ordering. The second principle merely states that the obvious fact that there will be less idle time and waiting time, if all the plant is evenly loaded by the production planners,

then if some of the machines are over loaded perhaps because direct labour cost on them are lower and others are idle for part of the time due to shortage of work. The third principle says about principle of flow. Sometimes it is also true if we sequence some jobs, which need the same machine set up, at a time, this avoids machine ancillary time needed, in case, the jobs of the above type are done at different times. **For example,** consider drilling a 10 mm hole in five different jobs may be done at a time so that the set up time required for five jobs can be once only.

Relationship between Routing and Scheduling :
Both routing and scheduling are interconnected as scheduling is difficult without routing and routing is also not effective without scheduling. Routing is a prerequisite for scheduling while time to be taken may form the basis of routing and that is fixed by scheduling.

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2018 - Dec [3] (b) Describe the objectives of Production Planning and Control. **(10 marks)**
Answer:
Objectives of Production Planning and Control are as follows:
  (i) Analysing the orders to determine the raw materials and parts that will be required for their completion,
  (ii) Answering questions from customers and salesmen concerning the status of their orders,
  (iii) Assisting the costing department in making cost estimates of orders,
  (iv) Assisting the human resource departments in the manpower planning and assignment of men to particular jobs,
  (v) Controlling the stock of finished parts and products,
  (vi) Determining the necessary tools required for manufacturing,
  (vii) Direction and control of the movement of materials through production process,
  (viii) Initiating changes in orders as requested by customers while orders are in process,
  (ix) Issuing requisitions for the purchase of necessary materials,

(x) Issuing requisitions for the purchase or manufacture of necessary tools and parts,

(xi) Keeping the up-to-date records scheduled and in process,

(xii) Maintaining stocks of materials and parts,

(xiii) Notifying sales and accounting of the acceptance of orders in terms of production feasibility,

(xiv) Preparing the route sheets and schedules showing the sequence of operation required to produce particular products,

(xv) Production of work orders to initiate production activities,

(xvi) Receiving and evaluating reports of progress on particular orders and initiating corrective action, if necessary,

(xvii) Receiving orders from customers,

(xviii) Revising plans when production activities cannot conform to original plans and when revisions in scheduled production are necessary because of rush orders.

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2019 - June [3] (b) Describe the different types of Production Control.

(10 marks)

Answer:

Production Control can be of six types:

(i) **Block Control:**

This type of control is most prominent in textiles and book and magazine printing. In these industries it is necessary to keep things separated and this is the fundamental reason why industries resort to block control.

(ii) **Flow Control:**

This type of control is commonly applied in industries like chemicals, petroleum, glass, and some areas of food manufacturing and processing. Once the production system is thoroughly designed, the production planning and control department controls the rate of flow of work into the system and checks it as it comes out of the system. But, under this method, routing and scheduling are done when the plant is laid out. That is to say, the production line which is established

is well balanced and sequenced before production operations begin; this type of control is more prevalent in continuous production systems.

(iii) **Load Control:**

Load control is typically found wherever a particular bottleneck machine exists in the process of manufacturing.

(iv) **Order Control:**

The most, common type of production control is called order control. This type of control is commonly employed in companies with intermittent production systems, the so-called job-lot shops. Under this method, orders come into the shop for different quantities for different products. Therefore, production planning and control must be based, on the individual orders.

(v) **Special Project Control:**

Special production control is necessary in certain projects like the construction of bridges, office buildings, schools, colleges, universities, hospitals and any other construction industries. Under this type of control, instead of having sets of elaborate forms for tooling and scheduling, a man or a group of men keeps in close contact with the work.

(vi) **Batch Control**:

Batch control is another important, type of production control which is frequently found in the food processing industries.

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2021 - Dec [2] What are the objectives of Just-in-Time (JIT) manufacturing?

(6 marks) [Sec. C - Three LAQ]

Answer:

JIT Manufacturing: The specific goal of JIT manufacturing is to provide the right quality level at the right place. Customer demand always determines what is right.

JIT tries to build only what internal and external customers want and when they want it.

Objectives of Just in Time (JIT) manufacturing:
  (i)   Produce only the products (goods or services) that customers want.
  (ii) Produce products only as quickly as customers want to use them.
  (iii) Produce products with perfect quality.
  (iv) Produce in the minimum possible lead times.
  (v)   Produce products with features that customers want and no others.
  (vi) Produce with no waste of labour, materials or equipment, designate a purpose for every movement to leave zero idle inventory.

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PRACTICAL QUESTIONS

2013 - June [2] (a) A company manufactures two items X_1 and X_2. They are sold at a profit of ₹ 30 per unit of X_1 and ₹ 20 per unit of X_2. X_1 requires 2 kg. of materials, 3 man hours and 1 machine hour per unit. X_2 requires 1 kg of material, 2 man hours and 3 machine hours per unit.

During each production run there are 280 kg of material available, 500 labour hours and 420 hours of machines used. Please introduce the slack variables and write down the equations, including the objective function, that will determine the quantity of production of the two items to maximize profits.

(4 marks)

Answer:
The equation can be developed as under for Introducing slack variables S1, S2 and S3. Objective function is

Maximize $Z = 30X_1 + 20X_2 + 0S_1 + 0S_2 + 0S_3$
Subject to the constraints
$2X_1 + X_2 + S_1 + 0S_2 + 0S_3 = 280$
$3X_1 + 2X_2 + 0S_1 + S_2 + 0S_3 = 500$
$X_1 + 3X_2 + 0S_1 + 0S_2 + S_3 \geq 420$
$X_1, X_2, S_1, S_2, S_3 = 0$

—— Space to write important points for revision ——

2013 - Dec [1] {C} (i) Shin's Car Wash & Dry is an automatic, five-minute operation with a single bay. On a typical Saturday morning, cars arrive at a mean rate of ten per hour, with arrivals tending to follow a Poisson distribution. Find the average number of cars in line. **(1×5 =5 marks)**

Answer:

(i) Here, Given

$\lambda = 10$ cars per hour

$\mu = 1$ per 5 minutes, 12 per hour

$$Lq = \frac{\lambda^2}{2\mu(\mu-\lambda)} = \frac{10^2}{2 \times 12(12-10)} = \frac{100}{48} = 2.08 \text{ cars}$$

2013 - Dec [5] (a) A company plans to fill four positions and it decides to conduct aptitude tests and interviews for the same. While the aptitude tests are conducted by people from the clerical positions, the job interviews are held by the personnel from the management cadre. The job interviews immediately follow the aptitude test. The time required (in minutes) by each of the positions is given here,

Position	P1	P2	P3	P4
Aptitude Test	100	110	140	120
Job Interview	70	90	80	110

If it is desired to minimise the waiting time of the management personnel, in what order the position filling be handled? **(5 marks)**

Answer :

From the given information, the optimal sequence can be determined using the algorithm. This would be P4, P2, P3 and P1.

Calculation of total elapsed Time T

Position	Aptitude Test		Job interview	
	Start	Finish	Start	Finish
P4	0	120	120	230
P2	120	230	230	320
P3	230	370	370	450
P1	370	470	470	**540**

The total elapsed time T is equal to 540 minutes as calculated above, while the idle time for the management personnel would be:120 + 100 + 50 + 20 = 290 minutes.

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2014 - Dec [2] Answer the question:

(c) (ii) An Industrial Engineer, appointed to conduct a time-study for a job, has after observation, divided the job into 5 elements. He had noted the timings for four cycles of the job as below:

Element	Time in Minutes				Performance Rating (%)
	Cycle 1	Cycle 2	Cycle 3	Cycle 4	
1	1.327	1.254	1.351	1.269	85%
2	0.983	1.854	0.882	0.956	95%
3	1.894	1.821	1.928	1.963	100%
4	2.569	2.173	2.132	2.285	120%
5	1.358	1.139	2.561	1.438	100%

(A) Are there any outliners in the data i.e. probable errors in reading or recording data which should not be included in the analysis?

(B) Compute the basic time for the job. Also compute the standard time if a relaxation allowance of 13%, a contingency allowance of 4% and an incentive of 25% are applicable for the job.

(1 + 6 = 7 marks)

(d) (iii) In a simulation operation, a firm's maintenance person received requests for service and provided service during an 8 hour period as shown below:

Request Arrival Time (Clock Time)	Service Time (Hours)
0	1.00
0.3	1.00

2.00	1.50
3.00	1.50
6.30	0.50

The maintenance labour cost is ₹ 150 per hour, and the delay time cost is ₹ 500 per hour. Find:

(A) The idle time cost for the maintenance person, and

(B) The delay time cost for the machinery.   **(5 marks)**

Answer:

(c) (ii) (A) The times for element no. 2 in cycle 2 and for element no. 5 in cycle 3 are suspect and should be disregarded as they vary very much as compared with time values for these elements in other cycles.

(B) The basic time or normal time is calculated on the basis of data excluding the outliners as below:

Element	Mean actual time (minutes)	Performance rating (%)	Normal or basic time (minutes)
1	1.3	85	$\frac{1.3 \times 85}{100} = 1.105$
2	0.94	95	$\frac{0.940 \times 95}{100} = 0.893$
3	1.902	100	$\frac{1.902 \times 100}{100} = 1.902$
4	2.29	120	$\frac{2.290 \times 120}{100} = 2.748$
5	1.312	100	$\frac{1.312 \times 100}{100} = 1.312$

Normal time for the total job which include all five elements = 7.96 minutes

Calculation of standard time

Standard time for the job = Normal time + Allowances

$$= 7.96 + \frac{13}{100} \times 7.96 + \frac{4}{100} \times 7.96$$

$$= 7.96 + 1.035 + 0.318$$

$$= 9.313 \text{ minutes}$$

If 25% incentive allowance is given, total time allowed under incentive scheme $= 9.313 + \dfrac{25}{100} \times 9.313$

$$= 9.313 + 2.328 = 11.641 \text{ minutes}$$

Answer:

(d) (iii) Calculation of machine down time:

Request Arrival time	Repair time reqd. with one person Hours	Repair time begins (clock time)	Repair time ends (clock time)	Machine down time (Hours)		
				Waiting time	Repair time	Total time
0.00	1.0	0.00	1.00	Nil	1.0	1.0
0.30	1.0	1.00	2.00	0.5	1.0	1.5
2.00	1.5	2.00	3.30	Nil	1.5	1.5
3.00	1.5	3.30	5.00	0.5	1.5	2.0
6.30	0.5	6.30	7.00	Nil	0.5	0.5
Total	**5.5 hours**			**1.0**	**5.5**	**6.5**

Idle time for the maintenance person = 8 - 5.5 = 2.5 hrs.

(a) Idle time cost for maintenance crew = 2.5 × 150 = ₹ 375
(b) Delay time or waiting time = 1.0 hour
    Delay time cost for the machinery = 1.0 × 500 = ₹ 500

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2015 - June [1] (c) The time study of a machinery operation recorded average cycle time of 9.0 minutes. The analyst rated the observed worker as 90%. The firm uses a 0.15 allowance fraction. Compute the standard time.

(2 marks)

Answer:

Average cycle time	=	9.0 minutes
Normal time	=	9.0 × 0.90
	=	8.1 minutes

Standard Time = $\dfrac{8.1}{1 - 0.15}$

= 9.53 minutes

The standard time for this machinery operation would be set at 9.53 minutes, which is greater than the average cycle time observed. The average cycle time was adjusted for the rating factor (90%) and the allowance fraction (0.15).

2015 - Dec [2] Answer the question:

(a) (ii)   A faculty in a college is planned to rise to strength of 60 staff members and then to remain at that level. The wastage of recruits depends upon their length of service and is as follows:

Year	1	2	3	4	5	6	7	8	9	10
Total % who left up to end of year	6	36	57	66	71	77	81	87	96	100

(I)   Find the number of staff members to be recruited every year.

(II)   If there are seven posts of Head of Department for which length of service is the only criterion of promotion, what will be average length of service after which a new entrant should expect promotion? **(3 + 4 = 7 marks)**

Answer:

(i)   With an intake of 100 staff members every year, the distribution of the length of service of the staff members, when equilibrium has been reached, shall be as follows:

Year	0	1	2	3	4	5	6	7	8	9	10	**Total**
No. of people Continuing	100	94	64	43	34	29	23	19	13	4	0	423

Thus if 100 staff members are recruited every year, the total number of staff members after 10 years of service = 423

To maintain a strength of 60 staff members, we need to recruit 60 x 100/423 = 14.18 staff members per year.

It is assumed that those staff members who completed x years' service but left before x + 1 year's service, actually left immediately before completing x + 1 years.

If we assume that the staff members leave as soon as they complete x years of service, the total of the staff members would be 323.

According to this, the recruitment necessary to have a staff members strength of 60 shall be equal to 60 x 100/323 = 18.58 staff members per year. Since, in practice, the staff members may leave at any time of the year, the number of recruitments should be (14.18+ 18.58) /2 or 16 (app).

(ii) If we recruit 16 persons every year then we want 7 seniors. Hence if we recruit 100 every year, we shall require 7/ 16 x 100 = 44 (approx) seniors.

It can be seen that 44 seniors will be available if we promote them during 6th year of their service
($\because$ 0 + 4 + 13 + 19 + 23 = 59 > 54).

$\therefore$ The promotion of a newly recruited staff member will be due after completing 5 years and before putting in 6 years of service.

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2015 - Dec [2] Answer the question:

(b) (ii) Calculate the standard time per article produced from the following data obtained by a work sampling study:

Total No. of observations	= 2597
No. of working observations	= 2000
No. of units produced in 100 hours duration	= 5000 numbers
Proportion of manual labour	= 3/4
Proportion of machine time	= 1/4
Observed rating factor	= 120%
Total allowances	= 15% of normal time.

(7 marks)

Answer:

Actual working time in the duration of 100 hours = $100 \times \dfrac{2000}{2597} = 77.01$ hours

Time taken per article = $\dfrac{77.01 \times 60}{5000} = 0.924$ minute

Observed manual labour time per article = $0.924 \times \dfrac{3}{4} = 0.693$ minute

Observed machine time per article = $0.924 \times \dfrac{1}{4} = 0.231$ minute

Normal labour time per unit = Observed time/unit × Rating factor
$$= 0.693 \times 1.20 = 0.8316 \text{ minutes}$$
Standard labour time per unit= $0.8316 + (15/100) \times 0.8316 = 0.9563$ minute
Standard time per unit of article produced = $0.9563 + 0.231 = 1.187$ minute
—— Space to write important points for revision ——

2015 - Dec [2] Answer the question:
(d) (ii) The work-study engineer carries out the work sampling study for 120 hours. The following observations were made for a machine shop:

Total number of observations	7000
No. of Idle activities	1200
Ratio between manual to machine elements	3:1
Average rating factor	120%
Total number of jobs produced during study	800 units
Rest and personal allowances	17%

Compute the standard time for the job.

(6 marks)

Answer:
(a) Overall time per unit $(To) = \dfrac{\text{Duration of study}}{\text{Number of jobs produced during study}} = \dfrac{120 \times 60}{800} = 9$ min.

(b) Effective time per piece $(Te) = T_0 \times \dfrac{\text{Production observation}}{\text{Total observation}} = 9 \times \dfrac{5800}{7000} = 7.46$ min.

The effective time is to be segregated into manual time and machine element time.

Machine controlled time per piece $(Tm) = 7.46 \times 1/4 = 1.87$ min.
Hand controlled time per piece $(T_h) = 7.46 \times 3/4 = 5.59$ min.
Normal time per piece = $Tm + T_h \times$ performance rating = $1.87 + 5.59 \times 1.2$ = 8.58 min.
Standard time per piece = $8.58 (1 + 0.17) = 10.04$ minutes.
—— Space to write important points for revision ——

2016 - June [II] Answer the question:

4. (c) Calculate the standard production per shift of 8 hours duration, with the following data:

Observed time per unit = 5 minutes, Rating Factor – 120%, Total allowances = 30% of normal time. **(6 marks)**

Answer:

Normal time per unit = $5 \times \dfrac{120}{100}$ = 6 minutes.

Allowances = $6 \times \dfrac{30}{100}$ = 1.8 minutes.

Standard time per unit = 6 + 1.8
= 7.8 minutes /units

Standard production in shift of 8 hours = $\dfrac{8 \times 60}{7.8}$ = 61.538 units.

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2017 - June [3] (b) Calculate the standard time per article produced from the following data obtained by a work sampling study:

Total no. of observations = 2,600
No. of working observations = 2,000
No. of units produced in 100 hours duration = 5,000 numbers
Proportion of manual labour = 3/4
Proportion of machine time = 1/4
Observed rating factor = 120%
Total allowances = 15% of normal time **(10 marks)**

Answer:

(1) Actual working time in the duration of 100 hours = 100 × (2,000/2,600)
= 76.923 hours

(2) Time taken per article = (76.923 × 60)/5,000 = 0.923 minute

(3) Observed manual labour time per article = 0.923 × (3/4) = 0.6922 minute

(4) Observed machine time per article = 0.923 × (1/4) = 0.230 minute

(5) Normal labour time per unit = Observed time/unit × Rating factor = 0.6922 × 1.20 = 0.8306 minute

(6) Standard labour time per unit = 0.8306 + (15/100) × 0.8306 = 0.9552 minute

(7) Standard time per unit of article produced = 0.9552 + 0.230 = 1.185 minutes.

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2017 - June [4] (a) A Bakery shop sells bakery items. Past data of demand per week in hundred kilograms with frequency is given below:

Demand/Week	0	6	12	18	24	30
Frequency	1	12	19	8	6	4

Using the following sequence of random numbers, generate the demand for the next 10 weeks. Also find out the average demand per week.

Random numbers	12	27	18	58	43	75	31
	62	47	35	53	42	68	71

(10 marks)

Answer:

Random No. Range Table for demand				
Demand per week	**Frequency**	**Probability**	**Cumulative Probability**	**Range**
0	1	.02	.02	0-1
6	12	.24	.26	2-25
12	19	.38	.64	26-63
18	8	.16	.80	64-79
24	6	.12	.92	80-91
30	4	.08	1.00	92-99
	$\sum f = 50$	1.00		

Simulated Values for next 10 weeks		
Weeks	**R. Nos.**	**Demand**
1	12	6

2	27	12
3	18	6
4	58	12
5	43	12
6	75	18
7	31	12
8	62	12
9	47	12
10	35	12
		114

Average weekly demand $= \dfrac{114}{10} = 11.4$

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2017 - June [4] (b) An incentive scheme allows proportionate production bonus beyond 100% performance level.

Calculate the amount of

(i) Incentive bonus and

(ii) Total payment received by an operator on a particular day during which the following particulars apply:

Operation : Assembling a table clock set

Work Content : 40 Standard minutes per assembled set

Attended Time : 8 Hours

Time spent on unmeasured work : 3 Hours

Number of sets assembled during the day : 10

Wage rate : ₹ 5 per hour

(iii) What is the net labour productivity achieved by the operator during the day? **(2 × 3 = 6 marks)**

Answer:

Total standard minutes worked during the day = 40×10 = 400, working time = 8-3 = 5 hours = 300 minutes.

Performance = (400×100)/300 = 133.34% or 0.3333

(i) Incentive bonus = 0.3333×5×5= ₹ 8.33 for five hours on measured work

(ii) Guaranteed wage for 8 hours = 8 × 5 = ₹ 40;
Total earnings for the day = ₹ (8.33+40) = ₹ 48.33

(iii) Net labour productivity = Output in units/Net person hours =10/5 = 2 sets per hour.

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2017 - Dec [3] (b) Workers come to a tool store room to enquire about special tools (required by them) for accomplishing a particular project assigned to them. The average time between the two arrivals is 60 seconds and the arrivals are assumed to be in Poisson distribution. The average service time (of the tool room attendant) is 48 seconds.
Determine:

(i) Average Queue Length

(ii) Average Length of non-empty queues

(iii) Average number of workers in system including the worker being attended **(3 × 3 = 9 marks)**

Answer:

Arrival Rate: λ = 60/60 per second = 1 per minute

Service Rate: μ = 60/48 per second = 1.25 per minute

(i) Average Queue Length:

L_q = $(\lambda/\mu) \times [\lambda/(\mu - \lambda)]$ = (1/1.25)×[(1/(1.25 - 1)]

$\qquad\qquad\qquad\qquad$ =1/(1.25×0.25)

$\qquad\qquad\qquad\qquad$ = 16/5

$\qquad\qquad\qquad\qquad$ = 3.2 workers

(ii) Average Length of non-empty queues:

L_n = $[\mu/(\mu - \lambda)]$ = 1.25/(1.25-1)

$\qquad\qquad\qquad$ = 1.25/0.25

$\qquad\qquad\qquad$ = 5 workers

(iii) Average Number of workers in system:

L_s = $[\lambda/(\mu - \lambda)]$ = 1/(1.25-1)

$\qquad\qquad\qquad$ = 1/0.25

$\qquad\qquad\qquad$ = 4 workers

—— Space to write important points for revision ——

2017 - Dec [4] (a) The below Table shows the time remaining (number of days until due date) and the work remaining (number of days' work) for 5 jobs which were assigned the Letters A to E as they arrived to the shop. Sequence these jobs by priority rules viz.,
(i) FCFS (ii) EDD (iii) LS (iv) SPT (v) LPT.

Job	Number of days until due date	Number of days' work remaining
A	9	5
B	4	7
C	5	3
D	6	6
E	8	2

(2 × 5 = 10 marks)

Answer:
Numerical: The below Table shows the time remaining

Job	Number of days until due date	Number of days work remaining
A	9	5
B	4	7
C	5	3
D	6	6
E	8	2

(i) **FCFS (First come first served):** Since the jobs are assigned letters A to E as they arrived to the shop, the sequence according to FCFS priority rule is ABCDE.

(ii) **EDD (Early Due Date job first) rule:** Taking into account the number of days until due date, the sequence of jobs as per EDD rules is B C D E A (4 5 6 8 9).

(iii) L.S. (Least slack) rule also called as Minimum slack rule. Calculation of slack:

Slack = (Number of days until due date) - (Number of days work remaining)

Job	Slack	(Days)
A	9-5	= 4
B	4-7	=(-3)
C	5-3	=2
D	6-6	=0
E	8-2	=6

Sequence: B D C A E
        (-3 0 2 4 6)

(iv) SPT (Shortest Processing Time job first) also referred as SOT (Shortest Operation time job First) rule or MINPRT (Minimum Processing time job first) rule.
Sequence: E C A D B
        (2 3 5 6 7)

(v) LPT (Longest Processing time job first) also referred to as LOT (Longest operation time job first) rule.
Sequence: B D A C E
        (7 6 5 3 2)

—— Space to write important points for revision ——————

2017 - Dec [4] (b) A department works on 8 hours shift, 285 days a year and has the usage data of a machine, as given below:

Product	Annual Demand (units)	Processing time (Standard time in hours)
A	360	7.0
B	435	5.0
C	570	6.0

Calculate:
(i) Processing time needed in hours to produce products A, B and C,
(ii) Annual production capacity of one machine in standard hours, and
(iii) Number of machines required. **(2 × 3 = 6 marks)**

Answer:
(i) The processing time needed in hours to produce products A, B and C in the quantities demanded visiting the standard time data;

Product	Annual Demand (units)	Processing time (Standard time in hours)	Processing time needed (hours)
A	360	7.0	360 x 7 = 2,520
B	435	5.0	435 x 5 = 2,175
C	570	6.0	570 x 6 = 3,420
			Total = 8,115 hrs.

(ii) Annual production capacity of one machine in standard hours = 8 x 285 = 2,280 hours/year

(iii) Number of machines required = Work load per year/Production capacity per machine = 8,115/2,280 = 3.5592 machines = 4 Machines

—— Space to write important points for revision ——

2018 - June [4] (a) A blacksmith supervisor in his workshop is considering how he should assign the four jobs that are to be performed, to four of the workers under him. He wants to assign the jobs to the workers such that the aggregate time to perform the jobs is the least. Based on previous experience, he has the information on the time taken by the four workers in performing these jobs and the same is given in the table below:

Time Taken(in minutes) by 4 Workers

Worker	Job			
	A	B	C	D
1	46	40	51	68
2	57	42	63	55

| 3 | 49 | 53 | 48 | 64 |
| 4 | 41 | 45 | 61 | 55 |

Solve the assignment problem for optimal solution using Hungarian Method.

(8 marks)

Answer:

(a) Step 1 :

The minimum value of each row is subtracted from all elements in the row. It is shown in the reduced cost table, also called opportunity cost table, given below:

Table-1: Reduced Cost Table - 1

Worker	Job			
	A	**B**	**C**	**D**
1	6	0	11	28
2	15	0	21	13
3	1	5	0	16
4	0	4	20	14

Step 2 :

For each column of this table, the minimum value is subtracted from all the other values. The columns that contain a zero would remain unaffected by this operation. Hence, only the fourth column values would change.

Table - 2 shows this.

Table - 2: Reduced Cost Table - 2

Worker	Job			
	A	**B**	**C**	**D**
1	6	0	11	15
2	15	0	21	0
3	1	5	0	3
4	0	4	20	1

Step 3 :

Draw the minimum number of lines covering all zeros. As a general rule, we should first cover those rows/columns which contain larger number of zeros. Table - 3 shows this.

Table - 3:

Worker	Job			
	A	**B**	**C**	**D**
1	6	0	11	15
2	15	0	21	0
3	1	5	0	3
4	0	4	20	1

Step 4 :

Since the number of lines drawn is equal to 4 (= n), the optimal solution is obtained. The assignments are made after scanning the rows and columns for unit zeros. Assignments made are shown with squares as shown in Table 4.

Table - 4: Assignment of Jobs

Worker	Job			
	A	**B**	**C**	**D**
1	6	[0]	11	15
2	15	0	21	[0]
3	1	5	[0]	3
4	[0]	4	20	1

Assignments are made in the following order. Rows 1, 3, and 4 contain only one zero each. So assigned 1-B, 3-C, and 4-A. Since worker 1 has been assigned job B, we cross the zero in the second column of the second row. After making these assignments, only worker 2 and job D are left for assignment. The final pattern of assignments is 1-B, 2-D, 3-C, and 4-A, involving a total time of 40 + 55 + 48 + 41 = 184 minutes. This is the optimal solution to the problem.

—— Space to write important points for revision ——

2018 - June [4] (b) At a tool service centre, the arrival rate is 3 per hour and the service potentials 4 per hour. Simple queue conditions exist. The hourly wage paid to the attendant at the service centre is ₹ 2 per hour and the hourly cost of a machinist away from his work is ₹ 5.
Calculate:
  (i)   The average number of machinists being served or waiting to be served at any given time.
  (ii) The average time a machinist spends waiting for service.
  (iii) The total cost of operating the system for an eight-hour day.
  (iv) The cost of the system if there were two attendants working together as a team, each paid ₹ 2 per hour and each able to service on average 3 per hour.   **(2 × 4 = 8 marks)**
Answer:
At a tool service centre, the arrival rate is 3 per hour and the service potentials are 4 per hour.
Arrival Rate: = λ = 3 per hour
Service Rate: = μ = 4 per hour
  (i)   The average number of machinists being served or waiting to be served at any given time:
        $L_n = [\lambda / (\mu - \lambda)] = 3 / (4 - 3) = 3$
  (ii) The average time a machinist spends waiting for service:
        $W_q = [(\lambda / \mu) \times 1/(\mu - \lambda)] = (3 / 4) \times 1 / (4 - 3) = 0.75$ hours = 45 minutes.
  (iii) Average time in the system:
        $W_s = [1 / \mu - \lambda] = 1/ (4 - 3) = 1$ hr.

Average number of machinists in the system = 3 [As per (i) above]
Cost of three machinists being away from work = 5 x 3 = 15 per hour.

    Attendant cost   = 2 per hour
    Total Cost / hour   = 17 per hour

The total cost of operating the system for an eight - hour day :
17 x 8 = 136

(iv) It is assumed that there is still a single service point, but the average service rate is now

    = 6 per hour.

    => Now λ = 3 per hour

           μ = 6 per hour

    => Average number in the system $L_n = [\lambda /(\mu - \lambda)] = 3 / (6 - 3) = 1$

    Average time spent in the system $W_s = 1/(\mu - \lambda)] = 1/ (6 - 3)$

    = 1/3 hours.

    = (1/3) x 60 = 20 minutes.

Machinists Cost = 1/3 hour x 5 =	1.67
Attendant Cost	4.00
Total Cost	5.67

Cost per 8 hour day = 5.67 x 8 = 45.36

—— Space to write important points for revision ——

2018 - June [5] (a) The following jobs have to be shipped a week from now (week has 5 working days)

Job	A	B	C	D	E	F
Number of days's work remaining	4	5	8	7	6	3

Sequence the jobs according to priority established by:

  (i) Least slack rule
  (ii) Critical ratio rule   **(4 × 2 = 8 marks)**

Answer:

(i) Least Slack Rule

Slack = (Number of days until due date) – Number of days works remaining)

Job	(5 Days) Slack	(Days)
A	(5 – 4)	= 1
B	(5 – 5)	= 0
C	(5 – 8)	= (– 3)
D	(5 – 7)	= (– 2)
E	(5 – 6)	= (– 1)
F	(5 – 3)	= 2

Sequence =

C	D	E	B	A	F
– 3	– 2	– 1	0	1	2

(ii) **Calculation of Critical Ratio:**

Critical Ratio = Available time / Operation time
Critical Ratio for job A = 5/4 = 1.25
Critical Ratio for job B = 5/5 = 1.00
Critical Ratio for job C = 5/8 = 0.625
Critical Ratio for job D = 5/7 = 0.714
Critical Ratio for job E = 5/6 = 0.833
Critical Ratio for job F = 5/3 = 1.667

Job having least critical ratio is given the first priority and so on.

Sequence	C	D	E	B	A	F
Critical Ratio	0.625	0.714	0.833	1.00	1.25	1.667

—— Space to write important points for revision ——

2018 - Dec [4] (a) Find initial Feasible Solution by North-West Corner method.

	W1	W2	W3	W4	SUPPLIES
F1	47	59	55	57	150
F2	44	54	52	59	270
F3	49	64	59	61	370
F4	51	63	54	60	230
DEMAND	210	330	260	220	

W_j - > Warehouse
F_j - > Factory, and
Cell entries are unit costs. **(6 marks)**

Answer:

Initial Feasible Solution by North- West Corner method.

	W1	W2	W3	W4	SUPPLIES
F1	150 / 47	59	55	57	150
F2	60 / 44	210 / 54	52	59	270
F3	49	120 / 64	250 / 59	61	370
F4	51	63	10 / 54	220 / 60	230
DEMAND	210	330	260	220	

2018 - Dec [4] (b) A departmental store is running a snack items selling outlet. Past data of snack items' demand per week in hundred kgs with frequency is given below:

Demand/Week	0	6	12	18	24	30
Frequency	3	10	9	20	6	2

Using the following sequence of random numbers, generate the demand for next 10 weeks. Also find out the average demand per week.

Random Numbers	21	34	48	97	72	31	45	56
	47	37	82	44	67	75	63	

(10 marks)

Answer:

Random No. Range Table for demand

Demand per week	Frequency	Probability	Cumulative Probability	Range
0	3	0.06	0.06	0-5
6	10	0.20	0.26	6-25
12	9	0.18	0.44	26-43
18	20	0.40	0.84	44-83
24	6	0.12	0.96	84-95
30	2	0.04	1.00	96-99
	$\Sigma f = 50$	1.00		

Simulated value for next 10 weeks

Weeks	R. Nos.	Demand
1	21	6
2	34	12
3	48	18
4	97	30

5	72	18
6	31	12
7	45	18
8	56	18
9	47	18
10	37 .	12
	TOTAL	162

Average Weekly Demand: 162/10 = 16.2

—— Space to write important points for revision ——

2019 - June [4] (a) A project consists of four major jobs, for which four contractors have submitted tenders. The tender amounts, in thousands of Rupees, are given below:

Contractor	Jobs			
	A	B	C	D
1	110	98	75	95
2	85	95	115	65
3	105	135	125	98
4	95	95	75	95

Find the assignment, which minimizes the total cost of the Project. Each contractor has to be assigned one job. **(8 marks)**

Answer:

The given problem is a standard minimization problem. Subtracting the minimum element of each row from all its elements in turn, the given problem reduces to :

Contractor	Jobs			
	A	B	C	D
1	35	23	0	20

2	20	30	50	0
3	7	37	27	0
4	20	20	0	20

Now subtract the minimum element of each column from all of its elements in turn. Draw the minimum number of lines, horizontal or vertical, so as to cover all zeros:

Contractor	Jobs			
	A	**B**	**C**	**D**
1	28	3	0	20
2	13	10	50	0
3	0	17	27	0
4	13	0	0	20

Since the minimum number of lines to cover all zeroes is equal to 4 (= order the matrix), this matrix will give optimal solution. The optimal assignment is made in the matrix below:

Contractor	Jobs			
	A	**B**	**C**	**D**
1	28	3	0	20
2	13	10	50	0
3	0	17	27	0
4	13	0	0	20

The optimal assignment is:

Contractors	Job	Cost (in thousands of Rupees
1	C	75
2	D	65
3	A	105
4	B	95

Hence, total minimum cost of project will be ₹ 3,40,000.

—— Space to write important points for revision ————————

2019 - June [4] (b) A Taxi operator is planning to open a computerised ticket counter in the center of the city, staffed by one ticket agent. It is estimated that requests for tickets and information will average 18 per hour, and requests will have a Poisson distribution.

Service time is assumed to be exponentially distributed. Previous experience with similar computerised operations suggests that mean service time should average about 2.5 minutes per request.

Determine each of the following:

  (i)   System utilization

 (ii) Percentage of time the server (agent) will be idle.

(iii) The expected number of customers waiting to be served

(iv) The average time customers will spend in the system. **(8 marks)**

Answer:

Arrival Rate = λ = 18 customers per hour

Service Rate = μ = 1/ service time = (1 customer / 2.5 minutes) × 60 minutes per hour = 24 customers per hour

  (i)   System Utilisation = $p = \lambda / M\mu$ = 18 / (1× 24) = 0.75

 (ii) Percentage idle time = 1 – p = 1– 0.75 = 0.25, or 25 percent

(iii) Expected no. of customers waiting to be served = $L_q = \lambda^2 / \mu(\mu - \lambda)$

        = $(18)^2$ / [24 × (24 – 18)] = 2.25 customers

(iv) Average time customers will spend in the system =

        $W_s = (L_q / \lambda) + (1/ \mu)$ = (2.25/18) + (1/24) = 0.1667 hrs = 10 minutes.

—— Space to write important points for revision ————————

2019 - June [5] (a) Table shows the time remaining (number of days until due date) and the work remaining (number of days still required to finish the work) for 5 jobs which were assigned the letters A to E as they arrived to the shop. Sequence these jobs by priority rules viz., (i) FCFS, (ii) EDD, (iii) LS, (iv) SPT and (v) LPT.

Job	Number of days until due date	Number of days of work remaining
A	10	8
B	4	5
C	8	7
D	11	4
E	5	9

(10 marks)

Answer:

Job	Number days until due date	Number of days of work remaining
A	10	8
B	4	5
C	8	7
D	11	4
E	5	9

(i) **FCFS (First come first served) :** Since the jobs are assigned letters A to E as they arrived /to the shop, the sequence according to FCFS priority rule is A B C D E

(ii) **EDD (Early due date job first) rule :** Taking into account the number of days until due date, the sequence of jobs as per EDD rules is

Job	B	E	C	A	D
No. of days until due date	4	5	8	10	11

(iii) L.S. (Least slack) rule also called as Minimum slack rule.

Calculation of Slack:

Slack = (Number of days until due date) - (Number of days of work remaining)

Job	No. of days until/due date	No. of days of work remaining	Slack (Days)
A	10	8	10 - 8 = 2
B	4	5	4 - 5 = 1
C	8	7	8 - 7 = 1
D	11	4	11 - 4 = 7
E	5	9	5 - 9 = - 4

Sequence :

Job	E	B	C	A	D
Slack	-4	-1	1	2	7

Here the jobs are sequenced in ascending order of magnitude of their respective slacks.

(iv) SPT (Shortest Processing Time job first) also referred as SOT (Shortest Operation Time job first) rule or MINPRT (Minimum Processing Time job first) rule. As per this rule, jobs are sequenced in ascending order of magnitude of their respective processing time.

Sequence:

Job	D	B	C	A	E
Processing Time (Days)	4	5	7	8	9

(v) LPT (Longest Processing Time job first) also referred to as LOT (Longest Operation Time job first) rule.

As per this rule jobs are sequenced in descending order of magnitude of their respective processing times.

Sequence:

Job	E	A	C	B	D
Processing Time (Days)	9	8	7	5	4

—— Space to write important points for revision ——

2019 - Dec [4] (a) Find the Initial Feasible Solution by North-West Corner method.

	W1	W2	W3	W4	Supplies
F1	10	12	14	18	210
F2	25	19	21	30	330
F3	18	16	11	23	430
F4	28	34	17	15	290
Demand	270	390	320	280	

W_j = Warehouse
F_i = Factory
Cell entries are unit costs in ₹. **(8 marks)**

(b) A retailer is dealing with FMCG items. The table, as given below, presents the past data of demand per week in hundred kgs with frequency.

Demand/Week	0	5	10	15	20	25
Frequency	3	7	5	11	18	6

Using the following sequence of the random numbers, generate the demand for the next 10 weeks. Also find out the average demand per week.

Random Nos.	27	43	50	11	16	36
	58	64	51	38	18	47

(6 + 2 = 8 marks)

Answer:

(a) The Initial Feasible Solution:

	W1	W2	W3	W4	Supplies
F1	**210** 10	12	14	18	210
F2	**60** 25	**270** 19	21	30	330
F3	18	**120** 16	**310** 11	23	430
F4	28	34	**10** 17	**280** 15	290
Demand	270	390	320	280	

Wj = Warehouse
Fi = Factory
Cell entries are unit costs in ₹

(b)

Random No. Range Table for Demand				
Demand per week	Frequency (f)	Probability (p=f/Σf)	Cumulative Probability	Range of Random numbers
0	3	0.06	0.06	0-5
5	7	0.14	0.20	6-19
10	5	0.10	0.30	20-29
15	11	0.22	0.52	30-51
20	18	0.36	0.88	52-87
25	6	0.12	1.00	88-99
	Σf=50	1.00		

Simulated Value for next 10 weeks		
Weeks	Random nos.	Demand
1	27	10
2	43	15
3	50	15
4	11	05
5	16	05
6	36	15
7	58	20
8	64	20
9	51	15
10	38	15
Total:	—	135

Average weekly demand is = 135/10 = 13.5

— Space to write important points for revision —

2021 - Dec [1]

Job	Machine A	Machine B
1	6	4
2	5	2
3	3	8
4	1	6
5	9	5
6	7	2

In a factory, there are six jobs to perform, each of which should go through two machines A and B, in the order AB. The processing timings (in hours) for the jobs are given here. You are required to determine the sequence for performing the jobs that would minimise the total elapsed time, T. What is the value of T? **(8 marks) [Sec. C -Four LAQ]**

Answer:

Value of T = 33 hours

—— Space to write important points for revision ————————————

2022 - Dec [3] (b) The following table shows the time remaining (number of days until due date) and the work remaining (number of days still required to finish the work) for 5 jobs of ZBA Ltd. which were assigned the letters A to E as they arrived to the shop.

Job	Number of days until due date	Number of days of work remaining
A	12	13
B	7	9
C	2	5
D	8	4
E	4	1

Required:

Sequence the jobs according to priority rules established by (i) First cum first served (FCFS) (ii) Early due date job first (EDD) (iii) Least slack (LS) (iv) Shortest processing time job first (SPT) and (v) Longest processing time job first (LPT). **(1 + 2 + 3 + 1 + 2 = 9 marks)**

—— Space to write important points for revision ————————————

2022 - Dec [4] (a) MABUN Ltd. a company producing industrial adhesives has four sales representatives who are to be assigned to four outlets in metro cities. The monthly sales (₹ in lakh) increase estimated for each salesman for different sales territories is shown in the following table:

Salesman	City A	City B	City C	City D
I	47	40	33	26
II	35	30	25	20
III	35	30	25	20
IV	29	25	21	17

Required:
(i) Find the optimum assignment of salesmen to outlets (cities).
(ii) Find the total maximum sales (₹ in lakh) increase per month.

(6 + 2 = 8 marks)

—— Space to write important points for revision ——

2022 - Dec [4] (b) The counter of a Ration shop experiences the arrival of 25 customers during peak working hours. Service time will have Poisson Distribution. Experience suggests that mean service time should average about two minutes per customer.

Determine each of the following:
(i) System utilization
(ii) Percentage of time the server (agent) will be idle
(iii) The expected number of customers waiting to be served
(iv) The average time customers will spend in the system.

(2 × 4 = 8 marks)

5 | PRODUCTIVITY MANAGEMENT AND QUALITY MANAGEMENT

THIS CHAPTER INCLUDES

- Measurement Techniques of Productivity Index
- Productivity of Employee
- Productivity of Materials
- Productivity of Management Resources

- Productivity of other factors
- Productivity Improving Methods
- TQM Basic Tools and Certification
- ISO Standard Basics

Marks of Objective, Short Notes, Distinguish Between, Descriptive & Practical Questions

Legend

Objective · Short Notes · Distinguish · Descriptive · Practical

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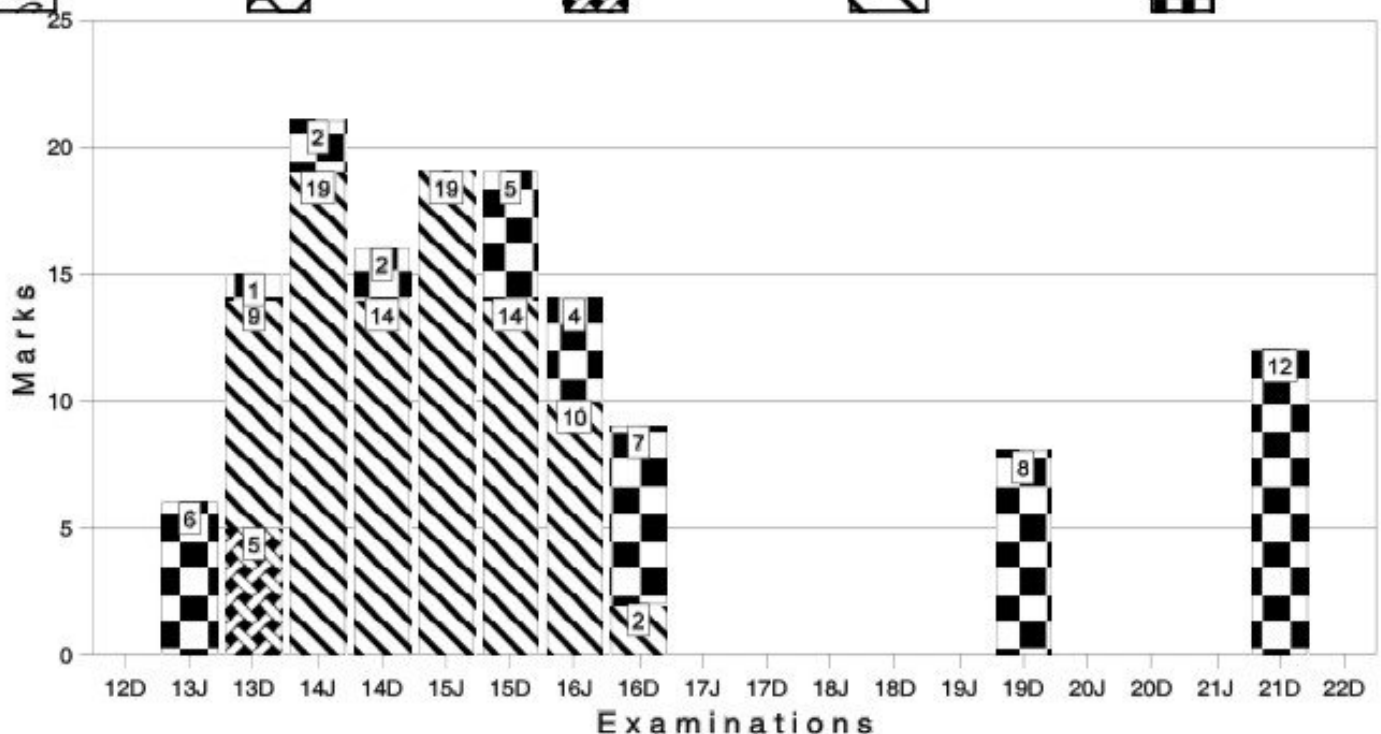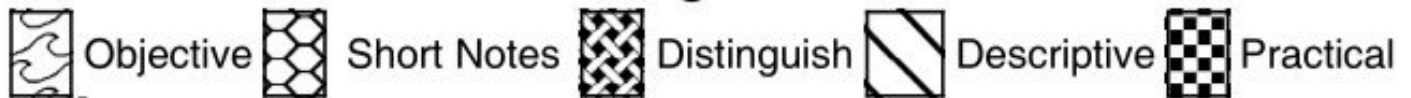
CHAPTER AT A GLANCE

1. Measurement techniques of Productivity Index

Productivity implies development of an attitude of mind and a constant urge to find better, cheaper, quicker, easier and safe ways of doing a job manufacturing an article and providing a service. Since the beginning of the industrial era, the manufacturers or producers have been facing the problem of how to use the available resources and factors of production to the best of their ability and capacity so as to get the maximum output with the minimum cost of production.

2. Importance of the Concept of Productivity

1. To beat the competition
2. Guide to Management
   (a) Strategic
   (b) Tactical
   (c) Planning
   (d) Administration
3. An Indicator of Progress
4. Maximum utilisation of Scarce resources
5. Key to National Prosperity
6. Prosperity to labour

3. Factors affecting Industrial Productivity

1. Technological development
2. Individual factors
3. Organisation factors
4. Work environment
5. Other factors

4. Production and Productivity

Production and productivity are not synonymous. Production refers to the volume, value or quantity of goods and services produced during a given period by a worker, plant, firm or economy. It is the sum total of results achieved by the various factors used together. Productivity, on the other hand, is not concerned with the volume of production. It is the ratio of output and input factors of an enterprise. It shows the efficiency of production or the efficiency level of input factors. In other words, productivity is relative to the resources used in turning out a certain amount of physical output, while production is used, more or less, in absolute sense.

5. TQM Basic Tools and Certification

Philosophy that involves everyone in an organisation in a continual effort to improve quality and achieve customer satisfaction.
Concepts in TQM
1. Top management commitment and support.
2. Focus on both internal and external customers.
3. Employee involvement and empowerment.
4. Continuous improvement (KAIZEN)
5. Partnership with suppliers
6. Establishing performance measures for processes.

6. Essentials of TQM Focus

1. Customer satisfaction
2. Leadership
3. Quality policy
4. Organisation structure
5. Employee involvement
6. Quality costs
7. Supplier selection and development
8. Recognition and reward.

7. ISO Standard Basics

Many international businesses recognize the importance of quality certification. The EU, in 1987, established ISO [International Organisation for Standardisation] 9000 certification. Two of the most well known of these are ISO 9000 and ISO 14000. ISO 9000 pertains to quality management. It concerns what an organization does to ensure that its products or services are suitable to customers expectations. ISO 14000 concerns minimization of harmful effects to the environment caused by its operations. Both ISO 9000 and ISO 14000 are related to an organization processes rather than its products and services and they stress continual improvement.

DISTINGUISH BETWEEN

2013 - Dec [6] (c) Identify the relationship between R & D Inputs and Output.
(5 marks)

Answer :

Some important variables determining R & D efforts and its success have been identified as follows:

(i) The size of the operation has been found to be positively related to the success of R & D.

(ii) The presence of technological opportunities in the industry leads to better R & D efforts.

(iii) The philosophy and genuine efforts of the management are necessary for successful R & D efforts.

(iv) The contribution of individual researchers to R & D has been found to be quite substantial.

(v) R & D efforts are likely to be more effective where growth prospects are good and profits are likely to be high.

(vi) Diversification is positively related to the R & D efforts, as there is scope of their utilization.

(vii)   A number of studies have suggested a strong relationship between R & D and the marketing opportunities for a new product. Market opportunities have been found to contribute three times more than technical opportunities as sources for innovations.

—— Space to write important points for revision ——

DESCRIPTIVE QUESTIONS

2013 - Dec [5] (c) Kindly mention the Principles of Total Quality. **(2 marks)**
Answer :
1. Quality oriented management
2. Focus on customer
3. Involving (entire) work force
4. Continuous improvement
5. Supplier Partnership
6. Measuring performance

—— Space to write important points for revision ——

2013 - Dec [6] (a) What are the advantages of KAIZEN Technique?

(4 marks)

(b) State the three models of Productivity Measurement.   **(3 marks)**
Answer :
(a) Kaizen is focused on making small improvements on a continuous basis. In simple terms Kaizen is Japanese for 'a change for better', which results in 'continuous improvement'.
   The advantages of KAIZEN are as follows :
   1.   Kaizen involves every employee in process of change mostly in small, incremental changes. It focuses on identifying problems at their own source, solving them at their own source, and changing standards to ensure the problem stays solved forever,
   2.   By involving employees they start looking about change at their environment to bring up results in their work area and improved morale as employee begins to find work more enjoyable and easier.

3. Kaizen reduces waste in area such as employee skills, waiting time, transportation, worker motion, over production, excess in inventory, quality and process.
4. Kaizen improves product quality, use of capital, production capacity, communications, space utilization and employee retention.
5. Incorporation of visual action oriented tasks.

Answer:

(b) The models of Productivity Measurement can be classified into three on the basis of the type and coverage of the output and input variables,
(a) Ratio method (b) Production Function method (c) P-O-P method.

—— Space to write important points for revision ——

2014 - June [3] (b) Briefly state the role of Information Technology in Production/ Operations Management. **(3 marks)**

Answer :

Role of Information Technology in Production/Operations Management:
Information technology is crucial to operations everywhere along the supply chain and to every functional area. Computer based information technology, in particular, has greatly influenced how operations are managed and how offices work. It makes cross-functional co-ordination easier and links a firm's basic processes. In a manufacturing plant, information technologies can link people with the work centres, data bases and computers.

—— Space to write important points for revision ——

2014 - June [4] (a) You are appointed as a Consultant to implement ISO-9000 in a firm. Suggest various steps to be taken for implementing this. **(10 marks)**

Answer :

Implementation of ISO 9000 affects the entire organization right from the start. If pursued with total dedication, it results in 'cultural transition' to an atmosphere of continuous improvement.

Suggestions to be taken for Implementing ISO-9000 are following:

Step 1: Commitment from Top Management	The top management of an organization should be determined and committed to implement a quality management system. No quality initiative within an organization can succeed without commitment from top management. Top management can demonstrate to their clients that the organization is committed to quality through the certification and registration of the ISO 9000 standard. Top management should thus come to the realization that overall business efficiency would be improved by means of a quality management system.
Step 2: Establishing an Implementation Team	People are responsible for the implementation of ISO 9000. An implementation team, headed by a Service Provider and a Management Representative (MR), is to be established. The Service Provider and MR are the coordinators and are responsible for planning and overseeing the implementation of the quality management system. They are thus, the link between top management and the ISO 9000 registrar. All departments within the organization should be represented on the implementation team.
Step 3: Conducting ISO 9000 Awareness Programs	Conducting ISO 9000 awareness programs will inform all employees about the aim of a quality management system. These include the advantages offered to customers and employees, their respective responsibilities and roles within the system, and how the quality management system operates. The benefits that an organization hopes to realize through a quality management system implementation should be emphasized through ISO 9000 awareness programs.

Step 4: Providing Training	All personnel and all areas in an organization are affected by a quality management system. Training regarding the quality management system should thus be provided for all employees. The quality management system implementation plan should make provision for this training. All basic concepts of quality management systems and its impact on the organization should be covered.
Step 5: Conducting an Initial Status Survey	A quality management system conforming to the ISO 9000 standard should be created. However, this does not preclude incorporating, adapting, or adding onto quality programs that already exist. Thus, this step basically involves comparing an organization's existing quality management system (if there is one) with the requirements of ISO 9001:2008.
Step 6: Creating a Documented Implementation Plan	Once an organization's quality management system has been compared with the ISO 9001:2008 standard, a documented implementation plan is used to address any non- conformance. The documented implementation plan identifies and describes processes in order to make the organization's current quality management system in full compliance with the ISO 9000 standard.

The implementation plan should be thorough and specific, detailing:
- Quality documentation to be developed
- Objective of the system
- Pertinent ISO 9001: 2008 section
- Person or team responsible
- Approval required
- Training required
- Resources required
- Estimated completion date

Step 7: Developing a Quality Management System Documentation	Documentation is an area where non-conformance regarding quality management systems is very common. In order to avoid these non-conformities, documentation of a quality management system should include the following: • Documented statements of a quality policy and quality objectives; • A quality manual; • Documented procedures and records required by the standard of ISO 9001:2008; and • Documents needed to ensure effective planning, operation and control of its processes.
Step 8: Control of Documents	In order to control quality management system documentation, a documented system should be created. The creation, approval, distribution, revision, storage, and disposal of various types of documentation are thus managed. Document control systems should be as easy and simple to operate as possible. However, it should still be sufficient enough to meet the requirements of ISO 9001:2008.
Step 9: Implementation	In large organizations, it is best to implement the quality management system being documented as the documentation is developed. This is in stark contrast to smaller organizations, where the quality management system is implemented throughout the organization all at once. During phased implementation, however, an evaluation can take place regarding the effectiveness of the system in different areas. Through management review and an internal quality audit, the implementation progress is monitored to ensure that the quality management system is effective and thus, conforms to the ISO 9000 standard.

Step 10: Internal Quality Audit	The effectiveness of the installed system should be checked regularly by means of an internal quality audit. Below are some reasons for conducting an internal quality audit into a quality management system: • To ensure that the quality management system conforms to the quality management system requirements established by the organization, as well as to the requirements of the ISO 9001:2008 standard; and • To ensure that the quality management system is implemented and maintained in an effective manner.
Step 11: Reviewing by Management	A management review should be conducted three to six months after quality management system implementation took place. The reasons for conducting management reviews are to ensure continuous effectiveness, adequacy and suitability of the quality management system.
Step 12: Pre-assessment Audit	Before applying for certification, a pre-assessment audit usually takes place. Certification bodies provide a qualified but independent auditor to conduct this service. Some degree of confidence is gained before application for certification, if the pre-assessment audit goes well.
Step 13: Certification and Registration	A formal application for certification is made at a certification body as soon as the quality management system has been operating for a few months and has stabilized. An audit of the documents (known as an adequacy audit) is first carried out, and if it conforms to the requirements of the quality standard, it is followed by an on-site audit. A certificate is only awarded to the organization if the certification body is satisfied with the workings of the system. However,

	the certificate is valid for a period of three years only, after which the certification body will carry out periodic surveillance audits.
Step 14: Continual Improvement	Certification to ISO 9000 should not be an end. The organisation should continually seek to improve the effectiveness and suitability of the quality management system through the use of: • Quality policy • Quality objectives • Audit results • Analysis of data • Corrective and preventive actions • Management review ISO 9001: 2008 provides a methodology for continual improvement.

—— Space to write important points for revision ——

2014 - June [5] (b) State the three levels of quality. **(3 marks)**

Answer :

Three levels of Quality:

1. **Organization level:** Satisfying requirements of external customers.
2. **Process level:** Meeting the needs of internal customers.
3. **Performer level (job level or task design level):** Meeting and maintaining the requirements of accuracy, completeness innovation, timeliness and cost.

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2014 - June [6] (e) State the limitations of Oligopoly Price Policy.

(3 marks)

Answer :

An oligopoly is a **market structure** in which a few firms dominate. When a market is shared among a few firms, it is said to be highly concentrated. Although only a few firms dominate, it is possible that many small firms may also operate in the market.

Limitations of Oligopoly Price Policy:
1. Setting of prices may be advantageous for the firms, but if done unrealistically, it may prove to be a great disadvantage for consumers.
2. Price cutting is not possible as it may lead to a price war resulting in all firms earning only normal profits.
3. Price reduction is not a plausible policy also because the customers may become suspicious about the quality of the product.
4. There is a general tendency of price rigidity under oligopoly; firms try to maintain a status quo as far as possible.
5. The cost of production as well as selling costs are so high that it is not an easy job to reduce prices.
6. This is more true in a situation of an inflationary rise in prices. It is ridiculous to talk of a reduction when maintaining the price is difficult.
7. Oligopolies are found mostly in the case of sophisticated manufactures such as engineering goods and consumer durables. The discretionary incomes squeeze under inflation. This poses a problem of demand recession, putting manufacturers in a situation of helplessness.

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2014 - Dec [1] Answer the question:
(b) Write the formula for Input Efficiency and Effectiveness. **(2 marks)**
Answer:
Input efficiency = Actual consumption/ Desired or standard consumption
Effectiveness = Target achieved/Target achievable

—— Space to write important points for revision ——

2014 - Dec [2] (a) Answer the question:
  (iii) State the four generic components of technological innovation.

(4 marks)
(d) (ii) State the Eight Most Common Benchmarking Errors. **(8 marks)**
Answer:
(a) (iii) The **technological innovation system** is a concept developed within the scientific field of innovation studies which serves to explain the nature and rate of technological change.

Generic components of technological innovation

Four generic components of technological innovation are as follows:

1.	**Basic research**	It is research for the advancement of scientific knowledge that has no specific commercial uses.
2.	**Applied research**	It is research for the advancement of scientific knowledge that has specific potential commercial uses.
3.	**Development**	It is technical activity concerned with translating basic or applied research results into products or processes.
4.	**Implementation**	It is activity concerned with designing and building pilot models, equipment, and facilities, and initiating the marketing channels for products or services emerging from research and development.

Answer:

(d) (ii) **The Eight Most Common Benchmarking Errors are:**

1.	**Lack of self-knowledge,**	unless you've thoroughly analysed your own operations, your benchmarking efforts will not pay off. You have to know how things work in your company, how effective your current processes are, and what factor are critical. That's why internal benchmarking is an important first step.
2.	**Benchmarking everything**	Be selective. Benchmarking another company's employee food service will usually not be worth the time, energy and cost. Your TQM effort as a whole will point out the areas where benchmarking is most likely to pay off.

3.	**Benchmarking projects**	are broad instead of focused. The more specific the project, the easier it is and the more likely it will generate useful ideas. Benchmark a successful company's hiring procedures, not their entire human resources operations. Focus on accounts receivable handling, not the accounting department as a whole.
4.	**Benchmarking produces reports,**	not action. Studies have indicated that 50% of benchmarking projects result in no specific changes. The process is not an academic exercise. It should be geared toward generating and implementing actual changes.
5.	**Benchmarking is not continuous**	Benchmarking is a process. Even before you reach the benchmark you've set, you should take another look at your partner's performance, or at other companies. New goals should be established and new techniques adopted. The process never ends.
6.	**Setting Too Many Goals**	When you start setting goals, you may see many things that you want to accomplish. So, you start setting goals in all areas. The problem with this is that you have a fixed amount time and energy. If you try to focus on many different goals at once, you can't give individual goals the attention they deserve.
7.	**Participants are not motivated**	Make sure benchmarking team members have the time to do the job. Even if the project is simply added on their regular jobs, make sure each has a stake in the success of the project. Don't consider benchmarking as "busy work" to be assigned to a group of low level employees.

8.	**Too much data**	Actions are what's important, not information for its own sake. Don't measure benchmarking success by quantity of information. Always focus on key issues.

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2015 - June [1] (d) What are the different approaches to overcome hurdles in the management of productivity improvements? **(2 marks)**

Answer:

The different approaches to overcome hurdles in the management of productivity improvements are as follows:

(a) Management by internal motivation (i.e., KAIZEN).

(b) Management by incentives.

(c) Management by fear.

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2015 - June [2] (a) (iii) What is TQC and what are its principles?

(5 marks)

Answer:

TQC is Total Quality Control. It is quality control and improvement from shop floors to board rooms. It is an effective system for integrating quality development, quality maintenance and quality improvement efforts of various groups in an organization.

Principles of Total Quality Control (TQC)

(1) Top management policies – Zero defects, continuous improvement etc.

(2) Quality control training for everyone.

(3) Quality at product/service design stage.

(4) Quality materials from suppliers.

(5) Quality control in production (SQC).

(6) Quality control in distribution, installation and usage.

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2015 - June [2] (c) (iii) As a Consultant what would be your suggestions to a Production Manager for managing technological changes? **(5 marks)**

Answer:

As a consultant my suggestions to production managers for managing technology changes are as follows:

   (i)   Make a master plan for automation.

  (ii)   Find out the risks in going for automation.

 (iii)   Establish a new production technology or technology development department.

 (iv)   Allow plenty of time for the completion of automation projects.

  (v)   Do not try to automate everything at once.

 (vi)   People are the key to the successful implementation of automation projects.

(vii)   Companies moving too slowly in adopting new production technology, may be left behind others.

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2015 - June [2] (d) (iii) Write a line to define the following terms with reference to measuring productivity:

(a) Validity, (b) Completeness, (c) Compatibility, (d) Inclusiveness, (e) Timeliness, (f) Cost effectiveness, (g) Partial productivity

(1 × 7 = 7 marks)

Answer:

Measuring Productivity:

Bain suggests that a good productivity measure should possess the following properties. The more closely the measurement meets these criteria, the more useful it is for improving productivity.

(a) Validity	It reflects accurately the changes in productivity.
(b) Completeness	It takes into consideration all components of both the output and the input for a given productivity ratio.
(c) Compatibility	It enables the accurate measurement of a productivity change between periods.

(d) Inclusiveness	It takes into account and measures separately the productivity of all activities.
(e) Timeliness	It ensures that data is provided soon enough for managerial action to be taken when problems arise.
(f) Cost Effectiveness	It obtains measurement in a manner that will cause the least interruption possible to the ongoing productive efforts of the firm.
(g) Partial Productivity	This measures productivity of one factor or input, keeping other factors or inputs constant or unchanged.

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2015 - Dec [1] Answer the question:
(d) Define Quality Triology under Total Quality Management. **(2 marks)**
Answer:
Quality Triology: Under Total Quality Management quality Juran takes a holistic approach to quality and his concept of quality revolves around what is called a quality trilogy, which is composed of:
  (i) Quality planning,
  (ii) Quality control and
  (iii) Quality improvement.
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2015 - Dec [2] Answer the question:
(a) (i) "Higher productivity has manifold advantages." State these advantages. **(6 marks)**
Answer:
Higher productivity has manifold advantages:
A. To the Individual Concern:
  (a) Higher productivity means more wages directly to the piece-workers and more production bonus to all workers. It means satisfied staff and harmonious staff relations.

(b) The factory earns more profit because of the reduction in costs.

(c) Continuous higher productivity may induce the management to reduce selling prices so that sales and production may increase.

B. To the Industry: Higher productivity in some concerns will enable less efficient firms to follow them for their own survival.

C. To the Government:

(a) Higher profits earned by factories will bring more revenue to the government by taxation.

(b) Export trades may develop bringing more foreign exchange to the nation.

(c) Overall higher productivity will raise an all-round standard of labour.

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2015 - Dec [2] Answer the question:

(c) (ii) Explain 'Eight Steps Benchmarking Process'. **(6 marks)**

Answer:

Eight Steps Benchmarking Process:

1. Select Benchmarking subject and appropriate team
2. Identify performance indicators and Drivers
3. Select Benchmark partners
4. Determine data collection method and collect data
5. Analyse performance gaps.
6. Communicate Findings and identify projects to close gaps
7. Implement plans and monitor results
8. Recalibrate benchmarks.

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2016 - June [I] Answer the question:

(d) Write the formula for Input Efficiency. **(2 marks)**

Answer:

$$\text{Input Efficiency} = \frac{\text{Actual Consumption}}{\text{Desired or Standard Consumption}}$$

—— Space to write important points for revision ——

2016 - June [II] Answer the question:
2. (c) List the benefits of Benchmarking. **(8 marks)**
Answer:
Benefits of Benchmarking:
* Benchmarking is particularly helpful in validating proposals for change.
* Benchmarking of ten results in creative imitation and the adoption of new practices that overcome previous industry barriers.
* This search for diversity and for innovative breakthroughs applied elsewhere is at the core of benchmarking benefits.
* By sharing information, all parties benefits, because it is difficult to excel in all activities.
* Sharing information and data is often first hurdle to be overcome in the Benchmarking process.
* Do not, however, attempt benchmarking in areas in which trade secrets or sensitive information determines the outcome of the process.
* Benchmarking, used in conjunction with other quality techniques or used alone, can influence how an organisation operates.
* If the search for "Best", or just "Better" practices is performed correctly, then the likelihood of successful outcomes is quite high.

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2016 - Dec [1] (e) List causes of low productivity in the Indian context.
(2 marks) [Sec. A]
Answer:
* In the Indian context, the causes of low productivity have their origin in two distinct sources.
* The first category consists of the exogenous or external factors like shortages of essential inputs-power, raw materials, transport facilities etc. - over which the management of an enterprise has little or no control.
* The second basket contains the endogenous or internal factors mainly in the form of system deficiencies preventing the optimum utilisation of resources.

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PRACTICAL QUESTIONS

2013 - June [4] (c) The following data is available for a machine in a manufacturing unit:

Hours worked per day	8
Working days per month	25
Number of operator	1
Standard minutes per unit of production : Machine time	22
Operator time	8
Total time per unit	30

(i) If plant is operated at 80% efficiency, and the operator is working at 100% efficiency, what is the output per month?

(ii) If machine productivity is increased by 25% over the existing level, what will be the output per month?

(iii) If operator efficiency is reduced by 25% over the existing level, what will be the output per month?   **(2 + 2 + 2 = 6 marks)**

Answer:

(i) If plant is operated at 80% efficiency, output per month

$$= \frac{Actual\,time}{Standard\,time} \times Efficiency\,level = \frac{25 \times 8 \times 60}{30} \times .8 = 320 \text{ units}$$

(ii) If the machine productivity is increased by 25%.

Then actual machine time $(22 \times 100) / 125 = 17.6$ minutes

Actual total time per unit $= 17.6 + 8 = 25.6$ minutes.

Output per month $= (8 \times 60 \times 25 \times 80) / (25.6 \times 100) = 375$ units.

(iii) If operator's efficiency is reduced by 25%.

Then operator time $= (8 \times 100) / 75 = 10.67$ minutes;

Actual total time per unit $= 10.67 + 22 = 32.67$ minutes;

Output per month $= (8 \times 60 \times 25 \times 80) / (32.67 \times 100) = 293.84$ or, say 293 units.

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2013 - Dec [1] {C} (f) A firm uses ₹ 20,00,000 in capital and 20,000 labour hours per year to produce ₹ 2,00,00,000 in product. What is the partial productivity of labour? **(1 mark)**

Answer :

Partial productivity of labour = $\dfrac{\text{Total Output}}{\text{Labour hour}} = \dfrac{2,00,00,000}{20,000} = ₹\ 1,000$

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2014 - June [2] (c) Compute the productivity per machine hour with the following data. Also draw your interpretation.

Month	No. of machines employed	Working hours	Production units
March	400	225	99,000
April	500	200	1,00,000
May	600	250	1,35,000

(2 marks)

Answer :

Productivity per machine hour $= \dfrac{\text{Number of Units Produced}}{\text{Machine hours}}$

Productivity per machine hour for March $= \dfrac{99,000}{90,000} = 1.1$ units

Productivity per machine hour for April $= \dfrac{1,00,000}{1,00,000} = 1$ unit

Productivity per machine hour for May $= \dfrac{1,35,000}{1,50,000} = 0.9$ unit

Interpretation:

Though the total production in number of units is increasing, the productivity is declining.

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2014 - Dec [1] Answer the question:

(d) A worker is employed for 11 hours. During this period he takes 7 hours to complete a job with the standard time of 6 hours. Calculate the productivity of the worker as a percentage. **(2 marks)**

Answer:

Productivity $= \dfrac{\text{Standard hours of output}}{\text{Clock hours Scheduled}}$

$= \dfrac{6}{11} \times 100 = 54.55\%$

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2015 - Dec [2] Answer the question:

(c) (iii) Compute the productivity per machine hour with the following data. Also draw your interpretation.

Month	No. of machines employed	Working hours	Production Units
July	400	225	99,000
August	500	200	1,00,000
September	600	250	1,35,000

(5 marks)

Answer:

The table is drawn as under:

Month	No. of machines employed	Working hours	Machine Hours	Production Units
July	400	225	90,000	99,000
August	500	200	1,00,000	1,00,000
September	600	250	1,50,000	1,35,000

We know, p = Productivity per machine hour,

= Number of units produced /Machine hours

For July $p = \dfrac{99,000}{90,000} = 1.1$

August $p = \dfrac{1,00,000}{1,00,000} = 1$

September $p = \dfrac{1,35,000}{1,50,000} = 0.9$

Interpretation: Though the total production in number of units is increasing, the productivity is declining.

2016 - June II. [3] (b) Compute the productivity per machine hour with the following data. Also draw your interpretation.

Month	No.of machines employed	Working hours	Production Units
January	400	220	99,000
February	550	180	1,00,000
March	580	220	1,25,000

(4 marks)

Answer:

Month	No. of Machines employed	Working hours	Machine hours	Production units
January	400	220	88,000	99,000
February	550	180	99,000	1,00,000
March	580	220	1,27,600	1,25,000

Productivity per machine hour, for

January $= \dfrac{99,000}{88,000} = 1.125$

February $= \dfrac{1,00,000}{99,000} = 1.01$

March $= \dfrac{1,25,000}{1,27,600} = 0.9796$

Interpretation: Total production in number of units is increasing however, the productivity is declining.

2016 - Dec [3] (b) Compute the productivity per machine hour with the following data. Also draw your interpretation.

Month	No. of machines employed	Working hours	Production units
July	390	210	95,000
August	540	170	1,00,000
September	570	230	1,30,000

(7 marks) [Sec. B]

Answer:

Month	No. of Machines employed	Working hours	Machine hours	Production units
July	390	210	81,900	95,000
August	540	170	91,800	1,00,000
September	570	230	1,31,100	1,30,000

P = Productivity per machine hour
= Number of units produced /Machine hours

For July	P = 95,000/81,900	= 1.160
August	P = 1,00,000/91,800	= 1.089
September	P = 1,30,000/1,31,100	= 0.992

Interpretation: Though, the total production in number of units is increasing, the productivity is declining.

—— Space to write important points for revision ——

2019 - Dec [3] (b) The following data is available for a manufacturing unit:

No. of operators	16
Daily working hours	8
No. of days per month	25
Standard production per month	400 units
Standard labour hours per units	8

The following information was obtained for June 2019:

Man days lost due to absenteeism	36
Units produced	300
Idle time	260 man hours

Find the following:
- (i) Per cent absenteeism
- (ii) Efficiency of utilization of labour
- (iii) Productive efficiency of labour
- (iv) Overall productivity of labour in terms of units produced per man per month. **(2 × 4 = 8 marks)**

Answer:

(i) Percent absenteeism = [(No. of Hrs. lost in absenteeism in a month)/(Total working hours per month)] × 100 = (36 × 8)/(16 × 25 × 8) = 0.09 × 100 = 9%

(ii) Efficiency of utilization of labour = [(Standard labour hour to produce 300 units)/(Total labour hour)] × 100 = [(300 × 8)/(16 × 25 × 8)] × 100 = 75%

(iii) **Determination of Productive efficiency of labour:**
Standard time required to produce 300 units = 300 × 8 = 2400 labour hours. In June 2019, man hours lost = 36 × 8 = 288
In June 2019, Idle time (in hours) = 260 Total loss of time = 548 hrs.
Productive hours available in June 2019 = 16 × 25 × 8 = 3,200 hrs.
Less, Total loss of time: 548 hrs.
Actual Labour hours = 3200 − 548 = 2,652 hrs
Productive efficiency of labour = [(Standard Labour hours)/(Actual labour hours)] × 100
= (2400/2652) × 100
= 90.497%
= 90.50 % (approx.)

(iv) Overall productivity of labour in terms of units produced per man per month: 16 men produce 400 units, Standard labour productivity = 400/16 = 25 units In June 2019, overall productivity = 300/16 = 18.75 units
i.e. productivity falls by [(25 − 18.75)/25] × 100 = 25%

—— Space to write important points for revision ——

2021 - Dec [1] You are working as a Production Manager in a manufacturing unit. The executive management of this company has decided to go for the ISO certification for this unit. For this purpose, you are appointed as a Management Representative to ensure successful implementation of ISO certification. Now answer the following:

   (i)   What are all those broad activities that you have to consider for such responsibility?

  (ii)   What are the five standards associated with ISO 9000 series, that you have to thoroughly refer to, for finding out the best fitment for your unit?

 (iii)   In which scenarios, ISO certification is a must, and is particularly helpful?

 (iv)   When is it reviewed?

                 (3+3+3+3 = 12 marks) [Sec. D - Case Study Question]

Answer:

   (i)   **ISO certification is an elaborate and expensive process.**

- You need to document how workers of your unit perform every function that affects quality and install mechanisms to ensure that, they follow on expected lines.
- ISO 9000 certification entails a complex analysis of management systems and procedures. Rather than judging the quality of a particular product, ISO 9000 evaluates the management of the entire manufacturing process, from purchasing, to design, to training.
- You must fill out a report and then be certified by a team of independent auditors. With certification comes registration in an ISO directory, that your firm can refer to, for a list of certified companies.
- They are generally given preference over unregistered companies.

  (ii)   **Quality System:**

- 9001 Model for Quality Assurance in Design, Production, Installation and Servicing. (To be used when conformance to specified requirements is to be assured by the supplier during several stages that may include design/development, production, installation and servicing).

- 9002 Model for Quality Assurance in Production and Installation. (To be used when conformance to specified requirements is to be assured by the supplier during production and installation).
- 9003 Model for Quality Assurance in Final Inspection Test. (To be used when conformance to specified requirements is to be assured by the supplier solely at final inspection and test).
- Guidelines for Use: 9000 Quality Management and Quality Assurance Standards - Guidelines for Selection and Use. 9004 Quality Management and Quality System Elements – Guidelines

(iii) **ISO certification is a must for doing business with any member of the EU.**

In addition to the benefits of accessing the EU, ISO 9000 certification and registration is particularly helpful for companies that do not currently have a quality management system, as it provides guidelines for establishing the system and making it effective.

(iv) **ISO standards are reviewed every 5 years and revised, if needed.**

This helps ensure they remain useful tools for market place.

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No.	Repeatedly Asked Questions	
	Question	**Frequency**
1	Practical Question of:	
	14 - June [2] (c), 16 - June [3] (b)	2 Times

6 PROJECT MANAGEMENT, MONITORING AND CONTROL

THIS CHAPTER INCLUDES

- Project Planning
- Project Life Cycle
- Gantt Charts

- PERT and CPM
- Basic of MS Project

Marks of Objective, Short Notes, Distinguish Between, Descriptive & Practical Questions

Legend

Objective | Short Notes | Distinguish | Descriptive | Practical

(Bar chart titled "Marks" vs "Examinations" showing marks distribution across examination sessions from 12D to 22D.)
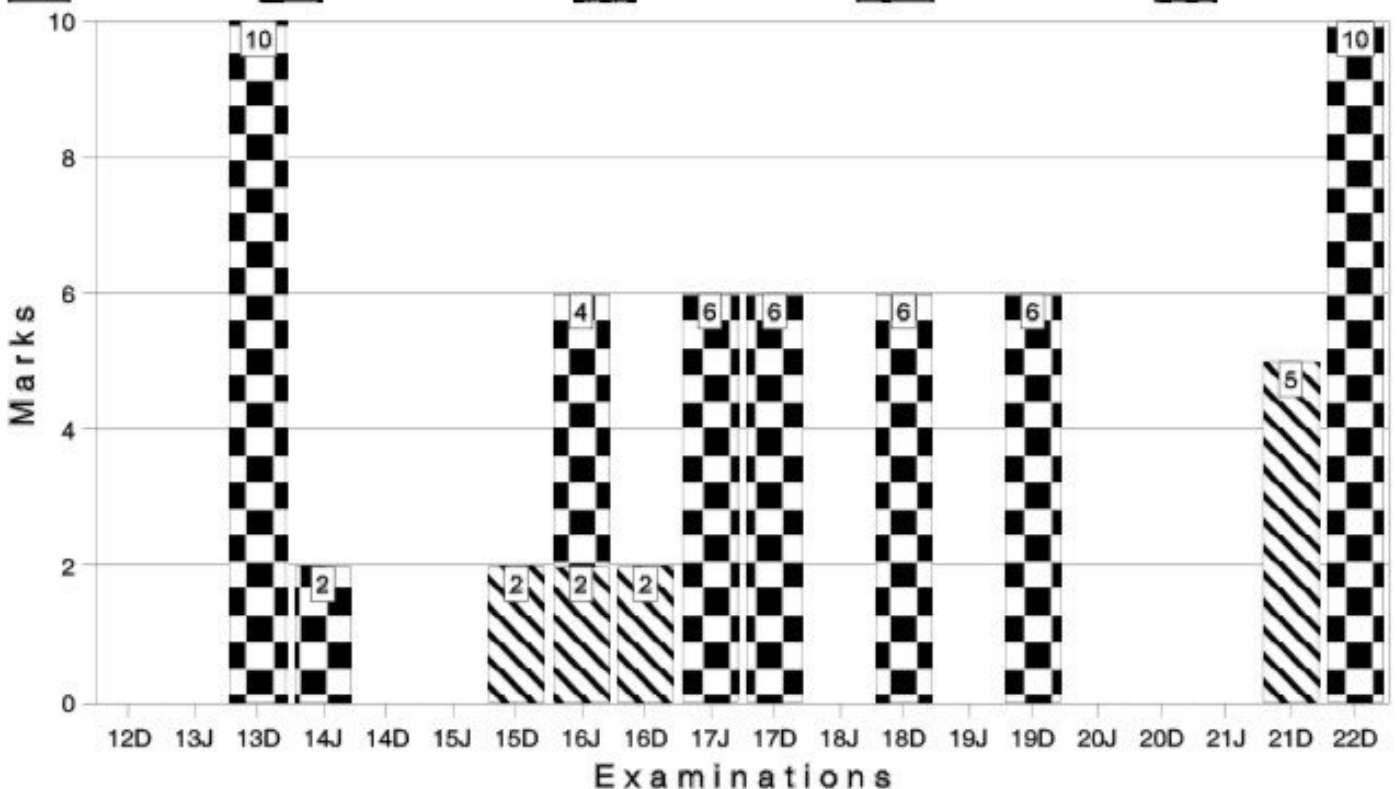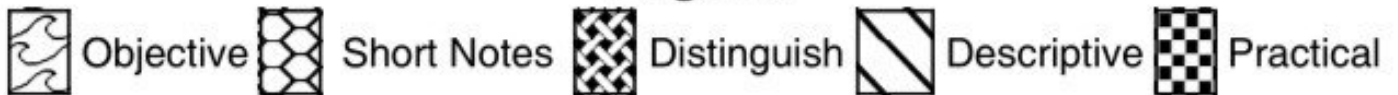
CHAPTER AT A GLANCE

1. Project Planning

Project planning is part of project management, which relates to the use of schedules such as Gantt charts to plan and subsequently report progress within the project environment. Project management is the discipline of organizing and managing resources (e.g. people) in such a way that the project is completed within defined scope, quality, time and cost constraints. A project is a temporary and one-time endeavor undertaken to create a unique product or service, which brings about beneficial change or added value.

2. Gantt Chart

Gantt chart is a principal tool used in scheduling and also in some methods of loading. This chart was originated by the American engineer Henry L. Gantt and consists of a simple rectangular grid, divided by series of parallel horizontal and vertical lines. The vertical lines always divide the horizontal scale units of time. The time units can be in years, months, weeks, days, hours, minutes or even seconds according to the work for which it is prepared. In this chart, the time which an activity takes in completing the task is represented by the horizontal line. The length of the line is drawn in proportion to the duration of time.

3. Network Analysis

Routing is the first step in production planning. In small projects, routing is very simple. Sequence of operations is almost decided and the operations can be performed one after the other in a given sequence. But in large project, this is rather a difficult problem. There may be more than one route to complete a job. The function of production manager is to find out the path which takes the least time in completing the project.

4. Critical Path Method (CPM)

The critical path analysis is an important tool in production planning and scheduling. Gnatt charts are also one of the tools of scheduling but they have one disadvantage for which they are found to be unsuitable. The problem with Gnatt Chart is that the sequence of operations of a project or the earliest possible date for the completion of the project as a whole cannot be ascertained. This problem is overcome by this method of Critical Path Analysis.

5. PERT (Programme Evaluation and Review Technique)

There are so many modem techniques mat have developed recently for the planning and control of large projects in various industries especially in defence, chemical and construction industries. Perhaps, the PERT is the best known of such techniques.

6. Gantt Charts

Gantt chart is a graphical representation of a series of activities drawn to a time scale. Horizontal axis (X-axis) represents time and vertical axis (Y-axis) shows the activities to be performed. The Gantt chart shows activities to specific jobs at individual/work centers by horizontal bars. Also known as a 'bar chart' because of its graphic presentation of the information, the position and the length of the horizontal bar indicate the start and completion date of the activity.

7. Pert and CPM

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

DESCRIPTIVE QUESTIONS

2015 - Dec [1] Answer the question:

(b) List the various elements of the framework for Project Management Issues.

(2 marks)

Answer:

A Framework for Project Management Issues	As per McKinsey and Co., management consultants there are seven points/elements Framework for Project Management Issues which are given below
1. **Strategy**	The high-level requirements of the project and means to achieve them.
2. **Structure**	The organisational arrangement to carry out the project.
3. **Systems**	The methods for work to be designed, monitored and controlled.
4. **Staff**	Selection, recruitment, management and leadership of staff working on the project.
5. **Skills**	The management and technical tools available to the project manager and the staff.
6. **Style/Culture**	The underlying way of working and interrelating within the work team or organisation.
7. **Stakeholders**	Individuals and groups who have an interest in the project process and outcome.

—— Space to write important points for revision ——

2016 - June [I] Answer the question:

1. **(a)** Define 'Load Chart'. **(2 marks)**

Answer :

A load schedule or load chart is a device for comparing the actual load (labour hours and machine hours) required to produce the products as per the MRS against the available capacity (labour hours and machine hours) in each week.

—— Space to write important points for revision ——

2016 - Dec [1] (b) Define 'critical path'. **(2 marks) [Sec. A]**

Answer:

* A critical path is a chain of sequential activities beginning with the project start and ending with its completion.
* Several or many path may exist through the network. Work may proceed on many independent paths concurrently, but, of course, work may proceed on an activity only after all the necessary predecessor activities in its path have been completed.
* All activities, hence all paths, must be completed before the project is finished.
* The path through the network that has the longest expected completion time and is expected to determine the completion date of the project is called the critical path.

—— Space to write important points for revision ——

2021 - Dec [2] What do you mean by Bar chart? **(1 mark) [Sec. B - SAQ]**

Answer:

This is also called Gantt Chart. This is graphical representation of a series of activities drawn to a time scale.

—— Space to write important points for revision ——

2021 - Dec [2] Draw a Circle and Arrow Diagram to show two activities, that cannot be started until the first activity has been completed.

(4 marks) [Sec. C - Five LAQ]

Answer:

Indicative example of Circle & Arrow Diagram

Here the activities of 'Select Hardware' and 'Core Module Analysis' cannot be started until 'High Level Analysis' has been completed.

Circle and Arrow Diagram showing two activities that cannot be started untill the first activity has been completed.
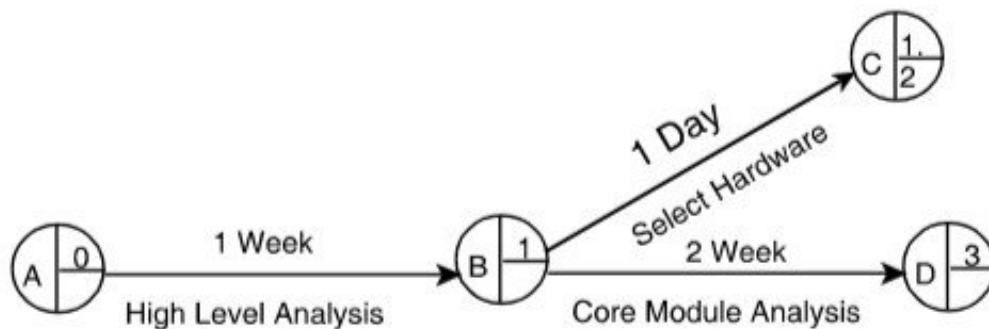
— Space to write important points for revision —

PRACTICAL QUESTIONS

2013 - Dec [2] (b) For a network shown in figure, normal time, crash time, and normal costs are given in the table; construct the network by crashing it to optimum value and calculate the critical path, project duration, activities with least cost slope and optimum project cost. Indirect cost is given as ₹ 95 per day.
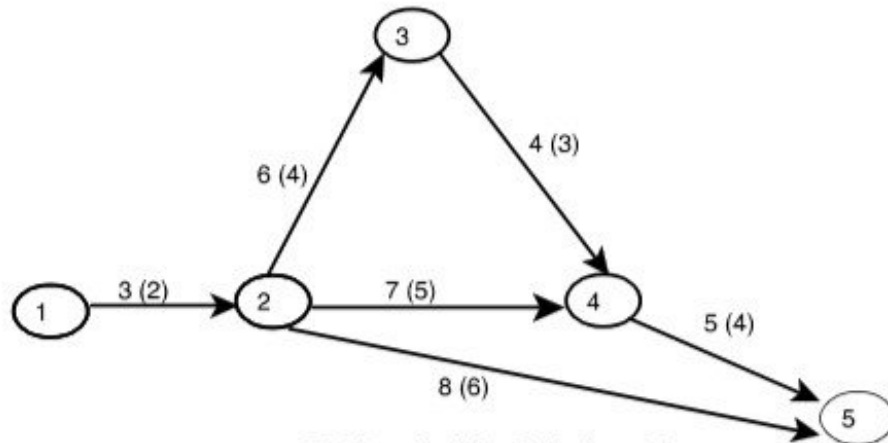
Table : Activity Relationship

Activity	Normal		Crash	
	Time (days)	Cost (₹)	Time (days)	Cost (₹)
1-2	3	300	2	400
2-3	6	480	4	520
2-4		2,100	5	2,500
2-5	8	400	6	600
3-4	4	320	3	360
4-5	5	500	4	520

(10 marks)

Answer :
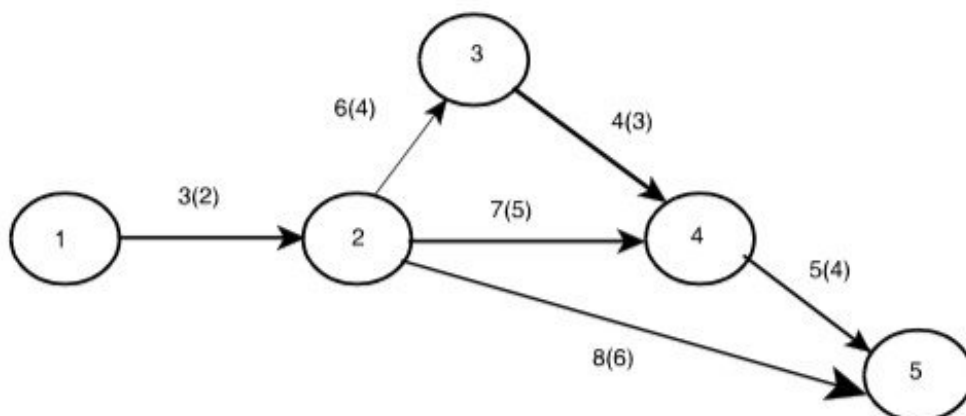
In the given network critical path is 1-2-3-4-5 and the period duration is 18 days.

Cost Slope Table

Activity	Normal		Crash		Crash	Normal	Cost
	Time (days)	Cost (₹)	Time (days)	Cost (₹)	Cost-Normal Cost (a)	Time-Crash Time (b)	Slope (a)/(b)
1-2	3	300	2	400	100	1	100
2-3	6	480	4	520	40	2	20
2-4	7	2,100	5	2,500	400	2	200
2-5	8	400	6	600	200	2	100
3-4	4	320	3	360	40	1	40
4-5	5	500	4	520	20	1	20

Table showing the different paths in the network with its durations

Path	Sequence	Target Time	Time Crashed at Various Stages		
			2-3	3-4	4-5
P1	1-2-3-4-5	18	16	14	15
P2	1-2-4-5	15	15	15	14
P3	1-2-5	11	11	11	11

From the table it is clear that Critical Path activities, 2-3 and 4-5, have least cost slopes.

Therefore, crashing the activities 2-3 and 4-5 by 2 days and 1 day respectively,

Project Duration = 18 - 3 = **15 days.**

Cost of Project = Normal Cost + Extra Crashing Cost + Indirect Cost

= (300 +480 +2100 +400 +320 +500) + (2 × 20 + 1 × 20) + 15 × 95

= ₹ 5,585

In second stage, crashing the least cost slope activity 3-4 on critical path by 1 day,

Project duration = **14 days.**

Cost of Project   =   Normal Cost + Extra Crashing Cost + Indirect Cost
                  = $4100 + (20 \times 2 + 1 \times 20 + 1 \times 40) + 14 \times 95 =$
                      ₹ 5,530

The total project cost with normal activities (without crashing)
                  =   Normal Cost + Indirect Cost for 18 days = 4100 +
                      $(18 \times 95) =$ ₹ 5,810

Therefore, the optimum cost of the project is ₹ 5,530.

—— Space to write important points for revision ——————

2014 - June [6] (a) A project consists of five activities. Activities P and Q run simultaneously. The relationship among the various activities is as follows:

Activity	Immediate Successor
P	R
Q	S

Activity T is the last operation of the project and it is also immediate successor to R and S. Draw the network of the project.   **(2 marks)**

Answer :

Network of the project will be as follows:
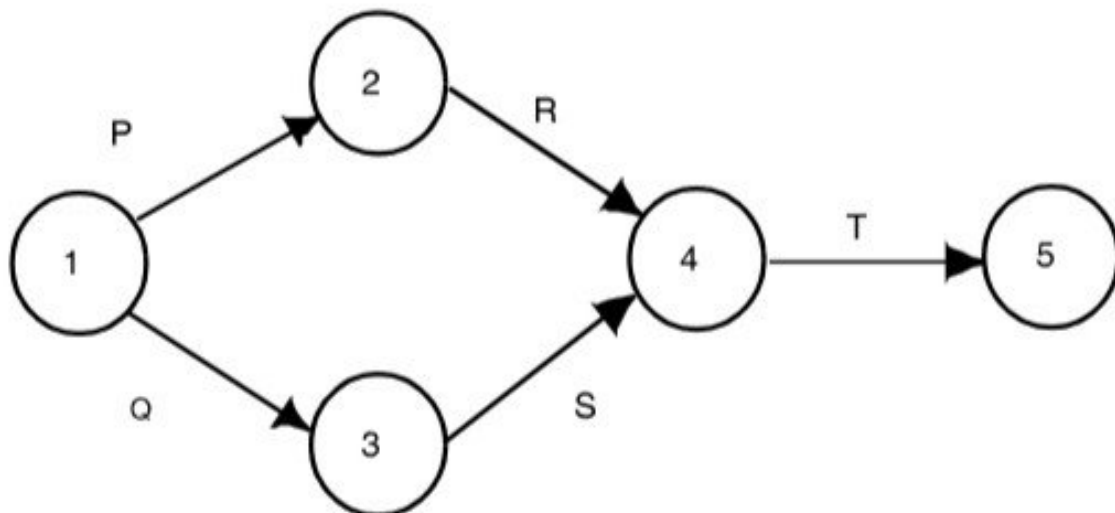
—— Space to write important points for revision ——————

2016 - June [II] Answer the questions:

4. (a) A project consists of five activities. Activities P and Q run simultaneously. The relationship among the various activities is as follows:

Activity	Immediate Successor
P	R
Q	S

Activity T is the last operation of the project and it is also immediate successor to R and S. Draw the network of the project. **(4 marks)**

Answer:
Please refer 2014 - June [6] (a) on page no. 164

—— Space to write important points for revision ——

2017 - June [5] (a) A project consists of eleven activities A, B, C, D, E, F, G, H, I, J and K.
The relationship among various activities is as follows:

Activity	Preceding Activity
A	-
B	A
C	A
D	B
E	C
F	D, E
G	F
H	F
I	G
J	I, H
K	J

Draw the network diagram. **(6 marks)**
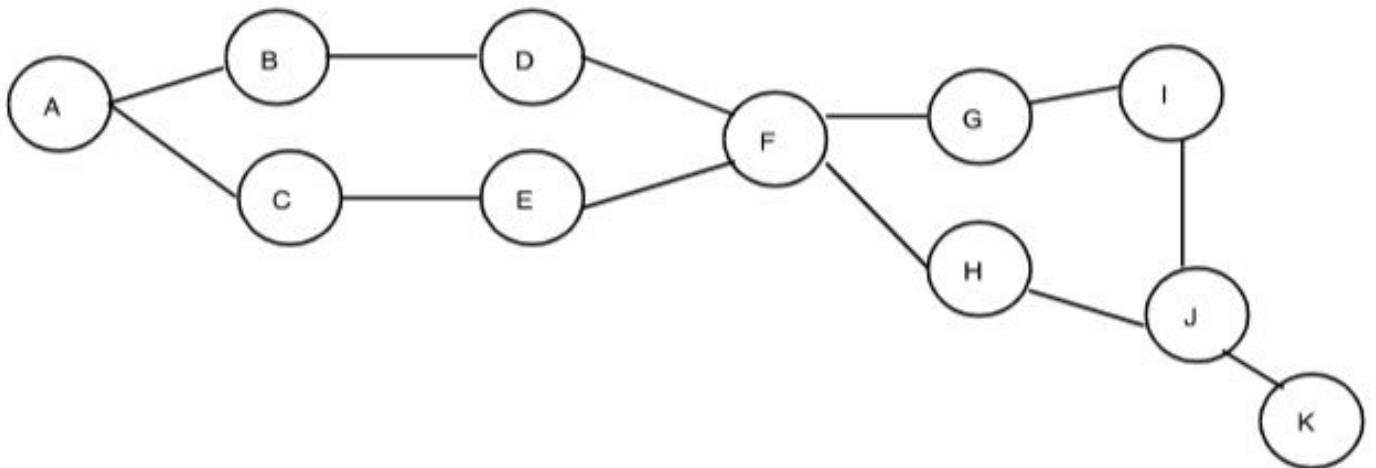
Answer:

—— Space to write important points for revision ——

2017 - Dec [5] (b) Draw the network for the following activities and find critical path and total duration of the project.

Activity	Duration (months)
1-2	2
2-3	3
2-4	1
3-4	2
4-5	3
5-6	2
5-7	4
6-8	1
7-8	3
8-9	4

(2 + 2 + 2 = 6 marks)

Answer:

Network diagram:
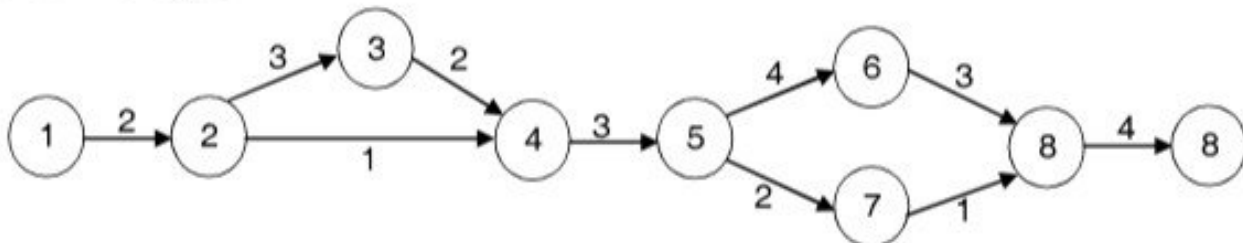
Paths	Duration (months)
1-2-3-4-5-7-8-9	2+3+2+3+4+3+4=21 (Critical path)
1-2-3-4-5-6-8-9	2+3+2+3+2+1+4=17
1-2-4-5-7-8-9	2+1+3+4+3+4=17
1-2-4-5-6-8-9	2+1+3+2+1+4=13

—— Space to write important points for revision ——

2018 - Dec [5] (a) Draw the network for the following activities and find the critical path and total duration of the project.

Activity	Duration (months)
1– 2	3
2 – 3	4
2 – 4	5
2 – 5	6
3 – 4	3
3 – 6	5
4 – 6	7
5 – 6	4
6 – 7	5

(6 marks)

Answer:
Network diagram:
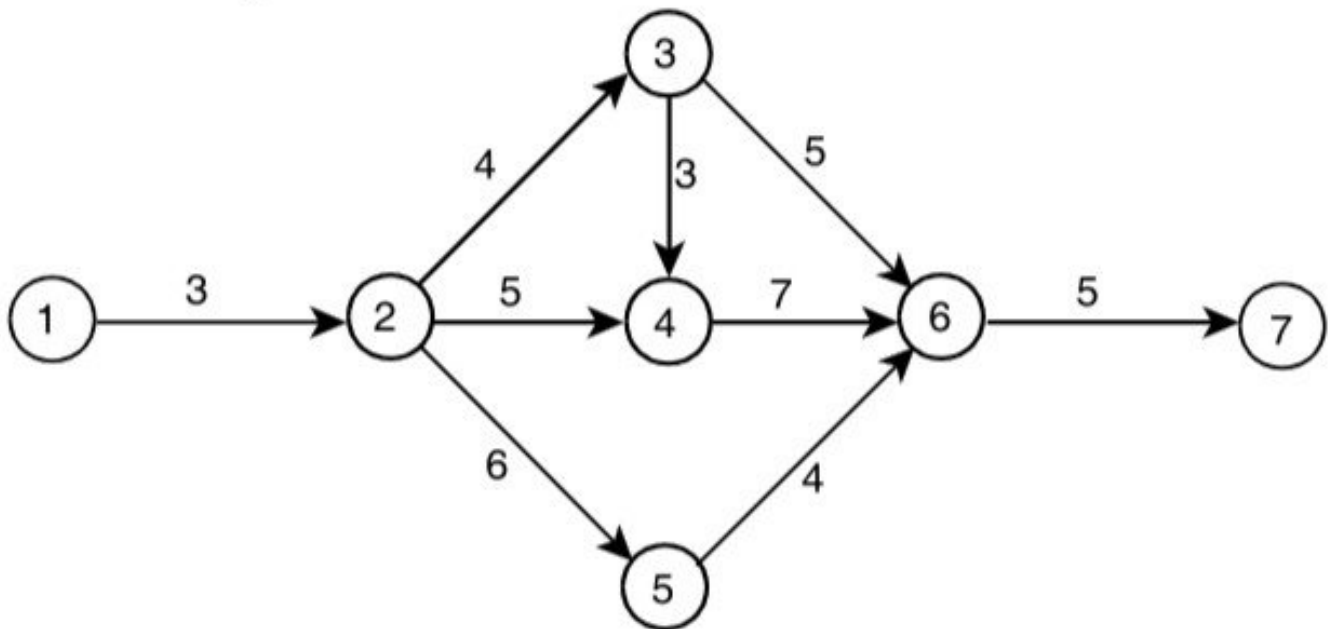
Paths and their durations:
1 - 2 - 3 - 6 - 7 → 3 + 4 + 5 + 5 = 17 months
1 - 2 - 3 - 4 - 6 - 7 → 3 + 4 + 3 + 7 + 5 = 22 months → Critical Path
1 - 2 - 4 - 6 - 7 → 3 + 5 + 7 + 5 = 20 months
1 - 2 - 5 - 6 - 7 → 3 + 6 + 4 + 5 = 18 months
—— Space to write important points for revision ——

2019 - Dec [5] (a) Draw the network for the following activities and find the Critical Path and Total duration of the project.

Activity	Predecessor	Duration (months)
A	-	2
B	-	3
C	-	5
D	A	4
E	B	1

F	B	5
G	C	8
H	D	1
I	E	2
J	F, G	4
K	H, I	3
L	K, J	2

(6 marks)

Answer:
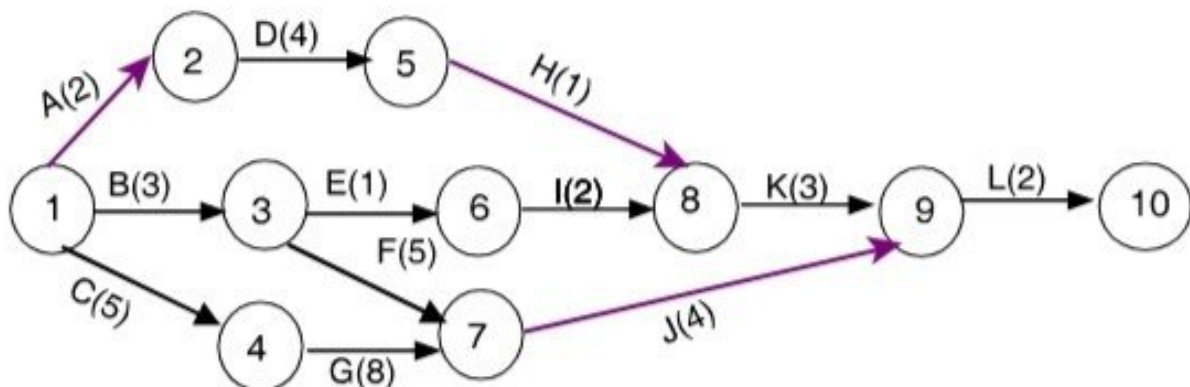
Calculation of Critical path:

  (i)   A-D-H-K-L = 2 + 4 + 1 + 3 + 2 = 12
  (ii)   B-E-I-K-L = 3 + 1 + 2 + 3 + 2 = 11
  (iii) B-F-J-L = 3 + 5 + 4 + 2 = 14
  (iv)   C-G-J-L- = 5 + 8 + 4 + 2 = 19 = Critical Path (Project duration)

—— Space to write important points for revision ——

2022 - Dec [5] (b) AXON TECH Ltd. has recently won a contract for the installation of a die casting machine and its associated building construction work at a local factory of large national firm of electronic engineers. Project manager has listed down the activities in the project as under:

Activity Identification		Preceding Activities	Duration (Days)
A	1-2	-	1
B	2-3	A	3
C	2-4	A	15
D	2-5	A	1
E	3-5	B	10
F	4-5	C	6
G	5-6	D, E, F	1
H	6-7	G	1
I	6-8	G	15
J	7-8	H	2

Required:
 (i)   Draw the network for the project.
 (ii) What are the possible paths with duration of the project?
 (iii) Identify the critical path with duration of the project.
 (iv) Find Total Float, Free Float and Independent Float of the activities D, E, H and J of the Project. **(3 + 2 + 2 + 3 = 10 marks)**

Repeatedly Asked Questions		
No.	**Question**	**Frequency**
1	Practical Question of: 14 - June [6] (a), 16 - June [II] (4) (a)	2 Times

7 ECONOMICS OF MAINTENANCE AND SPARES MANAGEMENT

THIS CHAPTER INCLUDES

- Break Down Maintenance
- Preventive Maintenance
- Routine Maintenance
- Replacement of Machine
- Spare Parts Management

Marks of Objective, Short Notes, Distinguish Between, Descriptive & Practical Questions

Legend

Objective ⬡ Short Notes ⬡ Distinguish ⬡ Descriptive ⬡ Practical
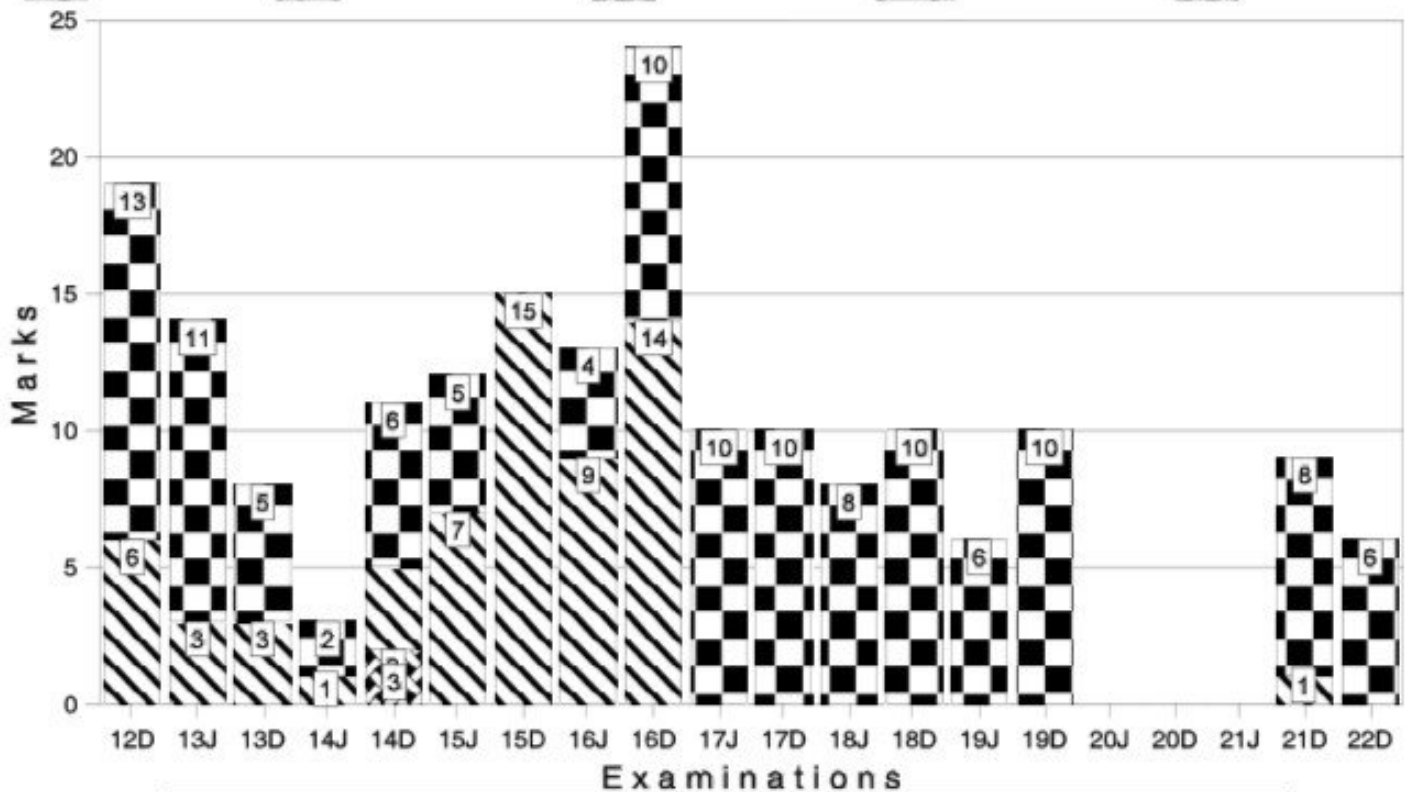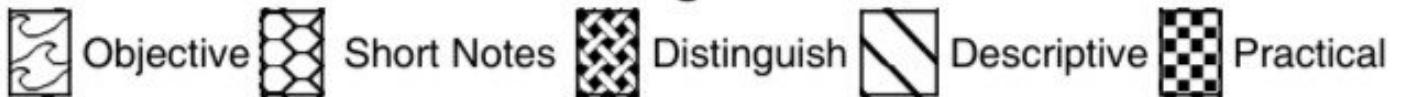
For detailed analysis Login at *www.scanneradda.com*
for registration and password see first page of this book.

CHAPTER AT A GLANCE

1. Break Down Maintenance

Here the production facility is run without much routine maintenance until it breakdown. Once the machine breakdown it is taken for repair and inspected to find out the defects. After identifying the defect, the required repair is planned and the spares are procured to repair the machine. As the breakdowns are random in nature and the machine cannot be used during the repair period, production hours are lost hence the productivity is reduced. Repair maintenance is not a recommended practice, in general, but many a time many organizations prefer this, because they do not want to keep the machine idle for maintenance.

2. Preventive Maintenance

A system of scheduled, planned or preventive maintenance tries to minimize the problems of breakdown maintenance. It locates weak parts in all equipments, provides them regular inspection and minor repairs thereby reducing the danger of unanticipated breakdowns. The underlying principle of preventive maintenance is that prevention is better than cure. It involves periodic inspection of equipment and machinery to uncover conditions that lead to production breakdown and harmful depreciation. The system of preventive maintenance varies from plant to plant depending on the requirement of the plant.

3. Routine Maintenance

It includes lubrication, cleaning, periodic overhaul; etc. This is done while the equipment is running or during preplanned shut-downs. Running maintenance is the work which can be carried out while the facility is in service.

4. Replacement of Machine

Wear and obsolescence are the two main causes for replacement of machinery in every aspect of life. The reduction of wear is therefore a primary concern when designing appliances. Wear and tear due to passage of time and/or normal usage of plant and machinery is an accepted fact. Technological obsolescence is a major danger which business firms face in modern era. With the development of new and better techniques or equipment of performing a particular function, existing equipment and machines become uneconomical. Whenever a firm decides to switch over to new machines or improved product designs, existing machine designs are said to be obsolete. Hence, obsolescence is a major issue in the procurement and installation of machinery and equipment.

5. Spare Parts Management

In manufacturing plants that own a huge number of equipment, supervising the spare parts correctly and in a timely manner is a difficult task. Usually, spare parts are categorized into two main groups
- fast moving
- slow moving parts.

DISTINGUISH BETWEEN

2014 - Dec [1] Answer the question:
(a) Distinguish between Regular Spares and Insurance Spares. **(2 marks)**
Answer:
Regular Spares: There are the spares which are required in large quantity at more or less periodical interval as and when the break downs occur.
Insurance Spares: Insurance spares are irregularly consumed spares. These are of high value and are not required for routine maintenance but would cause a lengthy shut-down of vital equipment or the entire plant in case they are not available besides would cause high stock out cost.

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DESCRIPTIVE QUESTIONS

2012 - Dec [3] (e) What are the various technical factors involved in the decision for replacement of machines and equipment? **(2 marks)**

Answer :

Technical Factors involved in the decision for replacement of machines and equipment are:

   (i)   When the existing assets have lost their utility because they have outlived their effective life.
  (ii)   When any machine or equipment suddenly completely fails.
 (iii)   Special advantage of the new machine as to easiness of set-ups, convenience of operation, safety, reliability performance, control panels and special features.
  (iv)   Flexibility and versatility of the machine.

—— Space to write important points for revision ————————

2012 - Dec [4] (d) Explain the objectives of maintenance. **(4 marks)**

Answer:

Objectives of maintenance:

   (i)   To keep the equipment in operational condition or repair it to its operational mode.
  (ii)   To keep all productive assets in good working conditions.
 (iii)   To maximize efficiency and economy in production through optimum use of facilities.
  (iv)   To ensure specified accuracy to products and time schedule of delivery to customers,
   (v)   To keep the downtime of the machine at minimum, so that the production program is not disturbed,
  (vi)   To keep the plant at the maximum production efficiency.
 (vii)   To keep the production cycle within the stipulated range,
(viii)   To modify the machine tools to meet the augmented need for production,

(ix) To improve productivity of existing machine tools and to avoid sinking of additional capital,

(x) To keep the maintenance cost at a minimum as far as possible, thereby keeping the factory overheads at minimum,

—— Space to write important points for revision ——————

2013 - June [2] (e) (i) "The main problem in maintenance analysis is to minimize the overall cost of maintenance without sacrificing the objectives." What are the alternatives before the management and how do you achieve a balance between the conflicting alternatives? **(3 marks)**

Answer:

The management has two alternatives one is to do premature maintenance and other to do breakdown maintenance.

1. **Premature or Preventive Maintenance:** Preventive Maintenance is carried out to prevent failure of a machine or plant. It is undertaken before the failure occurs or before the breakdown actually happens. It is a safety measure. But it involves cost of periodic shutdown for check and repairs.

2. **Breakdown Maintenance:** Breakdown Maintenance is carried out as and when a machine actually breaks down. It is a sort of corrective maintenance, as it is undertaken to restore equipment to an acceptable standard, after the breakdown has occurred.

—— Space to write important points for revision ——————

2013 - Dec [1] {C} (k) How are spare parts classified for stocking policy analysis? **(1 mark)**

Answer :

(A) Consumable Spares
(B) Insurance Spares
(C) Capital Spares
(D) Overhaul Spares
(E) Wear and Tear Spares

—— Space to write important points for revision ——————

2013 - Dec [3] (a) What are the limitations of Preventive Maintenance?

(2 marks)

Answer :

Disadvantages of Preventive Maintenance:

(a) Requires skilled personnel.

(b) Requires costly monitoring equipments.

(c) Greater Annual Cost if it is not applied from the beginning of the equipment installation.

(d) Need for spare parts storage.

—— Space to write important points for revision ——

2014 - June [2] (a) Write down the formula for:

(iii) Breakdown Maintenance Index (as a % age) **(1 mark)**

Answer :

Break down Maintenance Index $= \dfrac{\text{(Cost of breakdown repair)}}{\text{(No. of breakdown)}} \times 100$

—— Space to write important points for revision ——

2014 - Dec [2] (b) Answer the question:

(ii) Justify your choice between 'Preventive Replacement' and 'Breakdown Replacement'. **(3 marks)**

Answer:

Preventive Maintenance: Preventive Maintenance is a daily maintenance (cleaning, inspection, oiling and re-tightening), design to retain the healthy condition of equipment and prevent failure through the prevention of deterioration, periodic inspection or equipment condition diagnosis, to measure deterioration. Just like human life is extended by preventive medicine, the equipment service life can be prolonged by doing preventive maintenance.

Breakdown Maintenance: Breakdown maintenance is when the organization only conducts maintenance on a piece of equipment when the equipment breaks down.

A better maxim goes "An ounce of prevention is worth a pound of cure". Sorry, if anybody waits until the equipment breaks down, he pays for lost production, higher cost of parts, overtime and all associated "collateral damage".

—— Space to write important points for revision ——————

2015 - June [2] (b) (iii) What are the objectives of maintenance management? **(7 marks)**

Answer:

Objectives of Maintenance Management:

The following are some of the objectives of Maintenance Management:

1. Minimizing the loss of productive time because of equipment failure (i.e., minimizing idle time of equipment due to break down).
2. Minimizing the repair time and repair cost.
3. Minimizing the loss due to production stoppages.
4. Efficient use of maintenance personnel and equipments.
5. Prolonging the life of capital assets by minimizing the rate of wear and tear.
6. To keep all productive assets in good working condition.
7. To maximize efficiency and economy in production through optimum use of facilities.
8. To minimize accidents through regular inspection and repair of safety devices.
9. To minimize the total maintenance cost which includes the cost of repair, cost of preventive maintenance and inventory carrying costs due to spare parts inventory.
10. To improve the quality of products and to improve productivity.

—— Space to write important points for revision ——————

2015 - Dec [1] Answer the questions:

(c) Categorise spare parts for stocking policy analysis under Spare Parts Management. **(2 marks)**

(e) State the formula for maintenance cost index (as a percentage) to measure maintenance effectiveness. **(2 marks)**

(h) Explain the term 'rescue maintenance' under System Maintenance. **(2 marks)**

Answer:

(c)	Spare Part Management	Spare part can be classified in for categories for stocking policy analysis under Spare Parts Management as follows:
	(a) **Regular Spares**	These are required regularly and so, in substantial numbers.
	(b) **Insurance Spares**	Spares of this class have a very high reliability and are required rarely, if ever, during the life time of an equipment besides being a high cost item.
	(c) **Capital Spares**	Regular spares and Insurance spares are two ends of the spectrum; Capital spares fall somewhere in between. A few-say five or ten-of these spares are required, over the lifetime of an equipment.
	(d) **Rotable Spares**	These are repairable and re-usable spares, such as a jet engine or an electric motor which can be reconditioned after failure and put back in operation.
(e)	**Maintenance Effectiveness**	The effectiveness of maintenance can be evaluated in terms of maintenance costs incurred, equipment down time etc. Formula for maintenance cost index:

$$\text{Maintenance cost index (as a percentage)} = \frac{(\text{Annual Maintenance Cost})}{(\text{Cost of Production})} \times 100$$

(h)	Rescue Maintenance	Rescue maintenance refers to previously undetected malfunctions or such sudden changes that were not anticipated but require immediate solution. Rescue maintenance is unplanned, thus a system that is properly developed and tested should have few occasions of rescue maintenance.

—— Space to write important points for revision ——

2015 - Dec [2] Answer the questions:

(b) (i) List the major areas and types of maintenance an organization may use in those areas. **(4 marks)**

(c) (i) Expand TPM. Identify various activities a TPM system is encompassed of, with influence on equipment up time. **(1 + 4 = 5 marks)**

Answer:

(b) (i) **The major areas of maintenance are:**

1.	**Civil Maintenance**	Building construction and maintenance, maintaining service facilities such as water, gas, steam, compressed air, heating and ventilating, air conditioning, painting, plumbing and carpentry work. Also included in civil maintenance are janitor, service, house-keeping, scrap disposal, fencing, landscaping, gardening, and maintaining drainage, lawns and firefighting equipments.
2.	**Mechanical Maintenance**	Maintaining machines and equipments, transport vehicles, material handling equipments, steam generators, boilers, compressors, and furnaces. Lubricating the machines is also part of mechanical maintenance work.

3.	**Electrical Maintenance**	Maintaining electrical equipments such as generators, transformers, switch gears, motors, telephone systems, electrical installations, lighting, fans, meters, gages, instruments, control panels and battery charging.

(c) (i) TPM is a comprehensive system of equipment maintenance that encompasses all activities with any influence on equipment up time (i.e., working time). These activities are:

(i)	**Regulating basic conditions**	TPM advocates keeping a well-organized shop floor which should be very clean.
(ii)	**Adhering to proper operating procedures**	The most significant cause of failure is operators deviating from procedures and introduce errors and variance into the process.
(iii)	**Restoring deterioration**	TPM requires diligent efforts to discover and predict deterioration in equipment and then follow standard repair methods to eliminate any source of variation in the system.
(iv)	**Improving weaknesses in design**	TPM tries to identify and correct any defects in equipment designs that contribute to break-downs or complicate maintenance.
(v)	**Improving operation and maintenance skills**	Equipment users (i.e., workers) contribute to TPM by learning and following correct operating procedures to prevent errors and correct any problems on the first attempt. TPM enhances the skill of both users and maintenance workers through education and training.

—— Space to write important points for revision ——

2016 - June [II] 2. (b) Write down the formula for:
 (iii)   Frequency of Breakdown   (1 mark)
Answer:

Frequency of break downs = $\dfrac{\text{(Number of break downs per week)}}{\text{(Available machine hours per week)}}$

—— Space to write important points for revision ——

2016 - June [II] Answer the question:
3.   (c)   List the various steps in Maintenance Planning.   (8 marks)
Answer:
Steps in Maintenance Planning:
 (i)   Know the equipment to be maintained, available technique for maintenance and the facilities available to carry out maintenance work.
 (ii)   Establish the priorities of maintenance activities by categorising the activities as emergency work, priority work and non priority work.
 (iii)   Investigate the maintenance work to be done at the workstation to ascertain physical access and space limitations, facilities for lifting and handling (moving), facilities for disposal of water, oil, gas and other hazardous materials, space for keeping the dismantled parts etc.
 (iv)   Develop the repair plan on the basis of –
   (a) Recommendation of original equipment manufacturer,
   (b) Technical experience,
   (c) Equipment history and
   (d) Management decision for a new technique of maintenance work.
 (v)   Prepare a list of maintenance materials and spare parts required.
 (vi)   Prepare a list of special tools and special facilities such as material handling equipments (such as crane) required.
 (vii)   Estimate the time required to do the maintenance work.
 (viii)   Provide for necessary safety devices and safety instructions.
—— Space to write important points for revision ——

2016 - Dec [1] (a) 'Computers have entered the maintenance function in a big way.'
List two important areas in maintenance where computer assistance is taken.
                                (2 marks) [Sec. A]

Answer:
Key areas in maintenance where computer assistance is taken are:
  (i)   Scheduling maintenance projects;
  (ii) Maintenance cost reports by production department, cost category and other classifications;
  (iii) Inventory status reports for maintenance part and supplies;
  (iv) Parts failure data; and
  (v)   Operations analysis studies which may include computer simulation, waiting lines, and other analytical programmes.

——— Space to write important points for revision ———

2016 - Dec [2] (b) Write down the formula for the following which are used for measuring maintenance effectiveness:
  (i)   Down-time index (as a percentage); and
  (ii) Maintenance cost index as a percentage. **(2 × 2 = 4 marks) [Sec. B]**
Answer:
  (i)   Down time index (as a percentage):

$$\frac{(\text{Down time per week})}{(\text{Available machine hours per week})} \times 100$$

  (ii) Maintenance cost index (as a percentage):

$$\frac{(\text{Annual Maintenance cost})}{(\text{Cost of Production})} \times 100$$

——— Space to write important points for revision ———

2016 - Dec [3] (a) List the information to be collected before scheduling maintenance activities. **(8 marks) [Sec. B]**
Answer:
The following information should be collected before scheduling maintenance activities:
  (i)   Manpower (maintenance crew) available.
  (ii) Pending maintenance work (in terms of man hours backlog).
  (iii) Availability of machine or equipment for preventive maintenance service.
  (iv) Availability of proper tools, handling equipments, consumables, spare parts etc.

(v) Availability special maintenance equipments if any, special fixtures and tools, cranes, etc.

(vi) Whether additional manpower is available at outside sources to be hired when needed.

(vii) When to start the maintenance work and when it should be completed,

(viii) Previous maintenance history records or charts.

—— Space to write important points for revision ————————

2021 - Dec [10] What is the underlying principle of preventive maintenance?

(1 mark) [Sec. B - SAQ]

Answer:

Prevention is better than cure

—— Space to write important points for revision ————————

PRACTICAL QUESTIONS

2012 - Dec [2] (b) A company has 50 identical machines in its facilities. The cost of preventive servicing (C_P) is ₹ 20, and the cost of repair after breakdown (C_R) is ₹ 100. The company seeks the minimum cost preventive servicing frequency and has collected the data on breakdown probabilities in the following table:

Probabilities of machine breakdown by month:

Months after servicing that breakdown occurs (i)	Probability that breakdown will occur (P_i)
1	0.10
2	0.05
3	0.05
4	0.10
5	0.15
6	0.15
7	0.20
8	0.20

(8 marks)

Answer:

Probabilities of machine breakdown, by month

Months after servicing that break down occurs (i)	Probability that breakdown will occur (Pi)	(i) x (pi)
1	0.10	0.10
2	0.05	0.10
3	0.05	0.15
4	0.10	0.40
5	0.15	0.75
6	0.15	0.90
7	0.20	1.40
8	0.20	1.60
Total	1.00	5.40

The mean time before failure is 5.4 months.

The expected cost with no preventive maintenance would be $100 \times (50/5.4)$ = ₹925.93 per month.

The following calculations show Bj, the expected number of breakdowns between preventive maintenance intervals, for the possible intervals, that may be considered.

$B_1 = M \times P_1 = 50(0.10) = 5$

$B_2 = M\ (P_1 + P_2) + B_1 \times P_1 = 50(0.10 + 0.05) + 5(0.10) = 8$

$B_3 = 50(0.10 + 0.05 + 0.05) + 8(0.10) + 5(0.05) = 11.05$

Accordingly, $B_4 = 16.75$, $B_5 = 25.63$, $B_6 = 35.50$, $B_7 = 48.72$, $B_8 = 63.46$.

The summary of various costs preventive maintenance intervals is given below:

Cost of alternative preventive maintenance intervals

Number of months between preventive services (j)	Expected number of breakdowns in (i) months (B$_j$)	Expected cost/ month to repair breakdown (C$_R$X Bj/j)	cost per month for preventive service every j month C$_R$ (N)/j	Total expended cost/ month of preventive maintenance and repair
(1)	(2)	(3)	(4)	(5)
1	5.00	500.00	1000.00	1500.00
2	8.00	400.00	500.00	900.00
3	11.05	368.33	333.33	701.66
4	16.75	418.75	250.00	668.75
5	25.63	512.00	200.00	712.60
6	35.50	591.67	166.68	758.34
7	48.72	696.00	142.86	838.86
8	63.46	793.25	125.00	918.25

A policy of performing preventive maintenance every 4 months results in the lowest average cost, about ₹ 669. This amount is ₹ 257 per month less than the ₹ 926 expected cost without preventive maintenance.

This policy would reduce the costs by $(257 \div 926) \times 100 = 27.75\%$ below the cost of repairing the machines only when they breakdown.

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2012 - Dec [3] (d) The following table gives the running costs per year and resale values of a certain equipment whose purchase price is ₹ 6,500. At what year is the replacement due optimally?

Year	1	2	3	4	5	6	7	8
Running costs (₹)	1,400	1,500	1,700	2,000	2,400	2,800	3,300	3,900
Resale value (₹)	4,000	3,000	2,200	1,700	1,300	1,000	1,000	1,000

(5 marks)

Answer :

Year	Net Capital Cost (C-S) (₹)	Running Cost (₹)	Cumulative Running Cost (₹)	Total Cost (₹) (2) + (4)	Average Annual Cost (₹) (5) ÷ (1)
(1)	(2)	(3)	(4)	(5)	(6)
1	2,500	1,400	1,400	3,900	3,900
2	3,500	1,500	2,900	6,400	3,200
3	4,300	1,700	4,600	8,900	2,967
4	4,800	2,000	6,600	11,400	2,850
5	5,200	2,400	9,000	14,200	2,840
6	5,500	2,800	11,800	17,300	2,883
7	5,500	3,300	15,100	20,600	2942.86
8	5,500	3,900	19,000	24,500	3062.5

Here, C = Cost of Capital, S = Resale value

Optimal replacement period is at the end of 5th year.

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2013 - June [2] (b) Replace the 'missing words' with appropriate terms in the following formula to evaluate the work done by preventive maintenance:

  (i)   ('missing words')/(Inspections scheduled) x 100 should be less than 10%

  (ii) Frequency of breakdowns = (Number of breakdowns)/('missing words').

  (iii) Effectiveness of planning = (Labour hours on scheduled maintenance)/('missing words'). **(1x3=3 marks)**

(e) (ii) A Public transport system is experiencing the following number of breakdowns for months over the past 2 years in their new fleet of vehicles:

Number of breakdowns	0	1	2	3	4
Number of months this occurred	2	8	10	3	1

Each breakdown costs the firm an average of ₹ 2,800. For a cost of ₹ 1,500 per month, preventive maintenance can be carried out to limit the breakdowns to an average of one per month. Which policy is suitable for the firm? **(3 marks)**

Answer:

(b) (i) **(Inspections incomplete)**/(Inspections scheduled) x 100 should be less than 10%

    (ii) Frequency of breakdowns = (Number of breakdowns)/**(Available machine hours)**

    (iii) Effectiveness of planning = (Labour hours on scheduled maintenance)/**(Total labour hours spent on maintenance).**

(e) (ii) Converting the frequencies to a probability distribution and determining the expected cost/month of breakdown we get:

No. of Break Downs	Frequency in months	Frequency in percentage	Expected Value
0	2	0.083	0.000
1	8	0.333	0.333
2	10	0.417	0.834
3	3	0.125	0.375
4	1	0.042	0.168
			Total 1.710

Break down cost per month × Expected cost = 1.710 × ₹ 2,800 = ₹ 4,788

Preventive maintenance cost per month:
Average cost of one breakdown/ month = ₹ 2,800
Maintenance contract cost / month = ₹ 1,500
Total = ₹ 4,300
Thus preventive policy is suitable for the firm.

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2013 - June [4] (b) A fleet owner finds from his past records that the costs per year of running a vehicle whose purchase price is ₹ 1,00,000 are as under:

Year	1	2	3	4	5
Running costs (₹)	10,000	12,000	13,500	15,000	18,000
Resale value (₹)	80,000	65,000	55,000	25,000	6,000

Thereafter, running cost increases by ₹ 3,000, but resale value remains constant at ₹ 6,000. At what age is a replacement due? **(5 marks)**

Answer:

Chart showing Optimal Replacement Period Year	Net Capital Cost (C-S) (₹)	Running Cost (₹)	Cumulative operation Cost (₹)	Total Cost (₹) (2) + (4)	Average Annual Cost (₹) (5) ÷ (1)
(1)	(2)	(3)	(4)	(5)	(6)
1	20,000	10,000	10,000	30,000	30,000
2	35,000	12,000	22,000	57,000	28,500
3	45,000	13,500	35,500	80,500	26,833
4	75,000	15,000	50,500	1,25,500	31,375
5	94,000	18,000	68,500	1,62,500	32,500

Here, C = Cost of Capital, S = Resale value
Optimal replacement period is at the end of 3rd year.

—— Space to write important points for revision ——

2013 - Dec [5] (b) Arzuu Ltd.'s records of breakdowns of its machines for a 300 day work year are as shown below:

No. of breakdowns	Frequency in days
0	40
1	150
2	70
3	30
4	10
	300

The firm estimates that each breakdown costs ₹ 600 and is considering adopting a preventive maintenance program which would cost ₹ 200 per day and limit the number of breakdown to an average of one per day. What is the expected annual savings from preventive maintenance program?

(5 marks)

Answer :

No. of breakdowns (x)	Frequency of breakdowns in days i.e., f(x)	Probability distribution of breakdowns P(x)	Expected value of breakdowns (x) × P (x)
0	40	40/300 = 0.133	NIL
1	150	150/300 = 0.500	0.500
2	70	70/300 = 0.233	0.466
3	30	30/300 = 0.100	0.300
4	10	10/300 = 0.033	0.132
Total	**300**	**1.000**	**1.400**

Total no. of breakdowns per day   = 1.40
Cost of breakdown per day   = 1.40 × ₹ 600 = ₹ 840
Cost of preventive maintenance programme per day
       = ₹ 200 + ₹ 600 = ₹ 800
Expected annual savings from the preventive maintenance programme
       = ₹ (840-800) × 300days = ₹12,000

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2014 - June [2] (b) The main shaft of calcinator has a very high reliability of 0.990. The equipment comes from abroad and has a high downtime cost associated with the failure of this shaft. This is estimated at ₹ 2 crore as the costs of sales lost and other relevant costs. However, this spare is quoted at ₹ 10 Lakh at present. Should the shaft spare be procured along with the equipment and kept or not?   **(2 marks)**

Answer :

Reliability of machine = 0.990

Number of Standby units A	Reliability B	Device Cost ₹ C	Loss due to failure (1 – column B) 20000000 D	Total Cost ₹ E
0	0.990	10,00,000	2,00,000	12,00,000
1	0.9999	20,00,000	2,000	20,02,000

Total cost is minimum when shaft spare is not procured.

Therefore, no need to buy shaft at the time of procurement of calcinatory.

             Or

The expected down-time cost calcinatory = (Probability of failure) × (Cost when break-down occurs) = (1-0.990) × (₹2 crore) = ₹2 lakh

However, the cost of procuring the spare now is ₹10 lakh. Therefore, expected cost of downtime is less than the cost of spare; hence there is no need to buy shaft at the time of procurement of calcinator.

—— Space to write important points for revision ——

2014 - Dec [2] (a) Answer the question:
  (i) An engineering firm has a machine whose purchase price is ₹ 85,000. The expected maintenance costs and resale price in different years are as given below:

Year	1	2	3	4	5	6	7
Maintenance Cost (₹)	1200	1400	1800	2600	3200	4100	5200
Resale Value (₹ Thousand)	80	76	71	67	63	58	52

After what time interval should the machine be replaced?   (6 marks)

Answer:

(a) (i)

Year	Maintenance Cost, M_t	Cum. Maintenance Cost, ΣM_1	C-S	T(n)	A(n)
(i)	(ii)	(iii)	(iv)	(v) = (iii)+(iv)	(vi) = (v)/n
1	1,200	1,200	5,000	6,200	6,200
2	1,400	2,600	9,000	11,600	5,800*
3	1,800	4,400	14,000	18,400	6,133
4	2,600	7,000	18,000	25,000	6,250
5	3,200	10,200	22,000	32,200	6,440
6	4,100	14,300	27,000	41,300	6,883
7	5,200	19,500	33,000	52,500	7,500

Where:
C — Purchase price of machine
S — Scrap Value of machine at the end of n years,
* Here minimum A(n) — ₹ 5800, for n = 2 .
The machine should therefore be replaced every two years.

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2015 - June [2] (a) (ii) A firm is using a machine whose purchase price is ₹ 15,000. The installation charges amount to ₹ 3,500 and the machine has a scrap value of only ₹ 1,500 because the firm has a monopoly of this type of work. The maintenance cost in various years is given in the following table:

Year	1	2	3	4	5	6	7	8	9
Maintenance Cost (₹)	260	760	1100	1600	2200	3000	4100	4900	6100

The firm wants to determine after how many years should the machine be replaced on economic considerations, assuming that the machine replacement can be done only at the year end. **(5 marks)**

Answer:

Cost of machine, (C) = ₹15,000 + ₹3,500 = ₹18,500

Scrap value, (S) = ₹1,500

Determination of Optimal Replacement Period

Year	Maintenance Cost, $M_1 t$ ₹	Cum. Main. Cost, ΣM_1 ₹	Depreciation (C-S) ₹	Total Cost T(n) ₹	Annual Cost A(n) ₹
(i)	(ii)	(iii)	(iv)	(v) = (iii) + (iv)	(vi) = $\frac{(v)}{n}$
1	260	260	17,000	17,260	17,260
2	760	1,020	17,000	18,020	9,010
3	1,100	2,120	17,000	19,120	6,373
4	1,600	3,720	17,000	20,720	5,180
5	2,200	5,920	17,000	22,920	4,584
6	3,000	8,920	17,000	25,920	4,320
7	4,100	13,020	17,000	30,020	**4,288***
8	4,900	17,920	17,000	34,920	4,365
9	6,100	24,020	17,000	41,020	4,557

Here the lowest average cost, A (n), is ₹ 4,288 approximately, which corresponds to n = 7.

Therefore, the machine may be replaced every 7 years.

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2016 - June [II] Answer the question:

2. (a) The main shaft of Calcinator has a very high reliability of 0.980. The equipment comes from abroad and has a high downtime cost associated with the failure of this shaft. This is estimated at ₹ 1.80 crores as the costs of sales lost and other relevant costs. However, this spare is quoted at ₹ 10 lakhs at present. Should the shaft spare be procured along with the equipment and kept or not? **(4 marks)**

Answer:

Expected Cost of down time = (1 - 0.980) × 1.80

= ₹ 0.036 crores

= ₹ 3.6 lakhs

However, the cost of procuring the spare now is ₹ 10 lakhs. Therefore, expected cost of downtime is less than the cost of spare, hence spare need not be purchased along with equipment.

—— Space to write important points for revision ——

2016 - Dec [4] (b) Reddy Transport Company (RTC) has a fleet of 50 trucks. The past data on the breakdown of the trucks show the following probability distribution (for a new truck as well as for one which has been repaired after a breakdown).

Months after Maintenance	Probability of Breakdown
1	0.10
2	0.20
3	0.30
4	0.40

Each breakdown costs ₹ 3,000 on an average, which includes cost of time lost and cost of materials and manpower.

The manager of RTC knows the importance of preventive maintenance. He estimates the costs of the preventive maintenance to be ₹ 500 per such preventive action.

What should be the appropriate maintenance policy in terms of the mix of preventive and breakdown. **(10 marks) (Sec. B)**

Answer:

First, let us compute the cost of a totally breakdown maintenance policy. The expected number of months between failures

$= 0.1 (1) + 0.2 (2) + 0.3 (3) + 0.4 (4) = 3.0$

Cost per month of totally breakdown maintenance policy

$$= \frac{(\text{No. of trucks})\,(\text{Cost per breakdown})}{(\text{Expected number of months between failures})} = \frac{(50)\,(₹3,000)}{(3.0)} = ₹\,50,000.$$

Now, let us compute the costs of following different periodicities of preventive maintenance.

(i) Preventive maintenance (PM) period one month:

No. of breakdowns within the period of one month:
$B_1 = (50) \times (0.1) = 5$
Cost of breakdown = 5 × ₹ 3,000   = ₹ 15,000
Cost of preventive maintenance = ₹ 500 × 50   = ₹ 25,000
Total Cost during the PM period   = ₹ 40,000
Hence, cost per month for this policy is = ₹ 40,000 ÷ 1 = ₹ 40,000

(ii) Preventive maintenance (PM) period two months:

No. of breakdowns within 2 months:
$B_2 = (50) \times (0.1 + 0.2) + (50) \times (0.1) \times (0.1) = 15.5$
Cost of breakdown = (15.5) × ₹ 3,000 = ₹ 46,500
Cost of prev. maintenance = ₹ 500 x 50 = ₹ 25,000
Total cost during the PM period = ₹ 71,500
Hence, cost per month for this policy:
₹ 71,500 ÷ 2 months = ₹ 35,750

(iii) Preventive maintenance period 3 months:

No. of breakdowns within 3 months:
$B_3 = (50) \times (0.1 + 0.2 + 0.3) + (50 \times 0.1)\,(0.1 + 0.2) + (50 \times 0.1 \times 0.1)\,(0.1)$
$= 30 + 1.5 + 0.05 = 31.55$
Cost of breakdown = 31.55 × ₹ 3,000 = ₹ 94,650
Cost of preventive maintenance = 50 × ₹ 500 = ₹ 25,000
Total = ₹ 1,19,650
Hence, cost per month for this policy
= ₹ 1,19,650 ÷ 3 months = ₹ 39,883.33

(iv) Preventive maintenance period 4 months:

No. of breakdowns within 4 months
$B_4 = [(50) \times (1.0)] + [(50) \times (0.1) \times (0.1 + 0.2 + 0.3) + (50 \times 0.1 \times 0.1) \times (0.1 + 0.2) + (50 \times 0.1 \times 0.1 \times 0.1) \times (0.1) + (50 \times 0.1 \times 0.2) \times (0.1)] + [(50 \times 0.2) \times (0.1 + 0.2) + (50 \times 0.2 \times 0.1) \times (0.1)] + [(50 \times 0.3 \times (0.1)] = 57.855$

Cost of breakdown = (57.855) × (₹ 3,000) = ₹ 1,73,565

Cost of preventive maintenance = 50 × ₹ 500 = ₹ 25,000

Total = ₹ 1,98,565

Hence, cost per month for this policy is ₹ 1,98,565 ÷ 4 months = ₹ 49,641.25

Comparing the costs per month of different policies, we see that the policy of preventive maintenance every two months is the most economic policy.

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2017 - June [5] (b) Product A has a Mean Time Between Failures (MTBF) of 35 hours and a Mean Time to Repairs (MTTR) of 6 hours. Product B has a MTBF of 45 hours, and has a MTTR of 3 hours.

(i) Which product has higher reliability?

(ii) Which product has greater maintainability?

(iii) Which product has greater availability?　　**(3 + 3 + 4 = 10 marks)**

Answer:

(i) Product B, with the higher MTBF (i.e. 45 hours) than product A (i.e. 35 hours), is more reliable since it has lesser chances for failure during servicing.

(ii) The MTTR means time taken to repair a machine. Thus lesser MTTR (of 3 hours) pertaining to Product B vis-a-vis of 6 hrs of Product A makes Product B to have greater maintainability.

(iii) Availability of a machine/product = MTBF/(MTBF + MTTR)

Thus Availability of Product A = 35/(35 + 6) = 35/41 = 85.366%

Availability of Product B = 45/(45 + 3) = 45/48 = 93.75%

Hence, Product B has more availability.

—— Space to write important points for revision ——

2017 - Dec [5] (a) A Public Transport Company is experiencing the following number of breakdowns for months over the past 2 years in their new fleet of vehicles:

Number of breakdowns	0	1	2	3	4
Number of months this occurred	3	6	9	4	2

Each breakdown costs the company an average of ₹ 2,500. For a cost of ₹ 1,700 per month, preventive maintenance can be carried out to limit the breakdowns to an average of one per month. Which policy is suitable for the company? **(10 marks)**

Answer:

After converting the frequencies to a probability distribution and determining the expected cost/month of breakdowns, we get:

Number of breakdowns	Frequency in months	Frequency in percent	Expected value
0	3	3/24 = 0.125	0
1	6	6/24 = 0.25	0.25
2	9	9/24 = 0.375	0.75
3	4	4/24 = 0.167	0.5
4	2	2/24 = 0.083	0.334
		Total : 1	**Total: 1.834**

Breakdown cost per month; Expected cost = 1.834 x ₹ 2500 = ₹ 4,585.

Preventive maintenance cost per month:

Average cost of one breakdown/month = ₹ 2,500

Maintenance contract cost/month = ₹ 1,700

$$\text{Total} = ₹ 4,200.$$

Thus, preventive maintenance policy is suitable for the firm

—— Space to write important points for revision ——

2018 - June [5] (b) A cab operations company is experiencing the following number of breakdowns for months over the past 2 years in their new fleet of cabs:

Number of breakdowns	0	1	2	3	4
Number of months this occurred	3	7	9	4	1

Each breakdown costs the firm an average of ₹ 2,500. For a cost of ₹ 1,600 per month, preventive maintenance can be carried out to limit the breakdowns to an average of one per month. Which policy is suitable for the firm? **(8 marks)**

Answer:

(A) No. of Break down	(B) Freq	(C) Freq (a/b) in month	(A × C) Expected Value
0	3	0.13	0
1	7	0.29	0.29
2	9	0.38	0.76
3	4	0.16	0.48
4	1	0.04	0.16
		Total	1.69

Break down Cost per month × Expected
= 2,500 × 1.69
= ₹ 4225

Preventive Maintenance Cost per month :-

Average Cost of One Breakdown	2,500
Maintain Contract Cost Per Month	1,600
Total	4,100

Thus, Preventive Policy is suitable for the firm.

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2018 - Dec [5] (b) An automotive firm is using a machine whose purchase price is ₹ 18,000.

The Installation charges amount to ₹ 3,800 and the machine has a scrap value of only ₹ 1,800 because the firm has a monopoly of this type of work. The maintenance cost in various years is given in the following table:

Year	1	2	3	4	5	6	7	8	9
Maintenance cost (₹)	250	720	1200	1700	2300	3200	4300	4800	6300

The firm wants to determine after how many years should the machine be replaced on economic considerations, assuming that the machine replacement can be done only at the year end. **(10 marks)**

Answer:

An automotive firm is using a machine:

Cost of machine, C = ₹ 18,000 + 3,800 = 21,800

Scrap Value, S = ₹ 1,800

Year	Maintenance Cost, Mj (₹)	Cumulative Maintenance Cost, $\sum Mj$ (₹)	C - S (₹)	Total Cost $T_{(n)}$ (₹)	Annual Cost $A_{(n)}$ (₹)
(i)	(ii)	(iii)	(iv)	(v)=(iii)+(iv)	(vi) = (v)/n
1	250	250	21,800 -1,800 = 20,000	20,250	20,250
2	720	970	20,000	20,970	10,485
3	1,200	2,170	20,000	22,170	7,390
4	1,700	3,870	20,000	23,870	5,967.5
5	2,300	6,170	20,000	26,170	5,234
6	3,200	9,370	20,000	29,370	4,895
7	4,300	13,670	20,000	33,670	4,810
8	4,800	18,470	20,000	38,470	4,808.8
9	6,300	24,770	20,000	44,770	4,974.4

Lowest average cost is ₹ 4808.8 approx., which corresponds to n = 8 in above table. Thus machine needs to be replaced every 8th year.

2019 - June [5] (b) An electronic device components manufacturing company carries out the 'A' components testing for 2500 hours. A sample of 100 'A' components was put through this quality test during which two components failed. If the average usage of the electronic device by the customer is 5 hours/day and if 12,000 such devices were sold, then in one year how many 'A' components were expected to fail and what is the mean time between failures for these components? **(6 marks)**

Answer:

The total test time = (100 Components) × 2500 hours = 250,000 component-hours.

There are two components which have failed and hence the total time is to be adjusted for the number of hours lost due to the failures during the testing.

The lost hours are computed as = (2×2500) / 2 = 2500 hours.

The assumption is made here is that each of the failed tubes have lasted an average of half of the test period.

Therefore, the test shows that there are two failures during (2,50,000 - 2500) = 2,47,500 component hours of testing.

During 365 days a year (four hours a day) for 12,000 components the number of expected failures = (2 × 12,000 × 365 × 5) /2,47,500 = 176.97 =177 components approximately.

Mean time between failures = 2,47,500 components hrs. of testing / 2 failures = 1,23,750 components hours per failure = 1,23,750 / (5/365) = 67.8 components year per failure.

—— Space to write important points for revision ——

2019 - Dec [5] (b) RST Company has kept records of breakdown of its machines for 300 days work year as shown below:

No. of Breakdown	Frequency in days
0	50
1	140
2	60

3	30
4	20
Total:	**300**

The company estimates that each breakdown costs ₹600 and is considering adopting a preventive maintenance program which would cost ₹250 per day and limit the number of breakdown to an average of one per day. What is the expected annual savings from preventive maintenance program?

(10 marks)

Answer:

Step-1:

No. of Breakdowns (X)	Frequency of breakdowns in days; i.e. f(x)	Probability distribution of break downs; i.e. p(x)	Expected value of breakdown X p(x)
0	50	50/300 = 0.167	Nil
1	140	140/300 = 0.466	0.466
2	60	60/300 = 0.200	0.400
3	30	30/300 = 0.100	0.300
4	20	20/300 = 0.067	0.268
Total:	**300**	**1.000**	**1.434**

Step - 2:

Total no. of breakdowns per day = 1.434

Cost of breakdown per day = 1.434 × 600 = 860.4

Cost of preventive maintenance program per day = ₹250 + 600 = 850

Expected annual savings from the preventive maintenance program

= (860.4 − 850) × 300 = 10.4 × 300 = ₹3,120

—— Space to write important points for revision ——

2021 - Dec [1] A firm is using a machine whose purchase price is ₹ 12,000/-. The installation charges amount to ₹ 3,500/- and the machine has scrap value of ₹ 1,500 because the firm has a monopoly of this type of work. The maintenance cost in various years is given in the following table:

Year	1	2	3	4	5	6	7	8	9
Maintenance Cost (₹)	250	760	1200	1800	2500	3200	4100	5000	6000

(i) Find out Cost of machine.
Calculate the replacement period of the machine.
(ii) Determine the Optimal Replacement Period.

(4+4 = 8 marks) [Sec. C - Five LAQ]

Answer:
(i) Cost of Machine = ₹ 15,500
Replacement period of Machine is 6th year.
(ii) Here the lowest average cost is ₹ 3,951 approximately, in 6th year. Hence, the machine may best be replaced every 6 years.

—— Space to write important points for revision ——

2022 - Dec [5] (a) ANEX Ltd. an Engineering firm is using a machine whose purchase price is ₹ 13,000. The installation charges amount to ₹ 3,700 and the machine has a scrap value of only ₹ 1,400 because the firm has a monopoly of this type of work. The maintenance cost in various years as is shown below:

Year	1	2	3	4	5	6	7	8	9
Cost (₹)	300	850	1,300	1,900	2,600	3,300	4,200	6,000	7,500

Required:
(i) Determine after how many years should the machine be replaced on economic considerations (Assuming that machine replacement can be done only at the year end).
(ii) What will be the average cost of Replacement? **(5 + 1 = 6 marks)**

—— Space to write important points for revision ——

Repeatedly Asked Questions

No.	Question	Frequency
1	What are the objectives of maintenance management? 12 - Dec [4] (d), 15 - June [2] (b) (iii)	2 Times
2	Practical Question of: 14 - June [2] (b), 16 - June [II] [2] (a)	2 Times

OBJECTIVE QUESTIONS

2012 - Dec [1] {C} (a) For each part below, choose the most appropriate answer out of the four options given against each part.

(ii) Issuing necessary orders, and taking necessary steps to ensure that the time targets set in the schedules are effectively achieved is known as:
   A. Routing,
   B. Dispatching,
   C. Scheduling,
   D. Inspection.

(iii) Preventive maintenance is useful in reducing:
   A. Inspection Cost,
   B. Shutdown Cost,
   C. Cost of pre-mature replacement,
   D. Set-up cost of machine.

(iv) Computers are better used in Production Control in this area:
   A. Follow-up activity,
   B. To control labour,
   C. To disseminate information,
   D. Loading, scheduling and assignment work.   **(1x3 = 3 marks)**

(b) Examine each statement and indicate whether it is 'True' or 'False':
   (i) Project cost increases as the duration of the project increases.
   (iii) With increase in lot size the set up cost per unit decreases, whereas the inventory carrying cost increases.
   (iv) If the total float value is zero, it means the resources are just sufficient to complete the activity without delay.   **(1 x 3 = 3 marks)**

(c) Match the terms in Column I with the relevant terms in Column II.

Column I	Column II
(A) Production of goods according to orders of customers.	(I) Forecasting
(B) Systematic and Scientific Method of probing the future.	(ii) Layout Planning
(C) Includes cleaning, lubrication, periodic overhaul etc.	(iii) Maintenance Stores
(D) Involves decisions about the physical arrangement of economic activity centres within a facility	(iv) Capacity Management
(E) To match the level of operations to the level of demand	(v) Input-output Analysis
(F) A mathematical study of an economy in which different production sectors have interdependence	(vi) Flexible Manufacturing System
(G) Availability of vital spare parts essentially to meet an emergency like breakdown	(vii) Job Producting
(H) Automatic handling, loading, and unloading of materials for machining operations.	(viii) Routine Maintenance

(0.5 x 8 = 4 marks)

Answer :

(a) (ii) (B) Dispatching

   (iii) (B) Shutdown Cost

   (iv) (D) Loading, scheduling and assignment work

(b) (i) True

   (iii) True

   (iv) True

(c)
  (A) — (vii)
  (B) — (i)
  (C) — (viii)
  (D) — (ii)
  (E) — (iv)
  (F) — (v)
  (G) — (iii)
  (H) — (vi)

—— Space to write important points for revision ————————

2012 - Dec [4] (a) Put an appropriate word or two in blank position:
  (i)   Standard time is always more than_____time.
  (iii) One of the criteria to evaluate the work done by preventive maintenance is 'Frequency of breakdowns' which is calculated by the formula_____.
  (v) Lathe is a_____purpose machine tool.   **(1 × 3 = 3 marks)**
Answer :
  (i)   Normal
  (iii) $\dfrac{\text{Number of breakdowns}}{\text{Available machine hours}}$

  (v) General

—— Space to write important points for revision ————————

2013 - June [3] (b) Expand the following:
  (iii) MTM
  (iv) VAM   **(1x2=2 marks)**
Answer:
(b) (iii) MTM: Methods Time Measurement
    (iv) VAM: Vogel's Approximation Method.

—— Space to write important points for revision ————————

2013 - June [4] (a) For each part below, choose the most appropriate answer out of the four options given against each part:

(ii) The desired objective of Production and Operation Management is
   (a) Use of cheap machinery to produce,
   (b) To train unskilled workers to manufacture goods perfectly,
   (c) Optimal utilization of available resources,
   (d) To earn good profits.

(iii) Most suitable layout for Job Production is
   (a) Line layout,
   (b) Matrix layout,
   (c) Process layout,
   (d) Product layout.

(iv) The time horizon selected for forecasting depends on
   (a) The stability of the product,
   (b) The selling capacity of salesman,
   (c) Purpose for which forecast is made,
   (d) Time required for production cycle.

(v) A method in which a trend line is drawn in such a way that the sum of the squares of deviations of the actual points above and below the trend line is at the minimum is known as
   (a) Squared trend method,
   (b) Equal square method,
   (c) Adjusted square method,
   (d) Least square method.   **(1 x 4 = 4 marks)**

Answer:
   (ii) (c) Optimal utilization of available resources,
   (iii) (c) Process layout,
   (iv) (c) Purpose for which forecast is made,
   (v)   (d) Least square method.
—— Space to write important points for revision ——

2013 - Dec [1] {C} (b) _____ is typically found wherever a particular bottleneck machine exists in the process of manufacturing.
   (i) Load control
   (ii) Block control

(iii)   Flow control
(iv)   Order control   (1 mark)
Answer :
(b) (i)   Load control
—— Space to write important points for revision ——

2014 - June [1] {C} (c) State which of the following does not affect the Production Design:
  (i)   Cost/Price Ratio
  (ii)   Process Capability
  (iii)   Reliability
  (iv)   Product Quality   (1 mark)
(d) The time study of a machinery operation recorded cycle times of 7.0, 9.0, 10.0 and 10.0 minutes. The analyst rated the observed worker as 90%. The firm uses a 0.15 allowance fraction. What is the standard time?
  (i)   8.1
  (ii)   10.35
  (iii)   9.53
  (iv)   9.0   (2 marks)
(e) If a firm sells 7,000 units, its loss is ₹ 40,000. But if it sells 10,000 units, its profit is ₹ 20,000. Calculate Fixed Cost:
  (i)   2,00,000
  (ii)   1,80,000
  (iii)   1,60,000
  (v)   1,75,000   (2 marks)
(f) Given the following alternatives, Linear Programming is a technique used in:
  (i)   Manufacturing Sequence
  (ii)   Product Mix
  (iii)   Production Programme
  (iv)   Plant Layout   (1 mark)
Answer :
(c) (iii) Reliability does not affect Production Design.

(d) Average Cycle time $= \dfrac{7.0 + 9.0 + 10.0 + 10.0}{4} = 9.0$ Minutes

Normal time $= 9.0 \times 0.9 \qquad = 8.1$ minutes.

Standard Time $= \dfrac{8.1}{(1 - 0.15)} \qquad = 9.53$ minutes

(e) (ii) Change in quantity $\qquad = (10,000 - 7,000) = 3,000$ Units

Change in profit $\qquad = ₹ [20,000 - (- 40,000)] = ₹ 60,000$

Unit Contribution $\qquad = \dfrac{\text{Change in Profit}}{\text{Change in Output}} = \dfrac{60,000}{3,000} = ₹ 20$

So, when output $\qquad = 10,000$ units

Total contribution $\qquad = (₹ 20 \times 10,000) = ₹ 2,00,000$

Contribution $\qquad = $ Fixed Cost + Profit

2,00,000 $\qquad = $ Fixed Cost + 20,000

or, 2,00,000 − 20,000 $\qquad = $ Fixed Cost

or, Fixed cost $\qquad = ₹ 1,80,000$

(f) (ii) Production Mix

—— Space to write important points for revision ——

2014 - June [2] (f) Fill in the blank:

Being part of operations function, _____ involves the shipping of goods to warehouses, retail outlets or final customers. **(1 mark)**

Answer :

Distribution.

—— Space to write important points for revision ——

2014 - June [5] (c) Expand the following:

(i) TPM **(1 mark)**

Answer :

TPM stands for Total Productive Maintenance

—— Space to write important points for revision ——

2015 - June [1] (f) Fill in the blanks:
In applications of queuing theory in maintenance, the machine breakdowns are the _____ in the queue and they may have their own____ distribution.

(2 marks)

Answer:
In applications of queuing theory in maintenance, the machine breakdowns are the **"arrivals"** in the queue and they may have their own **"frequency"** distribution.

—— Space to write important points for revision ————————

2016 - June [I] Answer the questions:
(c) Fill in the blanks with one word or two:
   (i) The _____ is the sum of the setup time and run time for a batch of parts that are run on a machine.
   (ii) Efficiency is a ratio of the actual output of a process relative to some _____.

(2 marks)

(e) State whether 'True' or 'False':
   (i) Regular spares are also called Rotable spares.
   (ii) Role of the corrective maintenance department is almost active.

(2 marks)

(g) 'The characteristics of information vary with functions of levels of management'. Fill in the blanks (i) to (iv) in the following Table with regard to contents of report:

Characteristics of Information	Top Management	Middle Management	Operational Management
Focus of Planning and Management	Strategic Planning	(i)	(ii)
Boundary	(iii)	(iv)	Internal

(2 marks)

(h) Please complete the following sentence by putting in appropriate words in the blank positions:

'Configuration of an ERP system deals with handling of numerous usage controls, which can be switched _____ or switched _____, so as to balance its functionalities to extant needs. First thing to happen is to _____ specific modules needed and _____ these modules, as per the scope of the project.'

(2 marks)

Answer:

(c) (i) Operation time.

(ii) Standard.

(e) (i) False.

(ii) False.

(g)

Characteristics of Information	Top Management	Middle Management	Operational Management
Focus of Planning and Management	Strategic Planning	(i) Resource Management	(ii) Day-to-day Activities
Boundary	(iii) Internal and external	(iv) Internal	Internal

(h) 'Configuration of an ERP system deals with handling of numerous usage controls, which can be switched off or switched on, so as to balance its functionalities to extant needs. First thing to happen is to install specific modules needed and configuring these modules, as per the scope of the project.'

—— Space to write important points for revision ——

2016 - June [II] 3. Expand the following:

(a) (i) JIT, (ii) CBA and (iii) TPM **(1 × 3 = 3 marks)**

Answer:

(i) Just-in-time

  (ii) Cost Benefit Analysis
  (iii) Total Productive Maintenance.

—— Space to write important points for revision ——————

2016 - Dec [1] (c) After forecasting human resource needs, it is logical to _____ how these needs can be _____.

(f) State whether 'True' or 'False':
  (i) An individual having lower capabilities than his/her job requirements should be transferred to a less demanding job.
  (ii) The change in technology has no impact on the established methods, procedures and processes in an industry.

(2 marks each) [Sec. A]

Answer:

(c) Determine, met.

(f) (i) True
  (ii) False.

—— Space to write important points for revision ——————

2016 - Dec [2] (c) Expand the following:
  (i) DFM
  (ii) TPM
  (iii) RA
  (iv) TQC
  (v) VAM   **(1 × 5 = 5 marks) [Sec. B]**

Answer:

Abbreviation	Expansion
DFM	Design for Manufacturing
TPM	Total Productive Maintenance
RA	Relaxation Allowance
TQC	Total Quality Control
VAM	Vogel's Approximation Method

2017 - June [1] (a) Choose the correct answer:

(i) Out of the following trends in production/operations management, which one is sometimes called as agile manufacturing?
   (a) Re-engineering
   (b) Supply-Chain Management
   (c) Lean Production
   (d) Flexibility

(ii) Out of the following factors that are affecting Capacity Planning, which one is Less Controllable one?
   (a) Machine break-downs
   (b) Amount of labour employed
   (c) Facilities installed
   (d) Shifts of work per day

(iii) Which of the following stages of Product Life Cycle does attribute beginning of substantial increase in Sales and Profits?
   (a) Introduction
   (b) Growth
   (c) Maturity
   (d) Decline

(iv) This aims at finding the best and most efficient way of using the available resources-men, materials, money and machinery:
   (a) Time Study
   (b) Work Study
   (c) Method Study
   (d) Job Evaluation

(v) Which one is NOT an index of Productivity?
   (a) Man-hour output
   (b) Productivity ratio
   (c) TQM
   (d) Use of Financial Ratios

(vi) The time by which an activity can be rescheduled without affecting the other activities-preceding or succeeding is called as
   (a) Slack
   (b) Independent Float
   (c) Free Float
   (d) Total Float

(vii) Reliability and per unit cost of which of the following spares are less?
    (a) Regular spares
    (b) Insurance spares
    (c) Capital spares
    (d) Rotable spares

(viii) For a marketing manager, the sales forecast is
    (a) estimate of the amount of unit sales for a specified future period.
    (b) arranging the salesmen to different segments of the market.
    (c) to distribute the goods through transport to satisfy the market demand.
    (d) to plan the sales methods.

(ix) The activity of specifying when to start the job and when to end the job is known as
    (a) Planning
    (b) Scheduling
    (c) Timing
    (d) Follow-up

(x) The lead time is
    (a) Time for placeholders for materials
    (b) Time of receiving materials
    (c) Time between receipt of material and using materials
    (d) Time between placing the order and receiving the materials

(1×10 = 10 marks)

Answer:
  (i) (d) Flexibility
  (ii) (a) Machine break-downs
  (iii) (b) Growth
  (iv) (b) Work Study
  (v) (c) TQM
  (vi) (b) Independent Float
  (vii) (a) Regular spares
  (viii) (a) Estimate of the amount of unit sales for a specified future period.
  (ix) (b) Scheduling
  (x) (d) Time between placing the order and receiving the materials

2017 - June [1] (b) Match Column-I with Column-II:

I		II
(A) Aviation Fuel	(i)	Value Analysis
(B) Brainstorming	(ii)	Machine Shop
(C) Forgings	(iii)	Turbo-Alternator
(D) Tools	(iv)	Refinery
(E) Hydro-electricity	(v)	Job Evaluation
(F) Ranking Method	(vi)	Smithy

(1 × 6 = 6 marks)

Answer:

I		II
(A) Aviation Fuel	(iv)	Refinery
(B) Brainstorming	(i)	Value Analysis
(C) Forgings	(vi)	Smithy
(D) Tools	(ii)	Machine Shop
(E) Hydro-electricity	(iii)	Turbo-Alternator
(F) Ranking Method	(v)	Job Evaluation

—— Space to write important points for revision ——

2017 - June [1] (c) State whether the following statements are 'True' or 'False':

(i) Merit Rating is used to determine the cost of a product.

(ii) Project costs increase as the duration of the project increases.

(iii) In carrying out Job Evaluation studies, point system is the best method.

(iv) Production planning and control is essentially concerned with the control of Finished goods.

(v) A Productivity Index is a device of expressing the ratio between outputs and the inputs of the resources numerically.

(vi) If the total float value is zero, it means the resources are just sufficient to complete the activity without delay. **(1 × 6 = 6 marks)**

Answer:

(i) False

(ii) True

(iii) True

(iv) False

(v) True

(vi) True

—— Space to write important points for revision ——

2017 - Dec [1] (a) Choose the correct answer:

(i) The effective capacity is NOT influenced by which of the following factors:

(a) Forecasts of demand

(b) Plant and labour efficiency

(c) Subcontracting

(d) None of the above

(ii) Key aspects in process strategy does NOT include which of the following:

(a) Make or buy decisions

(b) Capital intensity

(c) Process flexibility

(d) Packaging

(iii) The example of worker involvement, as a recent trend in production/operations management is

(a) SCM

(b) Just-in-Time

(c) Quality Circle

(d) MRP

(iv) In an organization, the Production Planning and Control department comes under

(a) Planning department

(b) Manufacturing department

(c) Personnel department

(d) R & D department

(v) JIT stands for
  (a) Just In Time Purchase
  (b) Just In Time Production
  (c) Just In Time use of Materials
  (d) Just In Time Order the Material

(vi) In route sheet or operation layout, one has to show
  (a) a list of materials to be used
  (b) a list of machine tools to be used
  (c) every work center and operation to be done at that work center
  (d) the cost of product

(vii) One of the important charts used in Programme control is
  (a) Material chart
  (b) Gantt chart
  (c) Route chart
  (d) Inspection chart

(viii) Production planning in the intermediate range of time is termed as
  (a) Production planning.
  (b) Long range production planning.
  (c) Scheduling.
  (d) Aggregate planning.

(ix) Preventive maintenance is useful in reducing
  (a) Inspection Cost
  (b) Cost of premature replacement
  (c) Shutdown Cost
  (d) Set-up Cost of machine

(x) Which one of the following standards is associated with the "Quality Assurance in Production and Installation"?
  (a) ISO 9001
  (b) ISO 9002
  (c) ISO 9003
  (d) ISO 9004   (1 × 10 = 10 marks)

Answer:
  (i)   (d)
  (ii) (d)
  (iii) (c)

(iv)	(b)
(v)	(b)
(vi)	(c)
(vii)	(b)
(viii)	(d)
(ix)	(c)
(x)	(b)

—— Space to write important points for revision ——

2017 - Dec [1] (b) Match Column A with Column B:

Column A	Column B
(A) Fixture	(i) Conversion of Inputs into outputs
(B) Process layout	(ii) Network Analysis
(C) Capital Intensity	(iii) General purpose machines
(D) Operations Management	(iv) Mix of equipment and labour which will be used by the firm
(E) Crashing	(v) Appliance for holding the work
(F) Less prone to Obsolescence	(vi) Grouping together of similar machines in one department

(1 × 6 = 6 marks)

Answer:

Column A		Column B
(A) Fixture	(v)	Appliance for holding the work
(B) Process layout	(vi)	Grouping together of similar machines in one department
(C) Capital Intensity	(iv)	Mix of equipment and labour which will be used by the firm
(D) Operations Management	(i)	Conversion of Inputs into outputs
(E) Crashing	(ii)	Network Analysis
(F) Less prone to Obsolescence	(iii)	General purpose machines

2017 - Dec [1] (c) State whether the following statements are 'True' or 'False':

(i) Customer service is a key objective of operations management.

(ii) In general short term forecasting will be more useful in production planning.

(iii) If the total float value is zero, it means the resources are just sufficient to complete the activity without any delay.

(iv) Job Evaluation is a systematic approach to ascertain the labour worth of a job.

(v) Load control is typically found wherever a particular bottleneck machine does not exist in the process of manufacturing.

(vi) The term "aesthetics" which appeals to the human sense does not add value to the product. **(1 × 6 = 6 marks)**

Answer:

(i) True

(ii) True

(iii) True

(iv) True

(v) False

(vi) False

—— Space to write important points for revision ——

2018 - June [1] (a) Choose the correct answer:

(i) The recent trend in the Production/Operations management which suggests the use of minimal amount of resources to produce a high volume of high quality goods with some variety is referred to as:

(a) SCM

(b) TQM

(c) Lean Production

(d) Just-In-Time

(ii) Effective capacity can NOT be determined by which of the following factors?

(a) Product design and product-mix

(b) Quantity and quality capabilities

(c) Facilities

(d) None of the above

(iii) In which of the following stages the management should try to change its approach by changing its strategy from "buy my product" to "try my product"?

(a) Introduction

(b) Growth

(c) Maturity

(d) Decline

(iv) Conducting occasional check-ups of the products manufactured or assembled to ensure high quality of the production is known as:

(a) Planning

(b) Scheduling

(c) Inspection

(d) Routing

(v) Which one of the following standards is associated with the "Quality Assurance in Final Inspection Test"?

(a) ISO 9001

(b) ISO 9002

(c) ISO 9003

(d) ISO 9004

(vi) With reference to project management, identify which of the following statement is NOT correct?

(a) Gantt chart is a principal tool used in scheduling and also in some methods of loading.

(b) Routing is the first step in the production planning.

(c) The cost of any activity is proportional to its time of completion.

(d) The free float can be calculated by subtracting EFT from EST.

(vii) Identify which one of the following statement is NOT correct?

(a) Preventing maintenance includes lubrication, cleaning, periodic overhaul, etc.

(b) The two types of cost-cost of premature replacement and cost of breakdown-need to be balanced.

(c) Wear and obsolescence are the two main causes of replacement of machinery in every aspect of life.

(d) A machine is technically obsolete when another machine can do the same job more efficiently with reduced time and also at a lower cost.

(viii) To determine where the plant should be located for maximum operating economy and effectiveness, refers to which one of the following?
(a) Plant layout
(b) Facility location
(c) Capacity planning
(d) Capacity requirement

(ix) Which of the following models deals with the physical movement of goods from different supply origins to a number of different demand destinations?
(a) Simulation
(b) Transportation
(c) Lean operations
(d) Line balancing

(x) One of the objectives of maintenance is:
(a) to prevent obsolescence.
(b) to ensure spare parts management.
(c) to satisfy customers.
(d) to extend the useful life of Plant & Machinery without sacrificing the level of performance. **(1 × 10 = 10 marks)**

Answer:
(i) (c) Lean Production
(ii) (d) None of the above
(iii) (b) Growth
(iv) (c) Inspection
(v) (c) ISO 9003
(vi) (d) The free float can be calculated by subtracting EFT from EST.
(vii) (a) Preventive maintenance includes lubrication, cleaning, periodic overhaul, etc.
(viii) (b) Facility location
(ix) (b) Transportation
(x) (d) To extend the useful life of Plant and Machinery without sacrificing the level of performance

—— Space to write important points for revision ——

2018 - June [1] (b) Match Column A with Column B:

Column A	Column B
(A) The ability to adapt quickly to changes in volume of demand, in the product mix demanded and in product design or in delivery schedules	(i) Method Study
(B) To address the planning and controlling, of a manufacturing process and all of its related support functions	(ii) Maintenance Stores
(C) Degree to which the system can be adjusted to changes in processing requirements	(iii) Flexibility
(D) Eliminating unnecessary motions or by changing the sequence of operation or the process itself	(iv) Network Analysis
(E) Certain specific techniques which can be used for planning, management and control of project	(v) MRP-II
(F) Availability of vital spare parts needs to be ascertained to meet an emergency like breakdown	(vi) Process Flexibility

(1 × 6 = 6 marks)

Answer:

Column A	Column B
(A) The ability to adapt quickly to changes in volume of demand, in the product mix demanded and in product design or in delivery schedules	(iii) Flexibility
(B) To address the planning and controlling of a manufacturing process and all of its related support functions	(v) MRP-II
(C) Degree to which the system can be adjusted to changes in processing requirements	(vi) Process Flexibility
(D) Eliminating unnecessary motions or by changing the sequence of operation or the process itself	(i) Method Study
(E) Certain specific techniques which can be used for planning, management and control of project	(iv) Network Analysis
(F) Availability of vital spare parts needs to be ascertained to meet an emergency like breakdown	(ii) Maintenance Stores

—— Space to write important points for revision ——

2018 - June [1] (c) State whether the following statements are 'True' or 'False':

(i) The primary concern of production planning and control is the delivery of products to customers or to inventory stocks according to some predetermined schedule.

(ii) Capacity refers to the minimum load an operating unit can handle.

(iii) Job-shop process is used when a very highly standardized product is desired in high volumes.

(iv) The productivity is a measure of how much input is required to achieve a given output.

(v) One of the limitations of Gantt Chart is that it does not clearly indicate the details regarding progress of activities.

(vi) Preventive maintenance ensures greater safety to workers.

(1 × 6 = 6 marks)

Answer:
  (i) True
 (ii) False
(iii) False
(iv) True
 (v) True
(vi) True

—— Space to write important points for revision ——

2018 - Dec [1] (a) Choose the correct answer:

(i) Which one of the following recent trends in Production/Operations management involves drastic measures or break through improvements to improve the performance of a firm?
(a) Corporate Downsizing
(b) Re-Engineering
(c) Technology
(d) TQM

(ii) The starting point of Production cycle is
(a) Product design
(b) Production planning
(c) Routing
(d) Market research

(iii) Which of the following process types is used when a very highly standardized product is desired in high volumes?
(a) Repetitive Process
(b) Batch Process
(c) Project Process
(d) Continuous Process

(iv) Which of the following aims at finding the best and most efficient way of using the available resources–men, materials, money and machinery?
(a) Method Study
(b) Work Study
(c) Time Study
(d) Motion Study

(v) Generally the size of the order for production in Job production is
(a) small
(b) large
(c) medium
(d) very large

(vi) Which one of the following statements is NOT correct?
(a) LFT is calculated from the LFT of the head event.
(b) Slack can be calculated by adding EFT and LFT of any job.
(c) EFT is the sum of the EST and the time of duration for any event.
(d) The Total Project time is the shortest possible time required in completing the project.

(vii) Which one of the following is NOT the advantage of Preventive Maintenance?
(a) Better product quality
(b) Greater safety to workers
(c) Increased breakdowns and downtime
(d) Fewer large-scale repairs

(viii) Which one of the following establishes time sequence of operations?
(a) Routing
(b) Sequencing
(c) Scheduling
(d) Dispatching

(ix) MRP stands for
(a) Material Requirement Planning
(b) Material Reordering Planning
(c) Material Requisition Procedure
(d) Material Recording Procedure

(x) With reference to Aggregate Planning, identify which of the following statements is NOT correct?

(a) It is an Intermediate-term planning.

(b) It is made operational through a master schedule, that gives the manufacturing schedule.

(c) Facility planning and scheduling are closely related with the aggregate planning.

(d) It deals with the strategic decisions, such as purchase of facilities, introduction of new products, processes, etc. **(1×10 =10 marks)**

Answer:

  (i) (b) Re-engineering

 (ii) (d) Market Research

(iii) (d) Continuous Process

(iv) (b) Work Study

 (v) (a) Small

(vi) (b) Slack can be calculated by adding EFT and LFT of any job.

(vii) (c) Increased breakdowns and downtime

(viii) (c) Scheduling

(ix) (a) Material Requirement Planning

 (x) (d) It deals with the strategic decisions, such as purchase of facilities, introduction of new products, processes, etc.

—— Space to write important points for revision ——

2018 - Dec [1] (b) Match Column A with Column B:

Column A	Column B
(A) Any place in a production process where materials tend to pile up or produced at rates of speed less rapid than the previous or subsequent operations	(i) Assignment
(B) It is used when a low volume of high variety goods are needed	(ii) Globalisation

(C) A special Linear Programming Problem	(iii) Bottleneck
(D) Steep increase in the level of competition among manufacturing firms throughout the world	(iv) Maintenance Request
(E) Systematic Quantitative structural approach to the problem of managing a project through to successful completion	(v) Job-Shop Process
(F) This must be made in writing to a central point in the organization	(vi) Network Analysis

(1× 6 = 6 marks)

Answer:

Column A	Column B
(A) Any place in a production process where materials tend to pile up or produced at rates of speed less rapid than the previous or subsequent operations	(iii) Bottleneck
(B) It is used when a low volume of high variety goods are needed	(v) Job-Shop Process
(C) A special Linear Programming Problem	(i) Assignment
(D) Steep increase in the level of competition among manufacturing firms throughout the world	(ii) Globalisation
(E) Systematic Quantitative structural approach to the problem of managing a project through to successful completion	(vi) Network Analysis
(F) This must be made in writing to a central point in the organization	(iv) Maintenance Request

2018 - Dec [1] (c) State whether the following statements are 'True or False':
  (i) Short-term forecasting is useful to serve the purpose of estimating the inventory requirement.
  (ii) The life cycle of a product has many points of similarity with the human life cycle.
  (iii) The Linear Programming problem has two basic parts: the objective function and the constraint set.
  (iv) The most widely used index of productivity is to work out the output per machine-hour.
  (v) PERT is designed for repetitive projects, whereas CPM is suitable for non-repetitive projects.
  (vi) Wear and obsolescence are two main causes for replacement of machinery in every aspect of life.   **(1 × 6 = 6 marks)**

Answer:
  (i) True
  (ii) True
  (iii) True
  (iv) False
  (v) False
  (vi) True

—— Space to write important points for revision ——

2019 - June [1] (a) Choose the correct answer:
  (i) Inventory cost per product in intermittent production is
    (a) Higher
    (b) Lowest
    (c) Medium
    (d) Abnormal
  (ii) The act of assessing the future and make provisions for it is known as
    (a) Planning
    (b) Forecasting
    (c) Assessment
    (d) Scheduling

(iii) One of the important charts used in Programme control is
    (a) Material chart
    (b) Gantt chart
    (c) Route chart
    (d) Inspection chart

(iv) Cost reduction can be achieved through
    (a) Work sampling
    (b) Value analysis
    (c) Quality assurance
    (d) Supply chain management

(v) Linear Programming is a technique used for determining
    (a) Production Programme
    (b) Plant Layout
    (c) Product Mix
    (d) Manufacturing Sequence

(vi) (Total station time/cycle time × Number of work stations) × 100 is known as
    (a) Line efficiency
    (b) Line smoothness
    (c) Balance delay of line
    (d) Station efficiency

(vii) Arrangement of machines depending on sequence of operations happens in
    (a) Process Layout
    (b) Product Layout
    (c) Hybrid Layout
    (d) Group Technology Layout

(viii) Line of Best fit is another name given to
    (a) Method of Least Squares
    (b) Moving Average Method
    (c) Semi Average Method
    (d) Trend Line Method

(ix) In route sheet or operation layout, one has to show
    (a) A list of materials to be used.
    (b) A list of machine tools to be used.

(c) Every work center and the operation to be done at that work center.

(d) The cost of product.

(x) Computers are used in Production control in this area

(a) follow-up activity.

(b) to control labour.

(c) to disseminate information.

(d) Loading, Scheduling and Assignment works. **(1 × 10 = 10 marks)**

(b) Match Column A with Column B:

Column A	Column B
(A) Cost Benefit Analysis	(i) Crashing
(B) Network Analysis	(ii) Product Design
(C) Television Set	(iii) Plant Layout
(D) Use of Templates	(iv) Method Study
(E) Computer Aided Design	(v) Project Viability Checking
(F) Motion Economy	(vi) Assembly Line

(1 × 6 = 6 marks)

(c) State whether the following statements are *'True' or 'False'*:

(i) A work stoppage generally reduces the cost of production.

(ii) Depending on the need, the maintenance activity may be centralized or decentralized.

(iii) Piece wage system is a substitute for proper supervision.

(iv) Most suitable layout for continuous production is Matrix Layout.

(v) Addition of value to raw materials through application of technology is production.

(vi) Breakdown maintenance doesn't require use of standby machines.

(1 × 6 = 6 marks)

Answer:

(a) (i) (a)

(ii) (b)

(iii) (b)

(iv) (b)

(v) (c)
(vi) (a)
(vii) (b)
(viii) (a)
(ix) (c)
(x) (d)
(b) (a) (v)
(b) (i)
(c) (vi)
(d) (iii)
(e) (ii)
(f) (iv)
(c) (i) False
(ii) True
(iii) False
(iv) False
(v) True
(vi) False

—— Space to write important points for revision ——

2019 - Dec [1] (a) Choose the correct answer:
(i) Conversion of inputs into outputs is known as
(a) Application of technology
(b) Manufacturing products
(c) Product
(d) Operation management
(ii) Which of the following is NOT the Plant Layout Principle?
(a) Principle of sequence
(b) Principle of usage
(c) Principle of maximum travel
(d) Principle of minimum investment
(iii) Number of product varieties that can be manufactured in Mass production is
(a) one only.

    (b) few varieties in large volume.

    (c) two only.

    (d) large varieties in small volumes.

(iv) Scheduling shows

    (a) which resource should do which job and when.

    (b) total cost of production.

    (c) total material cost.

    (d) the flow line of materials.

(v) Which one of the following standards is associated with the "Quality Management and Quality System Elements-Guidelines"?

    (a) ISO 9001

    (b) ISO 9002

    (c) ISO 9003

    (d) ISO 9004

(vi) In a network diagram, the activity that must be completed prior to the start of an activity is called as

    (a) Successor activity

    (b) Predecessor activity

    (c) Concurrent activity

    (d) Dummy activity

(vii) Identify which one of the following is NOT the objective of the maintenance:

    (a) To keep all production facilities and allied facilities in an optimum working condition.

    (b) To ensure specified accuracy to products and time schedule of delivery to customers.

    (c) To keep the down time of the machine at the maximum.

    (d) To keep the production cycle within the stipulated range.

(viii) One of the important charts used in Programme control is

    (a) Gantt chart

    (b) Material chart

    (c) Distribution chart

    (d) Maintenance chart

(ix) The act of going round the production shop to note down the progress of work and feedback the information is known as
  (a) Dispatching
  (b) Routing
  (c) Follow up
  (d) Trip card

(x) With reference to the characteristics of a good product design, which one of the following is referred to "the case of manufacture with minimum cost"?
  (a) Reliability
  (b) Productibility
  (c) Specification
  (d) Simplification **(1×10=10 marks)**

(b) Match Column A with Column B:

Column A	Column B
(A) Use of minimal amounts of resources to produce a high volume of high quality goods with some variety	(i) KAIZEN
(B) Arranging and grouping of machines which are meant to produce goods	(ii) Network
(C) The extent to which a firm will produce goods or provide services in-house or go for outsourcing	(iii) Monte Carlo Method
(D) A given problem is solved by simulating the original data with random number generators	(iv) Lean Production
(E) The principle of continuous improvement	(v) Make or Buy Decisions
(F) A graphical representation of all the activities and events arranged in a logical and sequential order	(vi) Layout

(1× 6 = 6 marks)

(c) State whether the following statements are 'True' or 'False':

  (i) The full form of the word MRP in the term "MRP II" is Material Requirements Planning.

 (ii) Strikes and lock-out are controllable factors affecting Capacity Planning.

(iii) Queue Discipline refers to the order in which customers are processed.

 (iv) ISO Standards are reviewed every four years and revised if needed.

  (v) The CPM has the advantage of decreasing completion times by probably spending more money.

 (vi) The rotable spares are spare parts which are required regularly and in substantial number. **(1× 6 = 6 marks)**

Answer:

(a) (i) (d) Operation management

   (ii) (c) Principle of maximum travel

  (iii) (b) Few varieties in large volume.

  (iv) (a) Which resource should do which job and when.

   (v) (d) ISO 9004

  (vi) (b) Predecessor activity

 (vii) (c) To keep the down time of the machine at the maximum.

(viii) (a) Gantt chart

  (ix) (c) Follow up

   (x) (b) Productivity

(b)

Column A	Column B
(A) Use of minimal amounts of resources to produce a high volume of high quality goods with some variety	(iv) Lean Production
(B) Arranging and grouping of machines which are meant to produce goods	(vi) Layout

(C) The extent to which a firm will produce goods or provide services in-house or go for outsourcing	(v) Make or Buy Decisions
(D) A given problem is solved by simulating the original data with random number generators	(iii) Monte Carlo Method
(E) The principle of continuous improvement	(i) KAIZEN
(F) A graphical representation of all the activities and events arranged in a logical and sequential order	(ii) Network

(c) (i) False
   (ii) False
   (iii) True
   (iv) False
   (v) True
   (vi) False

—— Space to write important points for revision ——

2021 - Dec [1] The best way of improving the productivity of capital is:
(1) Purchase automatic machines
(2) Effective Labour control
(3) Productivity of capital is to be increased through effective materials management
(4) To use good financial management.
Answer:
(3) Productivity of capital is to be increased through effective materials management

—— Space to write important points for revision ——

2021 - Dec [2] Routing and Scheduling becomes relatively complicated in:
(1) Flow production
(2) Batch production
(3) Mass production
(4) Job production
Answer:
(2) Batch production
—— Space to write important points for revision ——

2021 - Dec [3] MRP stands for:
(1) Material Recording Procedure
(2) Material Requirement Planning
(3) Material Requisition Procedure,
(4) Material Reordering Planning
Answer:
(2) Material Requirement Planning
—— Space to write important points for revision ——

2021 - Dec [4] One of the important charts used in Programme control is:
(1) Material chart
(2) Route chart
(3) Gantt chart
(4) Inspection chart
Answer:
(3) Gantt chart
—— Space to write important points for revision ——

2021 - Dec [5] Number of product varieties that can be manufactured in Mass production is
(1) Few varieties in large volumes
(2) One only
(3) Large varieties in small volumes.
(4) Two only
Answer:
(1) Few varieties in large volumes

2021 - Dec [6] In Production by disintegration the material undergoes:
(1) Change in economic value only
(2) Change in physical and chemical characteristics
(3) Change in technology only
(4) None of these

Answer:
(2) Change in physical and chemical characteristics

—— Space to write important points for revision ——

2021 - Dec [7] JIT stands for:
(1) Just in time order the material
(2) Just in time purchase
(3) Just in time use of materials
(4) Just in time production

Answer:
(4) Just in time production

—— Space to write important points for revision ——

2021 - Dec [8] Production control concerned with:
(1) Good materials management
(2) Good product design.
(3) Strict control on labours
(4) Passive assessment of plant performance

Answer:
(4) Passive assessment of plant performance

—— Space to write important points for revision ——

2021 - Dec [9] The time horizon selected for forecasting depends on:
(1) Time required for production cycle.
(2) The salability of the product
(3) The selling capacity of Salesman
(4) Purpose for which forecast is made

Answer:
(4) Purpose for which forecast is made

2021 - Dec [10] The starting point of Production cycle is
(1) Market research
(2) Routing
(3) Product design
(4) Production Planning,
Answer:
(1) Market research
———— Space to write important points for revision ————————————

2021 - Dec [11] To decide work load for men and machines:
(1) Medium range forecasting is used
(2) A combination of long range and medium range forecasting is used
(3) Short term forecasting is used
(4) Long range forecasting is used
Answer:
(3) Short term forecasting is used
———— Space to write important points for revision ————————————

2021 - Dec [12] Most suitable layout for Job production is:
(1) Process layout
(2) Line layout
(3) Matrix layout
(4) Product layout
Answer:
(1) Process layout
———— Space to write important points for revision ————————————

2021 - Dec [13] In general number of product varieties that can be manufactured in Flow production is:
(1) Five only
(2) Ten to twenty varieties
(3) One only
(4) Large varieties
Answer:
(3) One only

2021 - Dec [14] Most important benefit to the consumer from efficient production system is:
(1) He can get the product on credit
(2) He can save money
(3) He will have product of his choice easily available
(4) He gets increased use value in the product.
Answer:
(4) He gets increased use value in the product.

2021 - Dec [15] For a marketing manager, the sales forecast is:
(1) To plan the sales methods.
(2) Arranging the sales men to different segments of the market
(3) Estimate of the amount of unit sales for a specified future period
(4) To distribute the goods through transport to satisfy the market demand
Answer:
(3) Estimate of the amount of unit sales for a specified future period

—— Space to write important points for revision ——

2021 - Dec [16] Production planning deals with:
(1) What should be the demand for the product in future?
(2) What production facilities are required and how these facilities should be laid out in space available?
(3) What to produce and when to produce and where to sell?
(4) What is the life of the product?
Answer:
(2) What production facilities are required and how these facilities should be laid out in space available?

2021 - Dec [17] Conversion of inputs into outputs is known as:
(1) Operations management
(2) Application of technology
(3) Product
(4) Manufacturing products
Answer:
(1) Operations management

2021 - Dec [18] The first stage in production planning is:
(1) Process Planning
(2) Layout planning
(3) Operation Planning
(4) Factory Planning
Answer:
(4) Factory Planning
—— Space to write important points for revision ——

2021 - Dec [19] For production planning:
(1) Shot term forecasting is useful
(2) Medium term forecasting is useful
(3) Forecasting is not useful
(4) Long term forecasting is useful
Answer:
(1) Shot term forecasting is useful
—— Space to write important points for revision ——

2021 - Dec [20] Scheduling deals with:
(1) Number of machine tools used to do a job
(2) Fixing up starting and finishing times of each operation in doing a job
(3) Number of jobs to be done on a machine
(4) Different materials used in the product
Answer:
(2) Fixing up starting and finishing times of each operation in doing a job
(1× 20 = 20 marks) [Sec. A - MCQ]
—— Space to write important points for revision ——

2021 - Dec [3] The systematic method of probing the future is
called…………..   **(1 mark) [Sec. B - SAQ]**
Answer:
Forecasting
—— Space to write important points for revision ——

2021 - Dec [5] The term Operations Management is more used for a system where tangible goods are produced. Is this statement correct?

(1 mark) [Sec. B - SAQ]

Answer:

No.

—— Space to write important points for revision ——

2021 - Dec [7] Is the below statement correct?

"PERT is suitable for non-repetitive projects while CPM is designed for repetitive projects". **(1 mark) [Sec. B - SAQ]**

Answer:

Yes

—— Space to write important points for revision ——

2021 - Dec [8] "Increase in production does not necessarily mean the increase in productivity". Is this statement correct?

(1 mark) [Sec. B - SAQ]

Answer:

Yes

—— Space to write important points for revision ——

2021 - Dec [13] Production Planning and Control is essentially concerned with the control of Work-in-Process. Is this correct?

(1 mark) [Sec. B - SAQ]

Answer:

Yes

—— Space to write important points for revision ——

2021 - Dec [15] Job evaluation is a systematic approach to ascertain the labour worth of a job. Is this correct? **(1 mark) [Sec. B - SAQ]**

Answer:

Yes.

—— Space to write important points for revision ——

2021 - Dec [16] The ratio of 'Down time due to total maintenance work' to the 'Downtime due to scheduled maintenance' is called Planning effectiveness, with respect to preventive maintenance. Is this correct?

(1 mark) [Sec. B - SAQ]

Answer:
No.
—— Space to write important points for revision ——————————————

2021 - Dec [18] KAIZEN is concerned with the continuous improvement. Is this statement correct? **(1 mark) [Sec. B - SAQ]**
Answer:
Yes.
—— Space to write important points for revision ——————————————

2022 - Dec [1] {C} (a) Choose the correct answer from the given alternatives (You may write only the Roman numeral and the alphabet chosen for your answer):
  (i) While referring to the customer service objective of Operations Management, primary consideration "Movement of a given, requested or acceptable specification" can be associated with which one of the following principal function?
      (a) Manufacture
      (b) Supply
      (c) Transport
      (d) Services **(1 mark)**
  (ii) Which one of the following is not the factor influencing effective capacity of a plant?
      (a) Forecasts of demand
      (b) Plant and labour efficiency
      (c) Multiple shift operation
      (d) Proper record keeping of maintenance **(1 mark)**

(iii) Which one is the objective of product design?
(a) Profit reduction in long run
(b) To increase the development time to maximum
(c) To increase the cost of the product
(d) To achieve the desired product quality **(1 mark)**

(iv) The type of production control which is typically found where a particular bottleneck machine exists in the process of manufacturing is:
(a) Block control
(b) Load control
(c) Flow control
(d) Batch control **(1 mark)**

(v) The ratio of "Value of output of goods of services" to "Capital assets employed" is:
(a) Manpower Productivity
(b) Materials Productivity
(c) Capital Productivity
(d) Energy Productivity **(1 mark)**

(vi) With reference to project planning, which one of the following signifies the "freedom for rescheduling or to start the job"?
(a) Slack
(b) Float
(c) Free Float
(d) Total Float **(1 mark)**

(vii) Which one of the following is the benefit of preventive maintenance?
(a) Increased breakdowns
(b) Increased downtime
(c) Higher large scale repairs
(d) Less standby or reserve equipment or spares required **(1 mark)**

(viii) ZAB Ltd. a large scale industry manufactures product-M of 24 units per shift of 8 hours. The standard time per unit is 15 minutes. What is the productivity of the per shift of 8 hours?

(a) 50%
(b) 60%
(c) 75%
(d) 80% **(1 mark)**

(ix) Which one of the following ISO standards concerns minimization of harmful effects to the environment caused by the operations of an organization?
(a) ISO 9001
(b) ISO 14000
(c) IS 9002
(d) ISO 9004 **(1 mark)**

(x) The type of basic process types, which is used when a very highly standardized product is desired in high volume is:
(a) Job shop
(b) Batch
(c) Project
(d) Continuous **(1 mark)**

—— Space to write important points for revision ——

2022 - Dec [1] {C} (b) Match the statement in Column I with the most appropriate statement in Column II (You may opt to write only the Roman numeral and the matched alphabet):

Column-I	Column-II
(A) OLAP	(1) Change for the better
(B) KAIZEN	(2) Value Analysis
(C) Ranking Method	(3) Analysis of Information from a data warehouse
(D) Gantt Chart	(4) Difference in time length of any path and the critical path
(E) Brainstorming	(5) Job Evaluation
(F) Path Slack	(6) Visual aid to plan and monitor individual activities

(1 × 6 = 6 marks)

2022 - Dec [1] {C} (c) State whether the following are 'True or False':

(i) Short-term planning deals with day-to-day work, scheduling and sometimes inventories problems.

(ii) The term Operations Management is more used for a system where tangible goods are produced.

(iii) Simulation is an optimizing technique.

(iv) There are essentially four standards associated with the ISO 9000 series.

(v) CPM Technique is designed for repetitive projects.

(vi) Preventive maintenance includes lubrication, cleaning, periodic overhaul etc. **(1 × 6 = 6 marks)**

Section - B

Strategic Management

8

STRATEGIC MANAGEMENT- INTRODUCTION

THIS CHAPTER INCLUDES

- Introduction to Strategy and Strategic Management
- Alignment of Strategy with Vision, Mission and Culture
- Objectives of Strategic Management
- Organisational Genomics

- Alignment with Individual Level Objective and Organisational Objective
- Balanced Score Card
- EVA – Driven Responsibility Accounting

Marks of Objective, Short Notes, Distinguish Between, Descriptive & Practical Questions

Legend

Objective ☒ Short Notes ☒ Distinguish ☒ Descriptive ☒ Practical
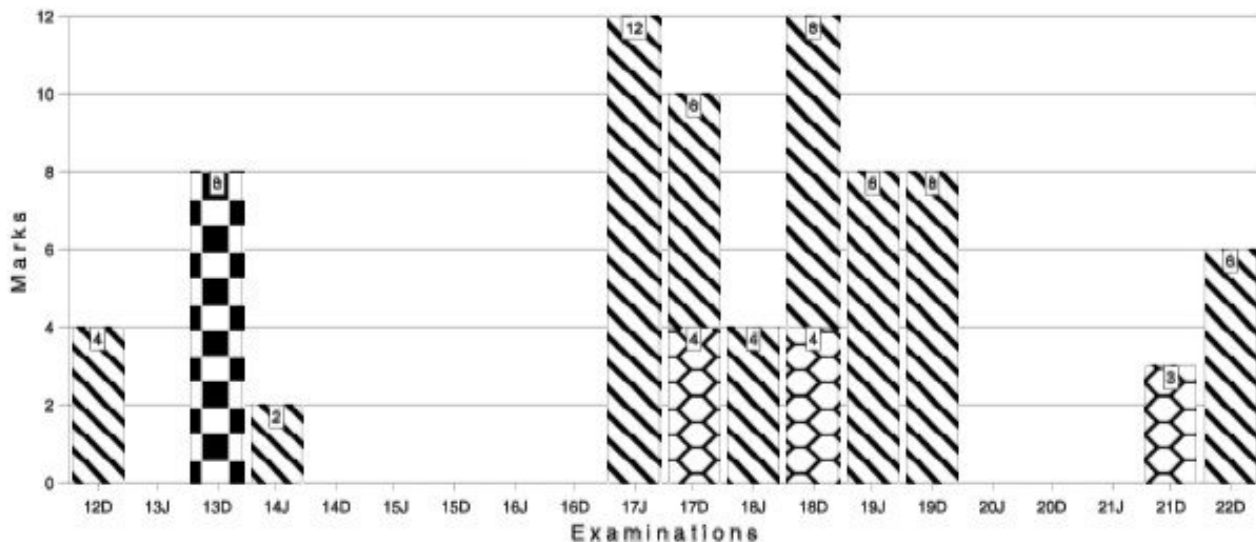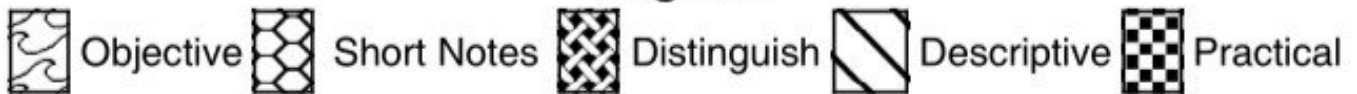
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CHAPTER AT A GLANCE

1. Strategy

Strategy is all about integrating organizational activities and utilizing and allocating the scarce resources within the organizational environment so as to meet the present objectives. While planning a strategy it is essential to consider that decisions are not taken in a vacuum and that any act taken by a firm is likely to be met by a reaction from those affected, competitors, customers, employees or suppliers.

2. Strategic Management

Strategic management is defined by William F. Glueck as "a stream of decisions and actions which leads to the development of an effective strategy or strategies to help achieve objectives."

Strategic management according to Alfred D. Chandler is "determination of the basic long-term goals and objectives of an enterprise and adoption of course of action and allocation of resources necessary to carry out these goals."

3. Advantages of Strategic Management

- Discharges board responsibility
- Forces an objective assessment
- Provides a framework for decision-making
- Supports understanding & buy-in
- Enables Measurement of Progress
- Provides an Organizational Perspective

4. Disadvantages of Strategic Management

- The Future doesn't unfold as anticipated
- It can be expensive
- Long Term Benefit vs. Immediate Results
- Impedes Flexibility

5. Importance of Strategic Management

(i) Discover organisation strengths and weaknesses
(ii) identify the available opportunities and possible threat
(iii) Discover the objectives and goals in line with organisations strengths and available opportunities
(iv) implement changes to overcome weaknesses and manage the threats
(v) Provide vision/mission or direction to future of organisations
(vi) Build a dynamic and strong organisation
(v) Help to achieve growing and stable organisation.

6. Steps of Strategic Management Process

Step 1: Identifying defining business mission, purpose and Objectives
Step 2: Environmental analysis
Step 3: Revise organisational direction
Step 4: Strategic alternatives and choice
Step 5: Strategy implementation
Step 6: Strategic evaluation and control

Vision

Vision is a statement of the future. It articulates the basic characteristic that shape organisations is headed and what it intends to be

7. Mission

The term 'mission' implies the fundamental and enduring objectives of an organisation that set it apart from other organisations of similar nature. The mission is a general enduring statement of instruction of an organisation. The corporate mission is the purpose or reason for it's existence. It refers the philosophy of business to the static decision maker to build the image of the company. The corporate mission highlights the organisation self-concept and indicates the nature of product or service to be offered or rendered for fulfillment of the requirements of the customers as also for the community and society as a whole.

8.	**Strategic Intent**
	Intent refers to intension. A company exhibits strategic intent when it relentlessly (aggressively) pursues an ambitious strategic objective and concentrates it's full resources and competitive actions on achieving that objective.
9.	**Levels in Organisation**
1.	**Corporate Level:** The corporate level of management consists of the Chief Executive officer (CEO), other senior executives, the board of directors, and corporate staff.
2.	**Business Level:** A business unit is a self-contained division (with it's own functions-for example, finance, purchasing, production, and marketing departments) that provides a product or service for a particular market.
3.	**Functional Level:** Functional-level managers are responsible for the specific business functions or operations (human resources, purchasing, product development, customer service, and so on) that constitute a company or one of it's divisions.

SHORT NOTES

2017 - Dec [9] Write short note on the following:

(d) Time Frame of Objectives   **(4 marks)**

Answer:

Time Frame of Objectives:

Objectives are timeless, enduring, and unending; goals are temporal, time-phased, and intended to be superseded by subsequent goals. Because objectives relate to' the ongoing activities of an organisation, their achievement tends to be open-ended in the sense of not being bounded by time. For example, the survival objective of a business organisation is never completely attained since failure is always a future possibility.

—— Space to write important points for revision ——

2018 - Dec [9] Write short note on the following:
(c) Stages of Strategic Management Framework **(4 marks)**
Answer:
The basic framework of strategic management involves five stages:
Stage 1: In this stage, organisation analyse about their present situation in terms of their Strengths, Weaknesses, Opportunities and Threats.
Stage 2: In this stage, organisations setup their missions, goals and objectives by analysing where they want to go in future.
Stage 3: In this stage organisation analyses various strategic alternatives to achieve their - goals and objectives. The alternatives are analysed in terms of what business portfolio/product mix to adopt, expansion, merger, acquisition and divestment options etc. are analysed to achieve the goals.
Stage 4: In this organisations select the best suitable alternatives in line with their SWOT analysis
Stage 5: This is implementation stage in which organisation implement and execute the selected alternatives to achieve their strategic goals and objectives.

—— Space to write important points for revision ——

2021 - Dec [2] Write short notes on Importance of Strategic Management.
(3 marks) [Sec. C - Six LAQ]
Answer:
Importance of Strategic Management:
  (i)   Discover organization strengths and weaknesses
  (ii) Identify the available opportunities and possible threats
  (iii) Discover the objectives and goals in line with organizations strengths and available opportunities
  (iv) Implement changes to overcome weaknesses and manage the threats.
  (v)   Provide vision/mission or direction to future of organizations
  (vi) Build a dynamic and strong organization.

—— Space to write important points for revision ——

DESCRIPTIVE QUESTIONS

2012 - Dec [2] (a) What is the value to the firm of having a specified vision and mission? **(4 marks)**

Answer:

- The firm's vision is a picture of what it wants to be and what it wants to ultimately achieve.
- The firm's mission is based on its vision.
- It specifies the businesses in which the firm intends to complete and the customer it intends to serve.
- The value of having a vision and mission is that they inform stakeholders what the firm is, what it seeks to accomplish and who it seeks to serve.
- A successful vision is inspirational.
- The mission is more concrete and guides employees' behaviour as they achieve the firm's vision.
- Research shows that an effectively formed vision and mission positively impacts firm's performance in terms of growth in sales, profits, employment and net worth.
- Developing a vision, mission, objectives and goals is the most important step of strategic management.
- Vision provides a roadmap to company's future and specify about company's intention and capabilities to adapt a new technology, while the corporate mission highlights the organizational self-concept and indicates the nature of product or service to be offered or rendered for fulfilment of requirements of the customers as also for the community and society as a whole.

—— Space to write important points for revision ——

2014 - June [4] (b) Mention the factors by which the choice of strategy is influenced. **(2 marks)**

Answer:

Choice of strategy is a decision making process of a choice from among alternative strategies. It is the process of comparing the impact of the possible strategies on the firm and it implies trade off between courses of action. These decisions involves focusing on a few alternatives, considering the selection factors, evaluating the alternatives and making the actual choice.

Choice of Strategy is Influenced by following factors:

(i)	**External constraints**	Choice of strategy is governed by the extent and degree of the firm's dependence on owners, customers, suppliers, and the government.
(ii)	**Intra-Organisational Forces**	Decisions are influenced by the power play among different interest groups and by the degree of uncertainty.
(iii)	**Values and preferences and managerial attitudes towards risk**	Evaluation of strategy is determined by personal values (truth, knowledge etc.) and attitude towards risk. Risk lover prefers high risky projects with high return. Risk a verse prefers safer options.
(iv)	**Impact of past strategy**	The choice of strategy may be influenced by the earlier strategy because it is starting point in the formulation of new strategy and decision maker is involved in past strategy.
(v)	**Time constraint**	Choice of strategy is influenced by the time dimension i.e., whether it will be short term or long term, whether it has immediate action or not.

─── Space to write important points for revision ───

2016 - June [1] {C} (a) State three operative levels of strategy in corporate management structure. How they help the management?

(8 marks) [CMAFG - III]

Answer:

The decision making hierarchy of a corporate structure firm typically comprises three operative levels of strategy as follows:

(i)	**Corporate level**	At the highest level of the decision-making hierarchy is the corporate level, composed principally of a board of directors, chief executive and the administrative personnel. They are responsible for the firm's financial performance and for the achievement of the non-financial goals, such as enhancing the firm's image and fulfilling its social responsibilities. This top level strategy is mainly concerned with defining how the business will remain sustainable in the long run. They are focused on maximizing long term profitability and creating business growth and value.
(ii)	**Business level**	In the middle of the decision-making hierarchy is the business level, composed principally of business and corporate managers. These managers must translate the statements of direction and intent generated at the corporate level into concrete objectives and strategies for individual business divisions or Strategic Business Units (SBUs). This strategy is a comprehensive for providing objectives for SBUs, allocation of resources among functional areas and coordination between them for making contribution to the achievement of the corporate level objectives.
(iii)	**Functional level**	At the bottom (i.e. operating divisions and departments) of the decision-making hierarchy is the functional level, composed principally of functional managers, such as production, marketing, personnel, finance, sales, HRM, R&D, etc. Decisions of the functional levels are often described as 'tactical decision'. The issues of functional level strategy are mainly related to business processes and the value chain. This strategy is focused on

	improving the effectiveness of a business at an operational level. This level strategy has the narrowest scope of the three strategy levels.
	A clear understanding of the three operative levels strategy in decision making hierarchy help the organization in the following ways: (i) To set-up realistic objectives, (ii) To develop plans and policies for achieving the set objectives, (iii) To ensure that the business remains sustainable and create business growth and business value in the long term. These three strategy levels are not completely independent of each other and must be developed and implemented in a co-ordinate manner.

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2016 - Dec [2] (a) State the value of a firm's vision and mission.

(8 marks) [CMA Final Gr. III]

Answer:

The firm's vision is a picture of what it wants to be and what it wants to ultimately achieve. The firm's mission is based on its vision. It specifies the business(es) in which the firm intends to compete and the customers it intends to serve. The value of having a vision and mission is that they inform the following three questions to the stakeholders:

(i) What the firm is?

(ii) What it seeks to accomplish?

(iii) Who it seeks to serve?

A successful vision is inspirational. The mission is more concrete and guides employees' behavior as they achieve the firm's vision. Research shows that an effectively formed vision and mission positively impacts firm performance in terms of growth in sales, profits, employment, net worth of the organization and the development of nation as well as welfare of the society at a large extent.

2017 - June [7] (a) Enlist the advantages of Strategic Management.

(6 marks)

Answer:

Advantages of Strategic Management:

- **Discharges Board Responsibility**

  The first reason that most organizations state for having a strategic management process is that it discharges the responsibility of the Board of Directors.

- **Forces an Objective Assessment**

  Strategic management provides a discipline that enables the board and senior management to actually take a step back from the day-to-day business to think about the future of the organization. Without this discipline, the organization can become solely consumed with working through the next issue or problem without consideration of the larger picture.

- **Provides a Framework for Decision-Making**

  Strategy provides a framework within which all staff can make day-to-day operational decisions and understand that those decisions are all moving the organization in a single direction. It is not possible (nor realistic or appropriate) for the board to know all the decisions the executive director will have to make, nor is it possible (nor realistic or practical) for the executive director to know all the decisions the staff will make. Strategy provides a vision of the future, confirms the purpose and values of an organization, sets objectives, clarifies threats and opportunities, determines methods to leverage strengths, and mitigate weaknesses (at a minimum).

- **Supports Understanding and Buy-in**

  Allowing the board and staff participation in the strategic discussion enables them to better understand the direction, why that direction was chosen and the associated benefits. For some people simply knowing is enough; for many people, to gain their full support requires them to understand.

- **Enables Measurement of Progress**
  A strategic management process forces an organization to set objectives and measures of success. The setting of measures of success requires that the organization first determine what is critical to its ongoing success and then forces the establishment of objectives and keeps these critical measures in front of the board and senior management.
- **Provides an Organizational Perspective**
  Addressing operational issues rarely looks at the whole organization and the interrelatedness of its varying components. Strategic management takes an organizational perspective and looks at all the components and the interrelationship between those components in order to develop a strategy that is optimal for the whole organization and not a single component.

—— Space to write important points for revision ——

2017 - June [8] (b) List down some guidelines for formulation of the "Mission Statement". **(6 marks)**
Answer:
Formulation of Organisational Mission:
Organisation can not declare the mission just on some great whim and fancy, it should be based on organisations' existing capabilities and achievable milestones. Here are some guidelines for formulation of "mission" statement:
- It should be based on existing business capabilities "Who we are and what we do?"
- It should follow the long term strategy principles
- Profit making should not be the only mission of organisation
- It should be logical extension of business existing capabilities
- It should clearly and precisely present the future orientation of business
- It should includes achievable missions
- It should be stated in a form that it becomes the motivating force to every member of organisation

- Mission statement once formed shall be communicated to every member of organisations
- It should include interest of customers and society.

—— Space to write important points for revision ——————

2017 - Dec [7] (a) Explain, in one or two statements, a Company mission. State any three major objectives. **(3 + 3 = 6 marks)**

Answer:

A Company Mission:

The mission is a broadly framed but enduring statement of company intent. It embodies the business philosophy of strategic decision makers; implies the image the company seeks to project; reflects the firm's self-concept; indicates the principal product or service areas and primary customer needs the company will attempt to satisfy. In short, the mission describes the product, market, and technological areas of emphasis for the business in a way that reflects the values and priorities of the strategic decision makers.

Objectives:

1. To ensure unanimity of purpose within the organisation.
2. To provide a basis for motivating the use of the organisation's resources.
3. To develop a basis, or standard, for allocating organisational resources.
4. To establish a general tone or organisational climate, for example, to suggest a businesslike operation.
5. To serve as a focal point for those who can identify with the organisation's purpose and direction, and to deter those who cannot from participating further in the organisation's activities.
6. To facilitate the translation of objectives and goals into a work structure involving the assignment of tasks to responsible elements within the organisation.
7. To specify organisational purposes and the translation of these purposes into goals in such a way that cost, time, and performance parameters can be assessed and controlled.

—— Space to write important points for revision ——————

2018 - June [7] (a) Identify basic elements of strategic vision and discuss about the important purposes served by such strategic vision.

(1½ + 2½ = 4 marks)

Answer:
Strategic Vision specifies primarily three elements:
1. Forming a mission statement that defines what business the company presently is in? And "who we are and where we are now?"
2. Using this mission statement as base to define long term path by indicating choices about "Where we are going?"
3. Finally, communicating above strategic vision in clear and committed term.

Strategic Vision has important purposes, such as:
1. Clearly provides the direction that company wants to follow.
2. Identify the need of changing from existing direction or products, if stated in vision statement.
3. Create passionate environment in the organisation to steer the company with great excitement in selected direction.
4. Create creativity in every member of company to prepare company for future.
5. Promote entrepreneurship.

—— Space to write important points for revision ——

2018 - Dec [7] Answer the question:
(a) 'There are primarily three levels of strategies in the organisation'. List the three levels. Build up one or two meaningful sentences to clarify the role of each level. **(8 marks)**

Answer:
There are primarily three levels of strategies in the organisation.
   (i)   Corporate Level
   (ii) Business Level
   (iii) Functional Level

(i) **Corporate Level:** The corporate level of management consisting of the chief executive officer (CEO), other senior executives, the board of directors, and corporate staff, empowered in decision-making within the organisation, is to oversee the development of strategies for the whole organisation. This role includes defining the mission and goals of the organisation, determining what businesses it should be in, allocating resources among the different businesses, formulating and implementing strategies that span individual businesses, and providing leadership for the organisation.

(ii) **Business Level:** A business unit is a self-contained division (with its own functions-for example, finance, purchasing, production, and marketing departments) that provides a product or service for a particular market. The strategic role of these managers is to translate the general statements of direction and intent that come from the corporate level into concrete strategies for individual businesses.

(iii) **Functional Level:** Functional-level managers are responsible for the specific business functions or operations (human resources, purchasing, product development, customer service, and so on) that constitute a company or one of its divisions. Thus, a functional manager's sphere of responsibility is generally confined to one organizational activity, whereas general managers oversee the operation of a whole company or division.

—— Space to write important points for revision ——

2019 - June [7] (a) What is a Company Mission? List the guidelines for formulation of 'mission' statement. **(8 marks)**
Answer:
The mission is a broadly framed but enduring statement of company intent. It embodies the business philosophy of strategic decision makers; implies the image the company seeks to project; reflects the firm's self-concept; indicates the principal product or service areas and primary customer needs the company will attempt to satisfy. In short, the mission describes the product, market, and technological areas of emphasis for the business. And it does so in a way that reflects the values and priorities of strategic decision makers.

Guidelines for formulation of "mission" statement:

- It should be based on existing business capabilities "Who we are and what we do".
- It should follow the long term strategy principles.
- Profit making should not be the only mission of organisation.
- It should be logical extension of business existing capabilities.
- It should clearly and precisely present the future orientation of business
- It should include achievable missions.
- It should be stated in a form that it becomes the motivating force to every member of organisation.
- Mission statement once formed shall be communicated to every member of organisations.
- It should include interest of customers and society.

——— Space to write important points for revision ———

2019 - Dec [7] (a) Define the term 'strategy' and list the characteristics of a strategic decision. **(2+6 = 8 marks)**

Answer:

Strategy can be defined as the direction and scope of an organisation over the long term, which achieves advantage for the organisation through the configuration of resources within a changing environment and to fulfill stakeholder expectations.

The definition of strategy encompasses a comprehensive master approach that states how the corporation will achieve its mission and objectives. It maximizes competitive advantage and minimizes competitive disadvantage.

The characteristics of a strategic decision/strategy are as follows:

(i) Strategy is likely to be concerned with long-term direction of an organisation.

(ii) Strategic decisions are normally about trying to achieve some advantage for the organisation over competition.

(iii) Strategy is likely to be concerned with the scope of the organisation's activities.

(iv) Strategy can be seen as matching the resources and activities to the environment in which it operates.

(v) Strategy can be seen as stretching an organisation's resources and competences to create new opportunities or to capitalise on them.

(vi) Strategies sometimes require major resource changes for an organisation.

(vii) Strategic decisions are likely to affect operational decisions.

(viii) The strategy of an organisation is affected not only by environmental factors and resource availability but also by the values and expectations of those who have power in and around the organisation.

———— Space to write important points for revision ————

2022 - Dec [7] (a) Enumerate the need for an Explicit Mission. How does a company's mission statement differ from its strategic vision?

(5 + 1 = 6 marks)

PRACTICAL QUESTIONS

2013 - Dec [1] {C} (a) Fastfix is a small company operating in a single city. Its business is repairing laptops. It has earned a good name for its fair charges and speedy delivery. For the next five years, the environment offers the following information:

Many school students are being given laptops by the school themselves and this trend is likely to continue for another five years. College students and coaching centres provide new laptops to all the students during the admission. The fees are inclusive of these costs.

Tablets are first replacing laptops in certain market segments and models are changing every six months. If there are major repairs, richer people discard the products and go in for new products or newer versions. However, there are rural markets and certain parts of urban markets which will still be interested in the low-cost repaired and re-sold products.

Considering the above case of Fastfix it will limit its operations to only one city. You are required to give:

(i) A vision statement;

(ii) A mission statement;

(iii) Does SWOT analysis exist?

(iv) Some parameters that could be used in such the above situation relating to the financial and growth perspectives in a Balance Score Card (BSC). **(2 + 2 + 2 + 2 = 8 marks)**

Answer :

(i) **Vision Statement:** Our Company intends to provide the best quality of repairs to laptops in the fastest possible time anywhere in the city with the most reasonable charges to customers.

(ii) **Mission Statement:** We deliver at customers' doorstep their fully functional laptops with minimum down times for customers while ensuring:

(a) Timely delivery as promised;

(b) Reasonable charges;

(c) Good quality of services;

(d) Replacement of parts by genuine parts based on genuine needs;

(e) Pick up of faulty laptops; and

(f) Offer stand by laptops as per customer requests.

(iii) **SWOT Analysis:**

(a) **Strengths:** Access to standard parts that normally fail in laptops, network of trained employees who have thorough job knowledge, available loyal customers, less time in delivery and perfect commitment.

(b) **Weakness:** Going beyond the scope of faults recognised by the customers, often leading to cost over runs while preventing future repairs calls.

(c) **Opportunities:** Branches may be opened in schools/colleges/big coaching centres. Business can be extended to sale of reworked computers in ready and going markets, preventing maintenance services, annual maintenance contracts, upgrades and compatibility addition with new peripherals, etc.

(d) **Threats:** Unless tablet markets also are created to, there is a threat to long term survival. Threats from one stop shops for repairing all types of mobiles/computers/laptop/tablets/iphones/smart phones, etc. Threats of obsolescence resulting in non-availability of spares.

(iv) **Balance Score Cards (BSC):**

(a) **Financial perspective:** Revenue from repairs, average job order cost, total spares purchases, delivery costs, (revenue per jobless variable cost per job) as a % of revenue per job, debtors management (target nil), etc.

(b) **Learning/innovation/growth perspectives:** Number of employees trained, number of new products repaired, number of new spares used, machinery used for cleaning/servicing, new logistics management, service call tracking, repair status on-line tracking, etc.

―――― Space to write important points for revision ――――

2015 - Dec [1] {C} Aashirvaad Ghee will make its debut in the January, 2016 as ITC plans to enter into the dairy segment. Extending the product range of its biggest non-cigarette brand, the company is looking to replicate the success it achieved in the unrecognized segment with the Aashirvaad brand. Being a household name, Aashirvaad has tremendous brand equity among households and housewives, so ITC has decided to launch ghee product under the Aashirvaad umbrella, which also provides spices and other food products. Aashirvaad is a ₹ 2,600 crore brand and controls 74% share of the country's packaged Atta market, which ITC entered in 2002, a year after getting into packaged food with ready-to-eat products. Dairy related product categories in India are in various stages of development. Now, ITC plans to extend its product portfolio to ICE-CREAM, BUTTER, CHEESE, CURD, MILK-BASED DRINKS and READY-TO-MIX items. India being the largest producer and consumer of dairy products is expected to see 15 to 16% growth with its expansion in the value added products. ITC sets to launch its first dairy product 'Aashirvaad Ghee'. ITC seeks to capitalize Aashirvaad brand name, who's spices and Atta are well known in domestic market. At the root of all, strategy lies with the ability to make good choices.
In the above perspective:

(i) What are the major subjective factors to be considered by the corporate planner to take a good strategic choice decision?

(ii) Does the entry of ITC in Indian dairy market fulfil the key attributes of its high quality strategic choice? **(10 marks) [CMAFG - III]**

Answer:

(i) The following factors mostly regulate strategic choice decisions of selective measures and directly or indirectly influence the strategic choice:

➢ Managerial perceptions of external dependence.

➢ Values, preference and managerial attitude towards risk.

➢ Managerial awareness of past strategies.

➢ Managerial power relationship and organization structure.

➢ Influence of lower-level managers.

➢ Organizational policies, culture etc.

(ii) Good choices identify and mobilize the company towards the combination of market positioning and unique activities that represent the best scenario for where to play and how to win in a chosen market. In short, a set of good choices positions a firm for competitive advantage.

A high quality strategic choice possesses following four key attributes:

It is genuine	The company must choose where to play (i.e. which customers are to be served and what needs to target) and where not to play and how to compete (i.e. How the firm will achieve advantage over competitors in chosen customer groups or segments of the market) and how not compete.
It is sound	A sound choice flows logically from the accumulated facts, data, figures and beliefs of the choice makers. Sound choices neither ignore nor rest on intuition. They are the product of good logic applied to accurate data, data which is representative and robust.
It is actionable	The choice can be easily communicated, can be broken down into series of steps to be taken immediately, and can be further broken down into long-term achievable goals and doable tasks.

It is compelling	The choice must be sufficiently compelling to generate management commitment to the choice-not just in an abstract it makes sense kind of way, but in an engaged and energetic way. **The test of a compelling choice are:** (i) Can the management team achieve sufficient commitment to make a choice to change direction? (ii) Can the team maintain sufficient enthusiasm to enable its employees to implement the choices? (iii) Can the management put the strategy into action for long enough to achieve success? In the light of the above, the ITC satisfied its four key attributes of high quality strategic choice in Indian dairy market.

——— Space to write important points for revision ———

<table>
<tr><td>**9**</td><td colspan="2">**STRATEGIC ANALYSIS AND STRATEGIC PLANNING**</td></tr>
<tr><td colspan="3" align="center">**THIS CHAPTER INCLUDES**</td></tr>
<tr>
<td colspan="2">
• Analysis of Business Environment
• PESTEL, Value Chain and Porter's 5 Framework
• SWOTC Analysis (Industry Sector and Company)
</td>
<td>
• Portfolio Analysis and BCG Matrix
• Stages in Strategic Planning
• Alternative in Strategic Planning
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Marks of Objective, Short Notes, Distinguish Between, Descriptive & Practical Questions

Legend

Objective Short Notes Distinguish Descriptive Practical

Examinations
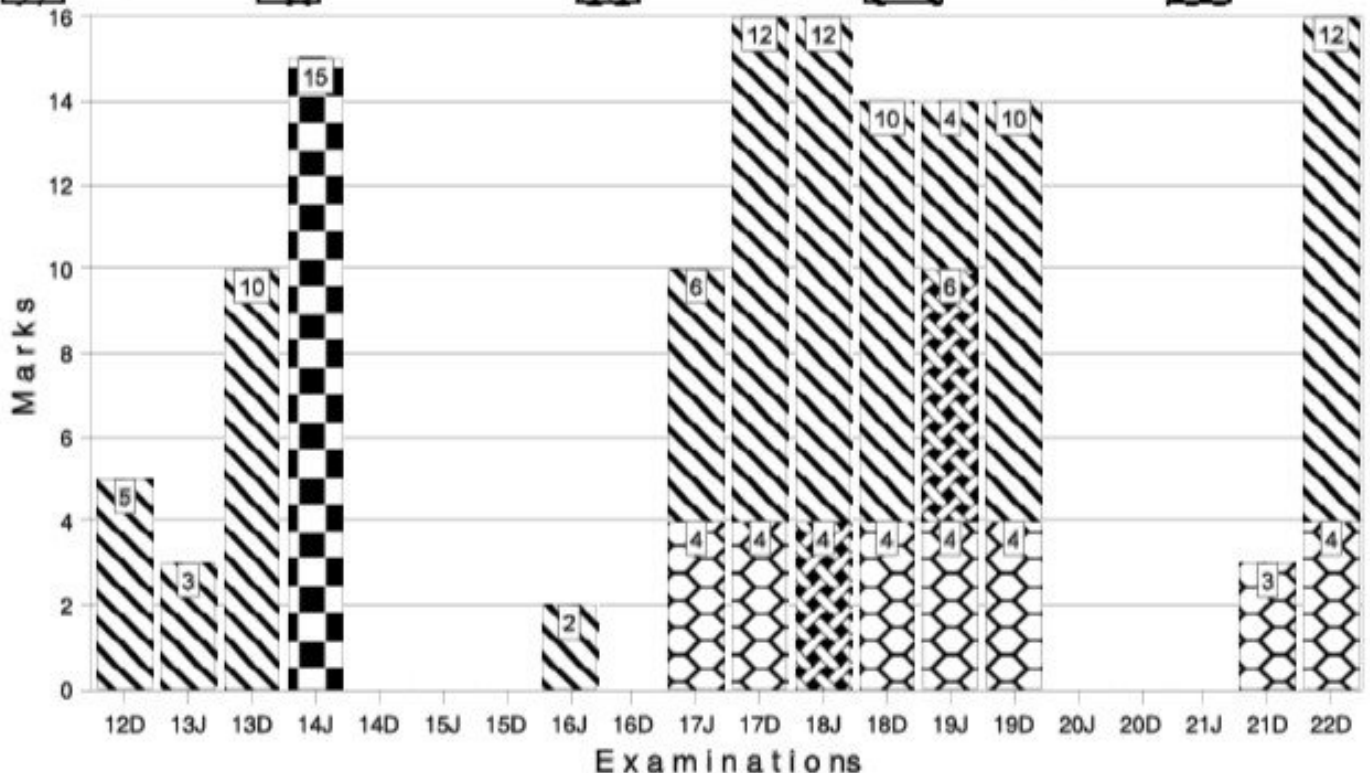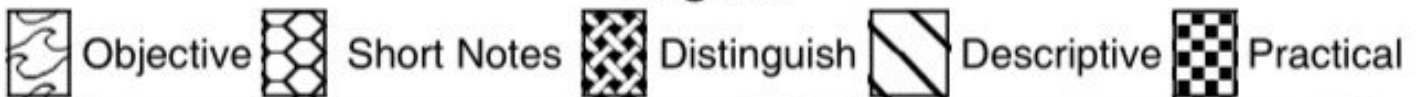
CHAPTER AT A GLANCE

1. Situational Analysis

A company's macro environment consists of all related dimensions and influences outside the company's boundaries; by relevant factors like direction, objectives, strategy, and business model. But influences coming from the outer globe of the macro environment have a small impact on a company's business situation. They only shape the limits of the company's direction and strategy. There are sufficient amount of strategically relevant trends and developments in the macro environment.

2. Swot Analysis

SWOT analysis refines this body of information by applying a general framework for understanding and managing the environment in which an organisation operates. (The acronym SWOT stands for Strengths, Weaknesses, opportunities, and Threats.) In many respects, the sophisticated analytical techniques discussed throughout the text are further refinements of basic SWOT analysis. In addition, students have repeatedly told us that SWOT is an excellent way to begin a case analysis. SWOT analysis attempts to assess the internal strengths and weaknesses of an organisation and the opportunities and threats that it's external environment presents.

3. Corporate Strengths

(i) Financially very sound
(ii) Good products and product-mix with high demand including future prospects
(iii) Full capacity utilisation, locational advantages
(iv) Good infrastructures
(v) Good industrial relations
(vi) No political interference

4. Corporate Weaknesses

(i) Under-utilisation of capacity due to economic slump
(ii) High debt burden in the capital structure
(iii) Poor product-mix
(iv) Lack of managerial strengths
(v) Industrial unrest
(vi) Technology gap
(vii) Demand gap

5. Opportunities

(i) Seasonal/climactical demand of products
(ii) Global markets for the company's products/ services (export opportunities)
(iii) Rural markets to explore and to penetrate
(iv) To explore the markets in the undeveloped/ under-developed/ developing states/places
(v) To avail of the incentives/concessions declared by central and state governments

6. Threats

(i) Globalisation
(ii) Competition
(iii) Price cutting war
(iv) Free imports
(v) Industrial unrest

7. Portfolio Analysis

Portfolio analysis is a term used in describing methods of analysing a product -market portfolio with the following aims.
(i) To identify the current strengths and weaknesses of an organisation's products in its markets, and the state of growth or decline in each of these markets.
(ii) To identify what strategy is needed to maintain a strong position or improve a weak one.

Factors influencing Portfolio Strategy
1. Mission/Vision
2. Value System
3. Future of Current Business
4. Position on the Portfolio Matrix/PIC
5. Government Policy
6. Competitive Environment
7. Company Resources
8. Supply/Demand Conditions
9. Competitive Moves
10. Portfolio Strategy of Parent
11. Business Environment

8. Boston Matrix

The Boston Consulting Group (BCG)'s matrix analyses 'products and businesses by market share and market growth.'

	High	Low
High Market growth **Low**	Star	Question mark
	Cash Cow	Dog

High ←——— Market Share ———→ Low

9. Ansoff's Model

The Ansoff Matrix: Ansoff (1965) demonstrates the choices of strategic direction open to a firm in the form of a matrix (Figure).

Figure: The Ansoff product-market scope matrix (adapted from Ansoff, 1965)

Market Penetration Strategy

	Products	
Markets	**Existing**	**New**
Existing	Market penetration	Product development
New	Market development	Diversification • Related • Unrelated

10. Stages in Strategic Planning

The stages in strategic planning are given below: **Stage I: Strategic Option Generations**

At this stage, a variety of alternatives are considered, relating to the firm's product and markets, its competitors and so forth. Examples of strategies might be:

(a) increase market share

(b) penetration into international market

(c) concentration on core competencies

(d) acquisition or expansion etc.

Stage II - Strategic Options Evaluation

Each option is then examined on its merits.

(a) does it increase existing strengths ?

(b) does it alleviate existing weaknesses ?

(c) is it suitable for the firm's existing position ?

(d) is it acceptable to stakeholders ?

Stage III - Strategic Selection

It involves choosing between the alternative strategies. This process is strongly influenced by the values of the managers in selecting the strategies

11. Alternatives in Strategic Planning

A basic premise of good strategic management is that firms plan ways to deal with unfavorable and favorable events before they occur. Too many organizations prepare contingency plans just for unfavorable events; this is a mistake, because both minimizing threats and capitalizing on opportunities can improve a firm's competitive position.

12. Steps in Contingency Planning

Robert Linnemam and Rajan Chandran have suggested that a seven step process as follows:

Step 1 - Identify the beneficial and unfavourable events that could possibly derail the strategy or strategies.

Step 2 - Specify trigger points. Calculate about when contingent events are likely to occur.

Step 3 - Assess the impact of each contingent event. Estimate the potential benefit or harm of each contingent event.

Step 4 - Develop contingency plans. Be sure that contingency plans are compatible with current strategy and are economically feasible.

Step 5 - Assess the counter impact of each contingency plan. That is, estimate how much each contingency plan will capitalize on or cancel out its associated contingent event.

13. Benefits of Contingency Planning

   (i)   It will make the future through their proactive planning and advanced preparation.

  (ii)   It will introduce original action by removing present difficulties.

 (iii)   It enables to anticipate future problems.

 (iv)   It will change the goals to suit internal and external changes.

  (v)   It experiments with creative ideas and take initiative.

 (vi)   It will attempt to shape the future and create a more desirable environment.

SHORT NOTES

2017 - June [9] Write a short note:
(c) Contingency plan. **(4 marks)**
Answer :
Contingency Plan:
A basic premise of good strategic management is that firms plan ways to deal with unfavourable and favourable events before they occur. Regardless of how carefully strategies are formulated, implemented, and evaluated, unforeseen events, such as strikes, boycotts, natural disasters, arrival of foreign competitors, and government actions, can make a strategy obsolete. To minimize the impact of potential threats, organizations should develop contingency plans as part of their strategy-evaluation process. Contingency plans can be defined as alternative plans that can be put into effect if certain key events do not occur as expected. Only high-priority areas require the insurance of contingency plans. Strategists cannot and should not try to cover all bases by planning for all possible contingencies. Contingency plans should be as simple as possible.

—— Space to write important points for revision ——

2017 - Dec [9] Write short note:
(a) Unrelated Diversification. **(4 marks)**
Answer:
(a) **Unrelated Diversification:**
Unrelated Diversification is also termed conglomerate growth because the resulting corporation is a conglomerate, i.e. a collection of businesses without any relationship to one another. The strategic justifications advanced for this strategy are to:
  • take advantage of poorly managed companies which can then be turned around and either run at a gain to the shareholders or sold-on at a profit;
  • spread the risks of the firm across a wide range of industries;

- escape a mature or declining industry by using the positive cash flows from it to develop into new and more profitable areas of business.

―― Space to write important points for revision ――

2018 - Dec [9] Write short note on the following:
(a) Corporate Planning   **(4 marks)**
Answer:
Corporate Planning is concerned with determination of objectives treating the company as a whole. It develops means to achieve the company's overall objectives. The corporate plans may relate to achieve corporate objectives for short-run and/or long-run. It is an integrated systems approach considering different functions, divisions and units of the organization. Such corporate plans are framed at the corporate level by the top management.

―― Space to write important points for revision ――

2019 - June [9] Write short note on the following:
(d) Stages involved in Strategic Planning   **(4 marks)**
Answer
Stages involved in Strategic Planning:
Stage I - Strategic Option Generations:
At this stage, a variety of alternatives are considered, relating to the firm's product and markets, its competitors and so forth. Examples of strategies might be:
  (i) increase market share
  (ii) penetration into international market
  (iii) concentration on core competencies
  (iv) acquisition or expansion etc.
Stage II - Strategic Options Evaluation:
Each option is then examined on its merits.
  (i) does it increase existing strengths?
  (ii) does it alleviate existing weaknesses?

(iii) is it suitable for the firm's existing position?

(iv) is it acceptable to stakeholders?

Stage III - Strategic Selection:

It involves choosing between the alternative strategies. This process is strongly influenced by the values of the managers in selecting the strategies.

—— Space to write important points for revision ——

2019 - Dec [9] Write short notes on following:

(d) What are the various approaches in Strategic Planning? **(4 marks)**

Answer:

There are three approaches that can be adopted in strategic planning:

(i) A top-down approach, in which managers are given targets to achieve which they pass on down the line.

(ii) A bottom-up approach, in which functional and line managers in conjunction with their staff submit plans, targets and budgets for approval by higher authority.

(iii) An iterative approach, which involves both the top-down and bottom-up setting of targets. There is a to-and-from movement between different levels until agreement is reached. However, this agreement will have to be consistent with the overall mission, objectives and priorities and will have to be made within the context of the financial resources available to the organization. The iterative approach, which involves the maximum number of people, is the one most likely to deliver worthwhile and acceptable strategic plans.

—— Space to write important points for revision ——

2021 - Dec [4] Write short notes on Stages in Strategic Planning.

(3 marks) [Sec. C - Six LAQ]

Answer:

Stages in Strategic Planning:

Stage I: Strategic Option Generations At this stage, a variety of alternatives are considered, relating to the firm"s product and markets, its competitors and so forth. Examples of strategies might be:

(a) increase market share
(b) penetration into international market
(c) concentration on core competencies
(d) Acquisition or expansion etc.

Stage II - Strategic Options Evaluation Each option is then examined on its merits.
(a) Does it increase existing strengths?
(b) Does it alleviate existing weaknesses?
(c) Is it suitable for the firm"s existing position?
(d) Is it acceptable to stakeholders?

—— Space to write important points for revision ——

2022 - Dec [9] Write short note on the following question:
(d) Enumerate the approaches that can be adopted to strategic planning.

(4 marks)

DISTINGUISH BETWEEN

2018 - June [9] Write short notes:
(d) Difference between strategic management and strategic planning

(4 marks)

Answer:

Strategic Management	Strategic Planning
1. It is focused on producing strategic results; new markets; new products; new technologies etc.	1. It is focused on making optimal strategic decisions.
2. It is management by results.	2. It is management by plans.
3. It is an organizational action process.	3. It is an analytical process.
4. It broadens focus to include psychological, sociological and political variables.	4. It is focused on business, economic and technological variables,

5. It is about choosing things to do and also about the people who will do them.	5. It is about choosing things to do.

—— Space to write important points for revision ——

2019 - June [8] (a) State the basic distinctions between Strategic Management and Strategic Planning. **(6 marks)**

Answer:

Please refer 2018 - June [9] (d) on page no. 276

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DESCRIPTIVE QUESTIONS

2012 - Dec [3] (d) "In the maturity stage of Product Life Cycle (PLC) the market becomes saturated, price competition intensifies and the rate of sales growth slows down." Suggest five strategic choices in such a stage of PLC.

(1 × 5 = 5 marks)

Answer:

In order to face the situations characterised by the maturity stage of PLC, alternative marketing and distribution strategies listed below are suggested:

  (i) Brand-stressing advertising:
      (1) More attractive design and functional packaging,
      (2) More after-sale services,
      (3) Heavier point of sale effort, and
      (4) Increase in sales promotion expenditure to hold customer loyalty.
  (ii) Trading down through:
      (1) Introduction of low price models of an established product,
      (2) Price-cutting of an entire product line and keeping prices close to private levels, and
      (3) Entering a 'fighting brand' on the market at lower price to avoid killing of an established premium brand.

(iii) Trading up (strategy opposite to item 2) through:
    (1) Improvement of quality / appearances.
    (2) Use of prestige packaging.
    (3) Price increase to cream market levels (in order to increase market penetration that earns more margins on possibly lower sales/keep greater differentiation over competitive products).
(iv) Proliferation, exclusive or radical, by
    (1) More designs,
    (2) More exclusive and innovative features,
    (3) Creating radical/distinct package designs, and
    (4) More options.
(v) Increase of product availability and point-of-sale services through more distribution outlets/dealers/services centres, etc.

—— Space to write important points for revision ——

2013 - June [2] (a) What are the factors that form the basis of analysis in each of the following models?
    (i) BCG Matrix   **(1mark)**
Answer:
(a) Factors that form the basis of analysis in the various models:
    (i) BCG Matrix analyses product and businesses by
        Market Share and Market Growth

—— Space to write important points for revision ——

2013 - June [2] (d) What is meant by 'Backward Integration'?   **(2 marks)**
Answer:
Backward integration means in-house production of critical inputs for the main business.

—— Space to write important points for revision ——

2013 - Dec [4] (a) What is 'Vertical integration'? State its pros and cons. conducted in order to ascertain the product acceptability.
                                 (1+ 4 = 5 marks)

Answer :

Vertical integration is the degree to which a firm's own production system handles the entire supply chain starting from procurement of raw materials to distribution of finished goods.

Pros of Vertical Integration:

* Lower costs due to eliminated market transaction costs
* Improved quality of supplies
* Critical resources can be acquired through VI
* Improved coordination in supply chain
* Greater market share
* Secured distribution channels
* Facilitates investment in specialized assets (site, physical-assets and human-assets)
* New competencies

Cons of Vertical Integration

* Higher costs if the company is incapable to manage new activities efficiently.
* The ownership of supply and distribution channels may lead to lower quality products and reduced efficiency because of the lack of competition.
* Increased bureaucracy and higher investments lead to reduced flexibility.
* Higher potential for legal repercussion due to size (An organization may become a monopoly).
* New competencies may clash with old ones and lead to competitive disadvantage.

—— Space to write important points for revision ——

2013 - Dec [4] (c) Write the benefits that can be derived from 'unrelated diversification'. What are the two ways that an unrelated diversification strategy can create value? **(1+2+2 = 5 marks)**

Answer :

With **unrelated diversification** few benefits are derived from horizontal relationships that is the leveraging the core competencies or the sharing of activities across business units within a corporation. Unrelated diversification can create value through two ways of financial economies (cost savings).

(i) **Unrelated diversified** firms can more efficiently allocate capital among the component businesses than can the external financial market. This is possible because the corporate level management has more complete information about the performance of the component businesses and it can also discipline under-performing management teams.

(ii) **Unrelated diversified** firms can also create value by purchasing other businesses at low prices, restructuring them and reselling them at a higher price. This practice is most successful with mature, low-technology business, rather than high technology or service businesses which are more dependent on employees who may leave.

——— Space to write important points for revision ———

2014 - Dec [2] Strategic planning is often defined as a process of proactively aligning the organization's resources with threats and opportunities caused by changes in the external environment in order to achieve prescribed goals. While it focuses on the future, it also reflects on what happened in the past.

(i) Explain the four aspects that are embedded in the definition of strategic planning.

(ii) Points out reasons why organizations may embark on the concept of strategic planning.

(iii) State some shortcomings of strategic planning.

(5 + 5 + 5 = 15 marks) [CMAFG - III]

Answer:

(i) • Strategic planning is the process of developing a direction for the future and detailing how to get there, how to reach a vision, how to solve a problem or how to implement a program or project.

• Simply put, strategic planning for an organization or community determines; where it is going, how it will get there, and when its goals are reached.

• Unlike business plans, which focus on a particular product, service or program, strategic planning focuses on the entire organization. Strategic Planning can be broken down into two components: strategy and tactics.

- Strategy determines the overall direction of a plan and establishes its principal goals or mission; tactics concern the detailed plans, choices and decisions made to reach the primary goal. In sum, strategy helps people choose and implement tactics.
- Following are the aspects that are embedded in the definition of strategic planning:

1.	**Why your business exists?**	Yes I know it's to make money. But what I'm talking about here is… what does it do for the people it serves, i.e. your clients? What is it's purpose? Answering this question (which is actually quite difficult) is the starting point for creating a clear strategic plan. Ours, for example, is "to help the owners and partners professional services firms to build better businesses".
2.	**What is your "Strategic Vision"?**	This is a simple description written in the present tense, but from 3 years in the future about exactly what your business looks like. How many clients will it serve? What about the number of professional and other staff? The level of revenue and profit? What do you want clients, suppliers, staff and commercial partners to say and feel about the business? Once you have these first 2 components nailed, it makes the decision making process around what to do (and what not to do) so much easier.
3.	**Critical Success Factors**	What core competencies have helped you to get to where you are today? What new competencies do you need to develop in order to continue to be successful? Remember, what has got you to where you are, may not get you to where you want to be. What are the 5 key things, that if you execute them really well (and

		consistently) will make your business hugely successful financially and from a customer attraction/retention perspective?
4.	**Operational Goals:**	These are simply the most important goals for your business in the next year. And to make sure that you pay attention to all aspects of your business, not just the financial results, specific objectives should be developed in the following 4 areas: (1) Financial (revenue/profit/recurring revenue) (2) Client (quality/acquisition/retention/ experience) (3) People (professional development/ performance management /recruitment/ retention /remuneration) (4) Process Improvement (efficiency/ effectiveness/consistency/automation/cost reduction): Establishing clear measures for each of these goals to help you track progress through the year, will give you a solid and effective framework for monitoring how you're doing.
5.	**Next Steps and Key Decisions**	Once your goals are set, you will need to identify your "Big Rocks"; the key actions or steps that need to be taken in order to execute the strategy effectively. Having a plan is one thing. Executing it is entirely another. Most businesses struggle to fulfil their potential, due to their lack of ability to execute effectively. Having a framework for recording and tracking these "big rocks" and ensuring that one individual is accountable for ensuring they get done is crucial. It requires discipline to set the

	time aside to do what needs to be done and regular reviews to hold everyone accountable for their part in executing the plan.

(ii) It truly requires a vision to know what you are aiming for, together with a plan of action to know what to do in order to achieve your vision. The best possibility thinking in the world will not ensure your success. It will ensure the opportunities can be in your reach if you figure out the means to capture them. Gone are the days when an organization can be a success despite itself. It takes concerted effort to establish the direction you need to go in, position it as a common focus for everyone in the organization and have a structured plan of action that everyone can execute. The risk of not having a strategic plan could be:

- not being prepared to deal with changes in the environment that the organization is confronted with
- sections or individuals in the organization following their own agendas
- incongruent communications transmitted to stakeholders
- inefficiencies and ineffectiveness throughout the operation.

You could choose to do business as usual, with the hope that the environment does not change around you. Alternatively, you can make a concerted effort to remain ahead of the curve by ensuring that the organization's position in the market place is secure and that its processes and resources are optimized and agile enough to change as the need requires.

(iii) The common shortcomings in strategic planning are as follows:

    (i) Non-availability of correct and accurate data.

    (ii) Doing strategic planning only to satisfy accreditation or regulatory requirements.

    (iii) Failing to communicate the plan to the people who execute the plan.

    (iv) Top management making intuitive decisions that conflict with formal plan.

    (v) Failing to use plans as a standard for measuring performance.

    (vi) Delegating tasks to a few persons rather than involving all managers.

(vii) Failing to involve key employees in all phases of planning.

(viii) Failing to create an environment conducive of change.

(ix) Lack of flexibility and creativity.

(x) Strategic planning usually restricted to hard business concerns, leaving without proper attention for soft issues like customer, quality, labour productivity, social concerns etc.

(xi) Strategy planning sometimes becomes a routine exercise, without having proper attention to strategic issues.

(xii) The planning process is isolated from the external groups that critically affect the company like labour unions, consumer advocates, social service organizations etc.

—— Space to write important points for revision ——

2015 - June [2] (a) (ii) It has been known for many years that the returns from diversification are often poor. Why do managers still persist with it as a strategy? **(6 marks)** *[CMAFG - III]*

Answer:

- The statement made is true. It is a fact that the returns from diversification are often poor, yet many managers seem to still persist with it. In diversification, an enterprise takes up new products or business which may be related or unrelated to its existing business.

- Diversification, in particular, involves a high degree of risk, as it amounts to manufacturing new products or entering into new markets, unfamiliar to the organization. One simple answer comes from the innate tendency of some entrepreneurs and entrepreneurial managers, to seize opportunities as they arise, in the belief that they can overcome the resulting challenges and hence firmly believe in diversifying.

- If every manager were to eschew diversification because the odds were against its succeeding, then many profitable openings would remain unexplored. Society and many companies would arguably be poorer if managers do not go in for diversification. The proper function of the manager, one might argue, is to take (properly assessed) risks rather than to avoid them.

- 'Betting the firm' on a diversification is not necessarily a sound strategy but a trial and error approach.
- This approach may have something to commend it, if the errors are affordable. One final point is that the failure rate of diversification is not infact as dreadful as a Porter made it out to be. Most major organizational initiatives carry a failure rate of around 70%. The success rate for diversification is pretty well at par.
- It is better than the success rates for new products, of which 9 out of 10 fail, according to commonly cited marketing folklore.
- It is also important to understand what it takes to manage a certain growth rate. Depending on where the existing business is in terms of the industry life cycle stage, a firm may need to get into other businesses for sustained future returns, as in case of companies in the tobacco business.
- Further, if the products are not doing too well in the traditional lines, managers should explore diversification. Diversification should also be resorted to in cases where the organization enjoy considerable resource strength and would like to expand its operation by looking at new businesses.
- To conclude, we can say that diversification is a high risk strategy. Yet we should go for it, in tune with the adage "No risk, no gain."

—— Space to write important points for revision ————————————

2015 - Dec [5] (a) Write the essential conditions in which the 'cost leadership business strategy' and 'differentiation business strategy' of Porter's Generic Business Level Strategy are used in business. **(6 marks)**

(b) Mention four possible areas where 'differentiation business strategy' is applicable. **(2 marks)**

(c) What types of risks are involved in 'focus business strategy'?

(2 marks) [CMAFG - III]

Answer:

(a) Conditions under which cost leadership business strategy is used:

   (i) The markets for the product operate in such a way that price-based competition is an important factor.

   (ii) The product is standardized and its consumption takes place in such a manner that differentiation is not required.

(iii) The bargaining power of buyer to negotiate a price reduction is high from the supplying firm.

(iv) There is lesser customer loyalty and the cost of switching from one seller to another is low.

Conditions under which differentiation business strategy is used:

(i) The firm knows who are its competitors and knows all the marketing-mix.

(ii) The market is too large and a few firms offering a standardized product.

(iii) The customers' needs and preferences are too diversified.

(iv) It is possible for the firm to charge a premium price for differentiation that is valued by the customers.

(v) The nature of the product is such that brand loyalty is possible to generate and sustain.

(b) Differentiation business strategy is possible in the following areas:

(i) Product design;

(ii) Quality of product;

(iii) Technology development;

(iv) Distribution system;

(v) Customer services etc.

(c) The risks involved in focus business strategy are as follows:

(i) Target segment may disappear for some reason.

(ii) It is difficult to identify which segments the firms should choose.

—— Space to write important points for revision ——

2015 - Dec [5] (d) "In the maturity stage of Product Life Cycle (PLC), the market becomes saturated, price competition is intensified, and the rate of sales growth slows down." Suggest strategic choices in such a stage of the PLC. **(5 marks) [CMAFG - III]**

Answer:

In order to face the situations characterized by the maturity stage of PLC (Product Life Cycle), alternative marketing and distribution strategies listed below are suggested:

(i)	Intensive promotion by means of	❖ Brand-stressing advertising, ❖ Attractive design and functional packaging, ❖ Effective after-sales services, ❖ Given importance in customer loyalty.
(ii)	Trading down through:	❖ Introduction of low-priced models of existing products or services, ❖ Price-cutting of entire product line.
(iii)	Trading up through	❖ Improvement of quality and appearances etc. ❖ Use of prestigious packages, ❖ Price increase to cream market levels.
(iv)	Proliferation, exclusive or radical by	❖ More design or varieties, ❖ More exclusive and innovative features, ❖ Creating radical and distinct package designs, ❖ More options.
(v)	Increase of product availability and point-of-sale service through	❖ More distribution outlets, ❖ More dealers, ❖ More service centers.

—— Space to write important points for revision ——

2016 - June [I] Answer the question:

(b) State the disadvantages of 'Vertical Integration'. **(2 marks)**

Answer:

Disadvantages of vertical integration are:

(i) Not attractive for low volumes.

(ii) High capital investment and operating costs.

(iii) Less ability to react more quickly to changes in customer demands, competitive actions and new techniques.

—— Space to write important points for revision ——

2016 - June [4] (a) What do you understand by 'Strategic Portfolio Analysis'? State the main objective of this analysis. **(6 marks)**

(b) What are the main contributions of General Electric (GE) and Boston Consulting Group (BCG) matrix in 'Strategic Portfolio Analysis'?

(2 marks)

(d) Write the main criticisms of BCG Matrix. **(3 marks)** *[CMAFG - III]*

Answer:

(a) Strategic Portfolio Analysis, alternatively termed business portfolio planning or portfolio strategy or policy-strategy profile or organizational portfolio plan, is a broad term and refers to a technique found in many different variations.

This analytical technique helps the management to satisfy the emerging need for centralized decisions on key strategic issues in MNCs. It provides a means of comparing numerous business activities in relation to each other, establishing priorities and deciding between winners and losers. The formulation of the organizational portfolio plan is the final phase of the strategic planning process. It assumes that most organizations, at a particular time and in reality, are a portfolio of business.

The primary/main objective of this analysis is to determine the optimal allocation of cash resource among the various business activities comprising of a diversified corporate portfolio. In addition, it can help the top management in the following respects:

  (i) What business activities the company should be in?

  (ii) How performance of the different business SBUs should be evaluated?

  (iii) Who should manage these SBUs?

(b) In the strategic portfolio analysis, General Electric (GE) and Boston Consultancy Group (BCG) matrix made pioneering contributions.

GE introduced the concept of dividing business activities into SBUs with like characteristics, related to the product life cycles.

BCG consisted of a wide variety of products in different growth rates and market shares, search for investment strategies to allocate resources among them to optimize company's long-run profits.

(d) BCG Matrix provides a framework for allocating the resources among different SBUs allows one to compare many business units at a glance. However, the approach has received some criticisms for the following reasons:

(i) The link between market share and profitability is questionable since increasing market share can be very expensive.

(ii) The approach may over emphasize high growth, since it ignores the potential of declining markets.

(iii) The model considers market growth rate to be a given. In practice the firm may be able to grow the market.

——— Space to write important points for revision ———

2016 - Dec [6] (a) (i) Define the term 'Vertical integration'. Give a suitable example with explanation.

(ii) State the drawbacks of 'vertical integration'.

(2 + 2 = 4 marks) *[CMA Final Gr. III]*

Answer:

(i) Vertical integration is the process in which several steps in the production and/or distribution of a product or services are controlled by a single company or entity, in order to increase that company's or entity's power in the market place. This integration represents an expansion or extension of the firm by integrating preceding or successive productive process.

Simply said, every single product/service that you can think of has big life cycle. While you might recognize the product/service with a brand name printed on it, many companies are involved in developing that product/service. These companies necessarily not part of the brand you see.

Example: The vertically integrated giants of computer industry, firms like IBM, Digital and Burroughs, were felled like young saplings when at the end of the 1970s Apple formed a network of independent specialists that produced machines for more efficiently than the do-it-all giants.

(ii) Vertical integration potentially has the following drawbacks:
   (a) Capacity balancing issues.
   (b) Potentially higher costs due to low efficiencies resulting from lack of supplier competition.
   (c) Decreased flexibility due to previous upstream or downstream investments.
   (d) Decreased ability to increase producer variety if significant in-house development is required.
   (e) Development new core competencies may compromise existing competencies.
   (f) Increased bureaucratic costs.

—— Space to write important points for revision ——

2016 - Dec [6] (b) State the important issues which are to be considered in making decisions associated with vertical integration.

(8 marks) [CMA Final Gr. III]

Answer:

In making decisions associated with vertical integration, the following four important issues should be considered:

(a) Is the company satisfied with the quality of the value that its present suppliers and distributors are providing? If the performance of organizations in vertical chain - both suppliers and distributors - is satisfactory, it may not, in general, be appropriate for a company to perform these activities themselves.

(b) Are their activities in the industry value chain presently being outsourced or performed independently by others that are a valuable source of future profits? Even if a firm is outsourcing value chain activities to companies that are doing credible job, it may be missing out on substantial profit opportunities.

(c) Is there a high level of stability in the demand for the organization's products? High demand or sales volatility would not be conducive to a vertical integration strategy.

(d) How high is the proportion of additional production capacity actually absorbed by existing products or by the prospects on new one and similar products? The smaller the proportion of production capacity to be absorbed by existing or future products, the lower is the potential for achieving scale economies associated with the increased capacity - either in terms of backward integration (towards the supply of raw materials) or forward integration (toward the end user). Alternatively, if there is excess capacity in the near term, the strategy of vertical integration may be viable if there is the anticipation of future expansion of products.

—— Space to write important points for revision ——

2017 - June [7] (b) State various limitations of the BCG model. **(6 marks)**
Answer:
Limitations of the BCG Model:
The BCG model analyses products in the light of two variables: The growth in the market as a whole and the growth of the product's share of the market in relation to other products. It suggests that there is a relationship between these variables and the product's propensity to generate cash or consume it. It rests on the assumption that the firm with the highest market share can be the lowest cost producer. The model suggests that cash cows should be used to fund stars. There are a number of limitations to the model (and remember that it is only a model, and any model necessarily simplifies the real world which it tries to depict).

(i) How do you define your market? Segmentation strategies can provide a niche. A niche is inevitably a low or restricted share of the market, yet it is the heart of a focus strategy. Firms can profit servicing small low-growth niches.

(ii) Market growth and market share are assumed to be reliable pointers for cash flow. This is often not true. High market share does not necessarily mean high profits, especially if a firm has high costs, or has bought market share by low pricing.

(iii) Relative market share amongst competitors is not necessarily an indication of their competitive strengths at any particular time. After all, market leaders are vulnerable.

(iv) The BCG model might become a self-fulfilling prophecy: Dogs which could be made profitable might simply be left to the rather than be resuscitated.

(v) It does not suggest any response to declining markets other than withdrawal: many firms can make money in 'sunset industries'.

(vi) It ignores the extent to which a firm which serves a number of markets can exploit production synergies.

(vii) It ignores the threat of substitute products.

—— Space to write important points for revision ——

2017 - Dec [7] (b) Define the term 'Portfolio Analysis'. List the factors influencing Portfolio Strategy. **(2 + 4 = 6 marks)**

Answer:

Portfolio analysis is a term used in describing methods of analysing a product -market portfolio with the following aims.

(i) To identify the current strengths and weaknesses of an organisation's products in its markets, and the state of growth or decline in each of these markets.

(ii) To identify what strategy is needed to maintain a strong position or improve a weak one.

Factors influencing Portfolio Strategy:

(1) Mission/Vision.
(2) Value system.
(3) Future of Current Business.
(4) Position on the Portfolio Matrix/PLC.
(5) Government Policy.
(6) Competitive Environment.
(7) Company Resources.
(8) Supply/Demand Conditions.
(9) Competitive Moves.
(10) Portfolio Strategy of Parent.
(11) Business Environment.

2017 - Dec [8] (b) What is meant by a contingency plan? List its benefits.

(2 + 4 = 6 marks)

Answer:

Contingency Plan: A basic premise of good strategic management is that firms plan ways to deal with unfavorable and favorable events before they occur. Too many organizations prepare contingency plans just for unfavorable events; this is a mistake, because both minimizing threats and capitalizing on opportunities can improve a firm's competitive position.

Regardless of how carefully strategies are formulated, implemented, and evaluated, unforeseen events, such as strikes, boycotts, natural disasters, arrival of foreign competitors, and government actions, can make a strategy obsolete. To minimize the impact of potential threats, organizations should develop contingency plans as part of their strategy-evaluation process. Contingency plans can be defined as alternative plans that can be put into effect if certain key events do not occur as expected. Only high-priority areas require the insurance of contingency plans. Strategists cannot and should not try to cover all bases by planning for all possible contingencies. But in any case, contingency plans should be as simple as possible.

Benefits of Contingency Planning:

  (i)   It will make the future through their proactive planning and advanced preparation.

  (ii)   It will introduce original action by removing present difficulties.

 (iii)   It enables to anticipate future problems.

 (iv)   It will change the goals to suit internal and external changes.

  (v)   It experiments with creative ideas and take initiative.

 (vi)   It will attempt to shape the future and create a more desirable environment.

 (vii)   It permits quick response to change,

(viii)   It prevents panic in crisis situations.

 (ix)   It makes managers more adaptable to unforeseen changes.

—— Space to write important points for revision ——

2018 - June [7] (b) Discuss in brief about the areas of attention for SWOT appraisal. State the purpose of such appraisal. **(6 +2 = 8 marks)**

Answer:

SWOT appraisal should give particular attention to the following:

(i) **A Study of past accounts and the use of ratios.** By looking at trends, or by comparing ratios (if possible) with those of other firms in a similar industry, it might be possible to identify strengths and weaknesses in major areas of the business. The assistance of a management accountant should be of great value in this work.

(ii) **Product position and Product - market mix.**

(iii) **Cash and Financial structure.** If a company intends to expand or diversify, it will need cash or sufficient financial standing in order to acquire subsidiaries by issuing shares.

(iv) **Cost Structure.** If a company operates with high fixed costs and relatively low variable costs, it might be in a relatively weak position with regard to production capacity. High volumes of production and sale might be required to break even. In contrast, a company with low fixed costs might be more flexible and adaptable so that it should be able to operate at a lower breakeven point.

(v) **Managerial Ability.** There may be a problem in attempting to assess this and objective measurements should be sought. The danger is that a poor management might overestimate their own ability and incorrectly analyse their weakness as strength.

The purpose of such appraisal is to express, qualitatively or quantitatively, which areas of the business have strengths to exploit, and which areas have weaknesses which must be improved. Although every area of the business should be investigated, only the areas of significant strength or weakness should warrant further attention.

While finalising the corporate plan together with corporate objectives, growth strategies, it would be necessary to make a review of the corporate strengths and weaknesses in connection with its mission and objectives. This is an important managerial task linked with corporate planning process.

—— Space to write important points for revision ——————

2018 - June [8] (a) State the different approaches in Strategic Planning.

(4 marks)

Answer:

Fundamentally, there are four different approaches to do formal strategic planning. The Approaches are:- 1. Top-Down Approach 2. Bottom-Up Approach 3. Mixture of the Top-Down and Bottom-Up Approaches 4. Team Approach.

1. **Top-Down Approach:**

   In a centralised company, such planning is done at the top of the corporation and the departments and outlying activities are advised straightway what to do.

   In a decentralised company, the CEO or the President may give the divisions guidelines and ask for plans. The plans after review at the head office are sent back to the divisions for modifications or with a note of acceptance.

2. **Bottom - Up Approach:**

   The Top management gives the divisions no guidelines but asks them to submit plans.

   Such Plans may contain information on:
   (i) Major opportunities and threats;
   (ii) Major objectives;
   (iii) Strategies to achieve the objectives;
   (iv) Specific data on sales/profits/market share sought;
   (v) Capital requirements, etc.

   These plans are then reviewed at top management levels and the same process, as in the top-down approach, is then followed.

3. **Mixture of the Top-Down and Bottom-Up Approaches:**

   This is practised in most large decentralised companies. In this approach, the guidelines given by the top management to the divisions are broad enough to permit the divisions a good amount of flexibility in developing their own plans. Sometimes, the top management may decide basic objectives by dialogue with divisional managers in respect of sales and return on investments especially when divisional performance is measured upon those criteria.

4. **Team Approach:**

The chief executive, in a small centralised company, often use his line managers to develop formal plans. The same approach is used even by the president of a large company. In many other companies, the president meets and interacts with his group of executives on a regular basis to deal with all the problems facing the company so that the group can develop written strategic plans.

—— Space to write important points for revision ——

2018 - Dec [7] Answer the following:

(b) What is meant by SWOT analysis? **(4 marks)**

Answer:

SWOT Analysis: Gathering data about the general, operating, and internal environments provides the raw material from which to develop a picture of the organizational environment.

SWOT Analysis: Refines this body of information by applying a general framework for understanding and managing the environment in which an organisation operates. The acronym SWOT stands for Strengths, Weaknesses, Opportunities, and Threats. In many respects, the sophisticated analytical techniques discussed throughout the text are further refinements of basic SWOT analysis. In addition, SWOT is an excellent way to begin a case analysis. SWOT analysis attempts to assess the internal strengths and weaknesses of an organisation and the opportunities and threats that its external environment presents. SWOT seeks to isolate the major issues facing an organisation through careful analysis of each of these four elements. Managers can then formulate strategies to address key issues.

The purpose of such appraisal is to express, qualitatively or quantitatively, which areas of the business have strengths to exploit, and which areas have weaknesses which must be improved. Although every area of the business should be investigated, only the areas of significant strength or weakness should warrant further attention

—— Space to write important points for revision ——

2018 - Dec [8] (a) Categories seven-steps process of Contingency Planning.
(6 marks)

Answer:
Steps in Contingency Planning
Step 1 - Identify the beneficial and unfavourable events that could possibly derail the strategy or strategies.
Step 2 - Specify trigger points. Calculate about when contingent events are likely to occur.
Step 3 - Assess the impact of each contingent event. Estimate the potential benefit or harm, of each contingent event.
Step 4 - Develop contingency plans. Be sure that contingency plans are compatible with current strategy and are economically feasible.
Step 5 - Assess the counter impact of each contingency plan. That is, estimate how much each contingency plan will capitalize on or cancel out its associated contingent event. Doing this will quantify the potential value of each contingency plan.
Step 6 - Determine early warning signals for key contingency event. Monitor the early warning signals.
Step 7 - For contingent event with reliable early warning signals, develop advance action plans to take advantage of the available lead time.
—— Space to write important points for revision ————————

2019 - June [7] (b) Briefly describe the limitations of the BCG model.
(4 marks)

Answer:
Please refer 2017 - June [7] (b) on page no. 291
—— Space to write important points for revision ————————

2019 - Dec [7] (b) What do you understand by Product Development Strategy? **(4 marks)**
Answer:
Product Development Strategy involves extending the product range available to the firm's existing markets.

These products may be obtained by:
  (i) investment in the research and development of additional products;
  (ii) acquisition of rights to produce someone else's product;
  (iii) buying-in the product and 'badging' it;
  (iv) joint development with owners of another product who need access to the firm's distribution channels or brands.

The critical factor for the success of this strategy is the profitability of the customer group for which the products are being developed. Also the firm's present competitive advantages in serving the market must confer on to the new good.

These may include:
  (i) customer information that allows accurate targeting;
  (ii) established distribution channels;
  (iii) a brand which can be credibly applied to the new product.

———— Space to write important points for revision ————

2019 - Dec [8] (a) What do you mean by Contingency Plans? Illustrate some contingency plans commonly established by firms.   **(1+5=6 marks)**
Answer:
Contingency Plans:
Contingency plans are alternative plans that can be put into effect if certain key events do not occur as expected.
Some contingency plans commonly established by firms are:
1. If a major competitor withdraws from particular markets as intelligence reports indicate, what actions should our firm take?
2. If our sales objectives are not reached, what actions should our firm take to avoid profit losses?
3. If demand for our new product exceeds plans, what actions should our firm take to meet the higher demand?
4. If certain disasters occur-such as loss of computer capabilities; a hostile takeover attempt; loss of patent protection; or destruction of manufacturing facilities because of earthquakes, tornadoes, or hurricanes - what actions should our firm take?
5. If a new technological advancement makes our new product obsolete sooner than expected, what actions should our firm take?

2022 - Dec [7] (b) State the aims of analyzing the product market portfolio. How value system influences the strategy? **(4 + 2 = 6 marks)**

2022 - Dec [8] (a) Robert Linneman and Rajan Chandran have suggested that a seven step process in contingency planning. In this context, describe in brief what are the said steps in contingency planning. **(6 marks)**

PRACTICAL QUESTIONS

2014 - June [1] {C} The Postal Department of GOI is trying to develop competitive strategies to make better profits. The Chief of the postal department presents the following facts:

(i) There are many couriers who operate in major cities and offer guaranteed delivery at very marginally higher prices than the postal department and yet manage to make a lot of profits.

(ii) Couriers offer tracking facilities on the e-computer so that a customer knows when his consignment is getting delivered or where it is located at any point of time.

(iii) Many pick up points are available for customers. Even retail customers find it convenient to book their requirements without having to travel much. For bulk booking, the couriers provided pick up facility at no further cost.

(iv) Couriers are not available in rural and sub-urban areas whereas postal network is very good in these places.

(v) Couriers in the cities operate until 7 p.m. whereas the corresponding speed posts or registered posts close at 2-30 p.m. / 4 p.m. in most areas and 6 p.m. / 8 p.m. in big Post Offices in Metro Cities/GPO respectively. There are one or at most two centres which operate speed post counters for 24 hours, but there are no 24×7 courier facilities.

(vi) Postal services for parcels are much cheaper than the courier services.

(vii) International courier charges very highly priced for documents and parcels, whereas postal charges are up to 70% cheaper, but delivery is at least 50% slower. Retail customers prefer postal services while corporate houses prefer couriers.

(viii) International courier is mainly parcel services. Documents are not prominent revenue makers due to electronic mode of communication.

(ix) Staff in courier services is more customer-friendly than the Postal Dept. staff, whereas the Postal Dept. staff are paid much more.

(x) While wondering how different the scale of profits could be between similar services, the Chief of Postal Department considers that for a Post Office to operate, in addition to document/parcel bookings, banking services like MIS/PF/Savings Account, etc. telephone bill payment services, stamp sale services and other services are being rendered, requiring the necessary hierarchy of approving authority to be present. He is considering opening of more centres exclusively for the equivalent of courier services.

Required:

(a) Identify threats to the Postal Department, GOI.

(b) What would you consider as important strengths of the Postal Department, GOI?

(c) Mention the opportunities that the Postal Department, GOI can profitably consider.

(d) Apart from (x) suggest appropriate business strategies that the Postal Department, GOI may practically apply to successfully run a long-term profitable document/parcel service on the lines of the courier service.

$$(3 + 3 + 3 + 6 = 15 \text{ marks})$$

Answer:

(a) **Threats:** Changes in the external environment also may present threats to the Postal Department. It is an unfavourable condition in the organization's environment which creates a risk or causes damage to the Postal Department, which the Postal Department is not equipped to handle.

There are different threats as given below:

- shifts in consumer tastes away from the firm's products

- emergence of substitute products
- new regulations
- increased trade barriers

(b) **Strengths:** A Postal Department's strengths are its resources and capabilities that can be used as a basis for developing a competitive advantage. It is an inherent capacity which an organization can use to gain strategic advantage. It may be the availability of a particular resource with the Postal Department or the ability of the Postal Department to leverage it to performing certain activities better than its competitors.

Important Strengths of Postal Department are given below:
- patents
- strong brand names
- good reputation among customers
- cost advantages from proprietary know-how
- exclusive access to high grade natural resources
- favorable access to distribution networks.

(c) **Opportunities:** The external environmental analysis may reveal certain new opportunities for profit and growth. It is a favourable condition in the Postal Department environment which enables it to consolidate and strengthen its position.

Opportunities of the Postal Department are given below:
- an unfulfilled customer need
- arrival of new technologies
- loosening of regulations
- removal of international trade barriers.

(d) **Business Strategies of Postal Department:**

(1) **SO Strategies**	The SO strategies try to improve the company's strengths relative to its environmental opportunities. These strategies use firm's internal strengths to take advantage of external opportunities. It is the aim of enterprises to move from other positions of the matrix to this one. When the firm faces a weakness, it strive to overcome it, making such weaknesses into

	strengths. When a major threat is faced by the firm, it will try to avoid such threat by focusing on opportunities.
(2) WO Strategies	The WO strategies will enable the Postal Department to overcome weaknesses and focus to tap its opportunities. WO strategies are evolved to improve internal weaknesses by taking advantage of external opportunities. The firm with internal weaknesses in certain areas may overcome them by developing such competencies internally or acquire from outside to take advantage of opportunities available in the external environment.
(3) ST Strategies	The ST strategies try to gear up the internal strengths to reduce the vulnerability of external environmental threats. The basic objective of these strategies is to maximize the advantage of internal strengths while minimizing the external environmental threats.
(4) WT Strategies	The WT strategies are the defensive strategies used to counter the internal weaknesses as well as external threats. In this situation retrenchment, joint ventures and liquidation strategies need to be evolved to up or out. SWOT matrix is widely used as a strategic planning tool and used to generate several strategic alternatives. The aim of a business organization is to move from one position to another desirable position in the SWOT matrix. SWOT matrix can be prepared for the whole organization or for particular strategic business unit.

—— Space to write important points for revision ——

2015 - June [1] {C} A significant example of Strategic Choices in Indian Corporate in recent times is the growth for Starbucks and the Tata group. Starbucks has opted to enter into a strategic alliance with the Tata Group, as it attempts to establish a position in the Indian market. Tata Starbucks Limited is the 50-50 joint venture between Tata Global Beverages Limited and the Starbucks Coffee Company. The Company celebrated the opening of the 50th Starbuck store in India on 8th July, 2014. The company launched its first store at Phoenix Market City, Velachery, Chennai.

The Company will continue to open more and more stores and grow thoughtfully in the market with a commitment to offer the unique starbucks experience, unrivalled service, hand-crafted beverages, extensive food offerings and with a distinct fragrance and aroma of Coffee to Coffee lovers across the country. With 50 stores now operational across 5 cities, Tata starbucks Limited continues to grow and nurture its brand in India-in line with its promise to build a strong connect with the Indian consumers.

Perhaps somewhat unusually, the stores will be co-branded as "Starbucks Coffee: A Tata Alliance." Long known as a nation of tea drinkers-despite a rich tradition of Coffee in the south-India has embraced Coffee house culture with a vengeance.

"We are going to move as fast as possible in opening as many stores as we can so long as we are successful and so long as we are embraced by the Indian consumers" said John Culver, President of Starbucks China and Asia Pacific. The need to address and respect potential cultural issues seems to have been a key factor in deciding to use the joint ventures route rather than set up a separate Starbucks subsidiary in India.

"We never considered 51%," Culver said, "When we looked at the opportunity to enter India, understanding the complexities of the market and the uniqueness that is India, we wanted to find a local business partner."

  (i)   What is Strategic Planning? State the Strategic Planning Process.
                                                    (3+5 = 8 marks)
  (ii) What approaches to Strategic Planning are advised to Tata Starbucks Limited for the Strategic Choice phases?   **(5 marks)**
  (iii) State the important key components of Strategic Planning Process for decision making in "Starbucks Coffee: A Tata Alliance."
                                                    (7 marks) [CMAFG - III]

Answer:

(i) **Strategic Planning:** Refers to the development of strategic plans that involve taking information from the environment and deciding upon an organizational mission and upon objectives, strategies and a portfolio plan. It involves establishing the overall identity of the company, deciding on the strategic alternatives the company will follow and choosing the tactics or weapons which the company will emphasize.

Simply put, Strategic Planning involves identifying the long-term objectives and determining the action plans for the company. The objectives and action plans should be established only after careful assessment and prediction of the future states of relevant environmental factors.

Strategic Planning Process: Involves the identification of alternatives, the collection of information, evaluation and selection of alternatives and finally the strategic decisions themselves. Strategic Planning Process can best be understood in terms of stages:

Stage-1: Defining the mission.

Stage-2: Assessing organizational resources

Stage-3: Evaluating environmental risks and opportunities

Stage-4: Establishing long-term objectives

Stage-5: Formulating strategy

Stage-6: Establishing annual objectives

Stage-7: Establishing operational plans

Stage-8: Implementing the plans

Stage-9: Implementing, Monitoring and Adapting.

(ii) **Approach to Strategic Planning Process for Tata Starbucks Limited.**
The following are the basic approaches to Strategic Planning process for Tata Starbucks Limited:

➢ Keep the engaging commitment.

➢ Set Long-term Strategic Objectives for improved performance of the organization,

➢ Keep on generating Strategic Options

➢ Keep evaluating and decide on strategies

➢ There is a need to track monitoring implementation of the strategies against the long-term objectives.

(iii) **Key Components of Strategic Planning Process are :**
  - √ The Strategic intent/objective to improve the long-term performance of the Starbucks Coffee: A Tata Alliance.
  - √ The Strategic issues distilled from the analysis of key factors relevant to the overall situation of the organization in its environment and
  - √ The Strategic options generated by the planning.

  The Strategic choice space is in the area of overlap among these three components. Consideration of the other overlaps between pairs of components may stimulate discussion and possible other thoughts to clarify what are the really important elements in any decision about strategy.

  Between intent and issue analysis there may be no feasible options apparent. Before giving up it may be worth looking to see if the alignment between factors raised in the analysis which seem relevant to objectives have been misread, or are alternative forms of issues already aligned in the central strategic choice space.

  Between intent and options it may be possible to identify early on that some options are just not feasible.

  There will of course be options thrown up that seem feasible, and to fit the issues raised to some extent, and yet do not align well with the objectives. They may be overly risky, or not align with the code of corporate conduct of the organization.

  However, it is only in the space created by all three component circles overlapping, that we find any logical candidate strategic choice for inclusion in the final corporate strategy.

  Honest and evidence based exploration of this space enables a reasonable and possible set of strategies to emerge as if by magic. The 'magic' is that which comes with systematic hard work, and honesty in facing up to the really big challenges or strategic elephants facing the organization, in its pursuit of longer term sustainable performance.

When managerial ego becomes involved or a deep rooted organizational culture is at play, it may be very difficult to follow the logic as presented.

It will be tempting to argue for a change in strategic intent in order to get in a favored strategic option.

A suggested but infeasible strategic choice which seems very attractive might have influential supporters, so the evidence regarding its feasibility needs to be sound and fully available to the planning team may need to be carefully argued with clear evidence in support. Choosing what not to do, is as important to agree and record as part of the planning process, as the finally agreed strategic choices.

—— Space to write important points for revision ——

2015 - Dec [3] (c) American Apparel is a fashion retailer and manufacturer that advertises itself as a vertically integrated industrial company. The brand is based in Downtown, Los Angles, where from a single building they control the dyeing, finishing, sewing, cutting, marketing and distribution of the company's product. The shoots and distributes its own advertisements, often uses its own employees as subjects. It also owns and operates each of its retail location as opposed to franchising. According to the management, the integration strategy allows the company to design, cut, distribute and sell an item globally in the span of a month.

  (i)   Which type of 'integration strategy' is being followed by the company?
  (ii) Give reasons for adopting such strategy in support of your answer.

(5 marks) [CMAFG - III]

Answer:

Since the company controls both production and distribution of its product, it is an example of a balanced vertically integrated strategy.

Vertical integration is the process in which several steps in the production and/or distribution of a product or service are controlled by a single company or entity, in order to increase that company's or entity's power in the marketplace.

Vertical integration represents an expansion or extension of the firm by integrating preceding or excessive productive processes. That is, the firm incorporates more processes toward the original source of raw materials (backward integration) or to ward the ultimate consumer (forward integration). For this reason the given case is an example of balanced vertical integration.

—— Space to write important points for revision ——

| No.	Question	Frequency
Repeatedly Asked Questions		
1	State the basic distinctions between Strategic Management and Strategic Planning. 18 - June [9] (d), 19 - June [8] (a)	2 Times

10 FORMULATION AND IMPLEMENTATION OF STRATEGY

THIS CHAPTER INCLUDES

- Strategy Formulation - Production Strategy, Supply Chain Strategy, Marketing Strategy, Human Resource Strategy
- Structuring of Organisation for Implementation of Strategy

- Strategic Business Unit
- Business Process Re-engineering
- Management Control, Operational Control and Task Control
- Goal Congruence

Marks of Objective, Short Notes, Distinguish Between, Descriptive & Practical Questions

Legend

Objective | Short Notes | Distinguish | Descriptive | Practical
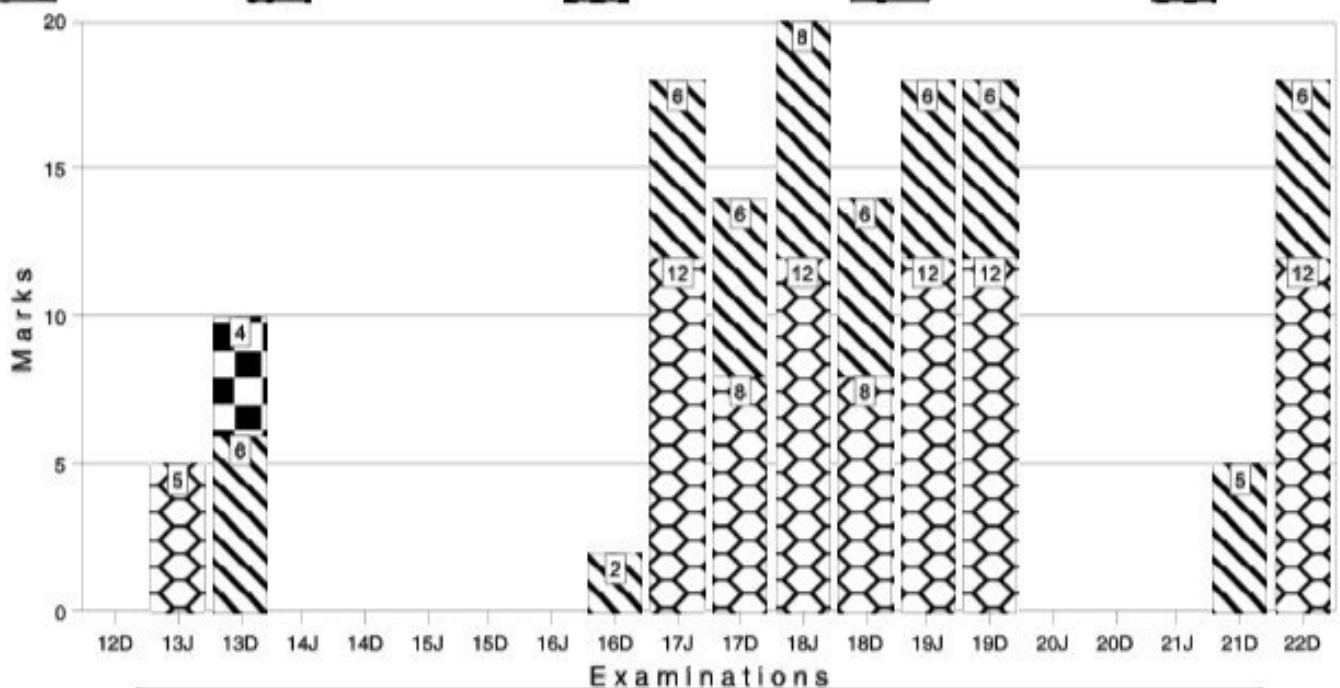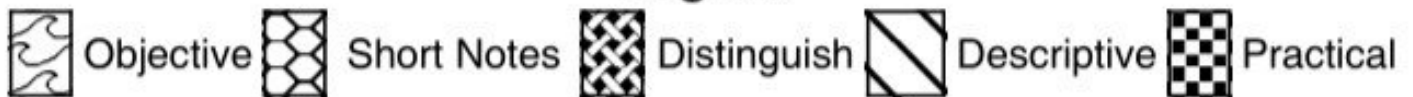
CHAPTER AT A GLANCE

1. Strategy Formulation Function-wise
Formulation of strategy (i) Develop and evaluate strategic alternatives (ii) Select appropriate strategies for all levels in the organisation that provide relative advantage over competitors (iii) Match organizational strengths to environmental opportunities (iv) Correct weaknesses and guard against threats.
2. Formulating Production Strategy
The following steps are involved in the formulation of production strategy– (i) Study the overall corporate plan and define the objectives. (ii) Analyse the present production operations and the present and future environment. (iii) Review sales- forecast and marketing. (iv) Make strategic decisions for production.
3. Plant Location
Plant location is essentially an investment decision having long-term significance and implied economic effects. A good decision plays off; a bad decision can cause grim financial difficulties. Once a plant is acquired, it is a permanent site that cannot readily be sold. The management may also contemplate relocation of the plant when business expansion and advanced technology require additional facilities to serve new market areas, to produce new products, or simply to replace the old, obsolete plants to increase the company's production capacity.
4. Plant Building
Once the company has chosen the plant site, due consideration must be given to providing physical facilities. A company requiring extensive space will always construct new buildings.

5. Plant Layout

Plant layout involves the arrangement and location of production machinery, work centres and auxiliary facilities and activities (inspection, handling of material storage and shipping) for the purpose of achieving efficiency in manufacturing products or supplying consumer services.

6. Maintenance of Equipment

Maintenance of equipment is an important facility of planning consideration. It is intimately linked with replacement policies. Every manufacturing enterprise follows some maintenance routine in order to avoid unexpected breakdowns and thus minimise costs associated with machine breakdowns such as machine down time and possible loss of potential sales, idle direct and indirect labour, delays in other processes that may depend for material supply on the machine that is down, increased scrap, customer dissatisfaction from possible delays in deliveries and the actual cost of repairing the machine.

7. Preventive Maintenance

Preventive maintenance is based on the premise that good maintenance prevents breakdowns. Preventive maintenance means preventing break downs by replacing worn-out machines or their parts before their breakdown. It anticipates likely difficulties and does the expected needed repairs at a convenient time before the repairs are actually needed. Preventive maintenance depends upon the past knowledge that certain wearing parts will need replacement after a normal interval of vise.

8. Manpower Strategy

The concept of Human Resource Development (HRD) has evolved over time with the recognition of people employed in organisations as a resource. In a comprehensive sense, HRD is defined as a process by which employees are encouraged and helped in a continuous and planned way to (a) acquire and sharpen capabilities to perform functions relating to their present or future positions, (b) develop their general abilities as individuals,

(c) identify and make use of their own inner potentials for their own and/or organisational purposes and (d) develop an organisational culture whereby superior- subordinate relations, team work and collaboration among sub-units may lead to strengthening healthy work ethos, motivation and pride of employees.

9. Strategic Implementation

- **Sreiner, Miner and Gray:** "Implementation of strategies is concerned with the design and management of systems to achieve the best integration of people, structures, processes, and resources in reaching organisational purposes.
- **Glueck:** "Strategic implementation is the assignment or reassignment of corporate and SBU leaders to match the strategy. The leaders will communicate the strategy to the employees. Implementation also involves the development of functional policies about the organisation structure and climate to support the strategy and help achieve organisational objectives.

10. Strategy Business Unit (SBU)

SBU groups similar divisions into "Strategic Business Units" and then delegate's authority and responsibility of each unit to a senior executive who is normally identified as CEO or MD of that SBU. It is an extension of divisional structure.

SBU Structure

Big organisation like Unilever, etc have many SBUs for their different categories of products like Cosmetics, Food products and Beverages, etc, and each is managed through separate unit head.

Advantages:
  (i) Promotes accountability since units' heads are responsible for individual SBU profitability
 (ii) Career development opportunities are further higher in this structure
(iii) Allow better control of categories of products manufacturing, marketing and distributions
 (iv) Helps to expand in different related and unrelated businesses

Disadvantages:
  (i) May provide inconsistent approach to tackle customers, etc, because each unit may work in it's own way to handle situations
  (ii) High cost approach.

11. Business Process Re-Engineering (BPR)

Business Process Re-engineering (BPR) is a business management strategy, originally pioneered in the early 1990s, focusing on the analysis and design of workflows and processes within an organization. BPR aimed to help organizations fundamentally rethink how they do their work in order to dramatically improve customer service, cut operational costs, and become world-class competitors. In the mid-1990s, as many as 60% of the Fortune 500 companies claimed to either have initiated re-engineering efforts, or to have plans to do so.

BPR seeks to help companies radically restructure their organizations by focusing on the ground-up design of their business processes. According to Davenport (1990) a business process is a set of logically related tasks performed to achieve a defined business outcome. Re-engineering emphasized a holistic focus on business objectives and how processes related to them, encouraging full-scale recreation of processes rather than iterative optimization of sub-processes.

SHORT NOTES

2013 - June [4] Write short note:
(c) Strategic Business Unit (SBU)   **(5 marks)**
Answer:
An SBU as defined by sharplin is any part of a business of organisation which is treated separately for strategic management purpose.

A multi-business enterprise groups related business units from the strategic planning stand point. Each such grouped business unit will have its own mission, objectives, competition and strategy and is evaluated for its profit

performance. Such a business is called a Strategic Business Unit (SBU). SBU purposes grouping. There is no need for any grouping in a single product business entity. There is no effective use.

—— Space to write important points for revision ——

2017 - June [9] Write short notes on the following:
(a) Functional organisational structure.
(b) Role of marketing.
(d) Managerial Communication. **(4 marks each)**
Answer:
(a) Organizational Structure:
The successful implementation of Strategy requires an effective organization structure. Organizational structure means the framework in which the organization defines how tasks are divided, resources are deployed and departments are co-ordinated.

There are several types of organizational structure:
(1) Functional Structure
(2) Geographic Structure
(3) Matrix Structure
(4) Hybrid Structure

Functional structure:
The functional structure is characterized by the simultaneous combination of similar activities and the separation of dissimilar activities on the basis of function. All Cost Accountants are located in the Cost Accounting Department, and the HOD of Cost Accounting is responsible for all cost related activities. The same is true in marketing, research and development, and manufacturing.

The functional organization form is one of the most common organizational structures found in firms pursuing strategy of concentration or very high relatedness. A functional structure is most appropriate when the organization is small to medium size and relatively stable.

(b) Role of Marketing:

The first and foremost role is that is stimulates potential aggregate demand and thus enlarges the size of the market. You might ask how it helps in the economic growth of a country. The answer is that through stimulation of demand people are motivated to work harder and earn additional money to buy the various ideas, goods and services being marketed. An additional advantage which accrues in the above context that it accelerates the process. (In India, it is believed that about one-fourth of GNP and more than one-third of agricultural output are still non-monetised).

Another important role which marketing plays is that it helps in the discovery of entrepreneurial talent. Peter Drucker, a celebrated writer in the field of management, makes this point very succinctly when he observes that marketing is a multiplier of managers and entrepreneurs. Still another important contribution which marketing makes is that it helps in sustaining and improving the existing levels of employment.

(d) Managerial Communication: The most important and basic strategy for a manager is simply to communicate well with the organisational people. This satisfies such basic human needs as recognition, a sense of belonging, and security. For example, such a simple action as a manager's attempting to become better acquainted with subordinates can contribute substantially to the satisfaction of each of these three needs. As another example, a message from a manager to a subordinate that praises the subordinate for a job well done can help satisfy the subordinate's recognition and security needs.

—— Space to write important points for revision ——

2017 - Dec [9] Write short note on the following:

(b) Hybrid Organization

(c) Strategy **(4 marks each)**

Answer:

(b) Hybrid Organization:

A single type of structural design is not always sufficient to meet the requirements of strategy. When this occurs, one opinion is to mix and blend the basic organizations forms, matching structure to strategy,

requirement by requirement, and unit by unit. Hybrid structure is a form of departmentalization that adopts parts of both functional and divisional structures at the same level of management. The major potential advantage of the hybrid structures is that the combination may allow the firm to gain the advantages offered by the primary structure while at least diminishing the impact of the disadvantages.

(c) Strategy:

Strategy is all about integrating organizational activities and utilizing and allocating the scarce resources within the organizational environment so as to meet the present objectives. While planning a strategy it is essential to consider that decisions are not taken in a vacuum and that any act taken by a firm is likely to be met by a reaction from those affected, competitors, customers, employees or suppliers. Strategy can also be defined as knowledge of the goals, the uncertainty of events and the need to take into consideration the likely or actual behaviour of others. Strategy is the outline of decisions in an organization that shows its objectives and goals, reduces the key policies, and plans for achieving these goals, and defines the business the company is to carry on, the type of economic and human organization it wants to be, and the contribution it plans to make to its shareholders, customers and society at large.

—— Space to write important points for revision ——

2018 - June [9] Write short notes on the following:
(a) Marketing Plan and Strategy.
(b) Geographic and Matrix structure for implementation of organisational strategy.
(c) Types of firms/organisations for which BPR can be applied.

(4 × 3 =12 marks)

Answer:
(a) Marketing Plan and Strategy: Marketing Plan is a written document that specifies in detail the firms marketing objectives and how marketing management will use the controllable marketing tools such as product design, channels, promotion and pricing to achieve these objectives.

Marketing Strategy means finding attractive opportunities and developing profitable ways to capture the market. A marketing strategy specifies a target market and a related marketing mix. It is a big picture of what a firm will do in some market. The job of planning strategies to guide a whole company is called strategic planning. It is the managerial process of developing and maintaining a match between an organisation's resources and its market opportunities.

(b) **The Geographic Structure:** is one of several organizational designs. This particular structure brings workers together in geographical divisions. Other divisional structures group according to product, service or customer. Each division operates as if it is a company in itself, complete with the personnel to carry out various business functions such as finance, marketing and production. The divisions establish themselves in the geographical area they serve, creating regional, national or international operations.

The Matrix Organization: structure is a combination of two or more types of organizational structures, such as the projectised organization structure and the functional organization structure. These two types of organizational structures represent the two extreme points of a string, while the matrix organization structure is a balance of these two. This combination may help organizations achieve higher efficiency, readiness, and quick market adaptation. Moreover, they often can respond faster to market or customer demand while decreasing the lead time to produce a new product. This type of structure is most suitable for organizations operating in a dynamic environment. However, if any organization is working in a stagnant environment, producing standard products with customers rarely changing requirements, the matrix structure is not well suited for them. They should adopt the functional organization structure instead.

(c) Types of Firms / Organisations for which BPR can be applied. BPR could be implemented to all firms (manufacturing firms, retailers, services, etc.) and public organizations that satisfy the following criteria:

- • **Minimum Number of Employees:** 20 (at least 4 in management positions).
- • **Strong Management** commitment to new ways of working and innovation.
- • **Well formed IT** infrastructure.

Business Process Re-engineering could be applied to companies that confront problems such as the following:

- • High operational costs
- • Low quality offered to customers
- • High level of "bottleneck" processes at pick seasons
- • Poor performance of middle level managers
- • Inappropriate distribution of resources and jobs in order to achieve maximum performance, etc.

—— Space to write important points for revision ——

2018 - Dec [9] Write short notes on the following:
(b) Definition of the terms 'Re-engineering' and 'Process' in Business Process Re-engineering
(d) Steps involved in the formulation of production strategy

(4 marks each)

Answer:

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

Process: is a structured, measured set of activities designed to produce a specified output for a particular customer or market. It implies a strong emphasis on how work is done within an organization. Each process is composed of related steps or activities that use people, information, and other resources to create value for customers.

(d) **The following steps are involved in the formulation of production strategy:**
   (i) Study the overall corporate plan and define the objectives.

(ii) Analyse the present production operations and the present and future environment.

(iii) Review sales- forecast and marketing.

(iv) Make strategic decisions for production.

——— Space to write important points for revision ———

2019 - June [9] Write short notes on the following:

(a) Features of Human Resources Strategy

(b) McKinsey's 7-S Framework

(c) Principle of BPR   **(4 marks each)**

Answer:

(a) Features of Human Resources Strategy:

The more important features which human resource strategy may bring to bear on the organisation are as follows:

(i) **Orientation of the members:** HRM strategy has to ensure that individuals employed in the organisation have necessary orientation so that the mission and objectives of the organisation are internalised by the members and they have a sense of identification with the values and culture of the organisation.

(ii) **Facilitation of organisational changes as and when called for:** The practices and procedures are required to be in conformity with the changing internal and external conditions. This is a vital role of HR strategy management.

(iii) **Coping with diversity of workforce:** Modem organisations with highly complex nature of jobs and processes generally have a highly diversified workforce differentiated in terms of age, sex, religion, professional and technical skills and educational background. To maintain a balanced workforce with harmonious relations and providing equitable incentives and rewards are aspects of HRM functions which can sustain an effective workforce. This is a responsibility of HR strategy managers.

(iv) **Maintaining competent and committed workforce in a competitive environment:** The intensity of market competition for enterprises has been growing fast with globalisation and liberalisation of economic policies. There are competitive strategies of low cost production and differentiation of products which may enable companies to secure a competitive edge. HRM has the responsibility of managing workforce so as to make it competent in ability as well as committed to organisational success.

(v) **Development of core competency:** An enterprise succeeds in achieving its strategic objectives mainly on the basis of capabilities in the technical, marketing or human skills in areas of crucial importance. These are known as core competencies of the organisation which are unique internal strengths not possessed by competitors. HRM is required to undertake building up of core competency by the organisation as to secure dynamic leadership in the product market.

(vi) **Empowered workforce as an active resource:** HR strategy is best managed when the members of an organisation are individually in control of their work and are able to realise their potentials with empowerment to take relevant decisions on their own. This is likely to secure enduring performance based achievements.

(vii) **Appropriate work culture and ethical norms:** No organisation can get the best contribution from its members unless individuals develop a liking for challenging jobs and follow the ethical norms of the organisation functionally. This may require redesigning of jobs and work processes as well as developing trust and confidence among individuals and work groups, as also emphasizing intrinsic motivation for improving performance. HRM encompasses creation of an appropriate work culture on the above lines.

(b) Mc Kinsey's 7 - S Framework
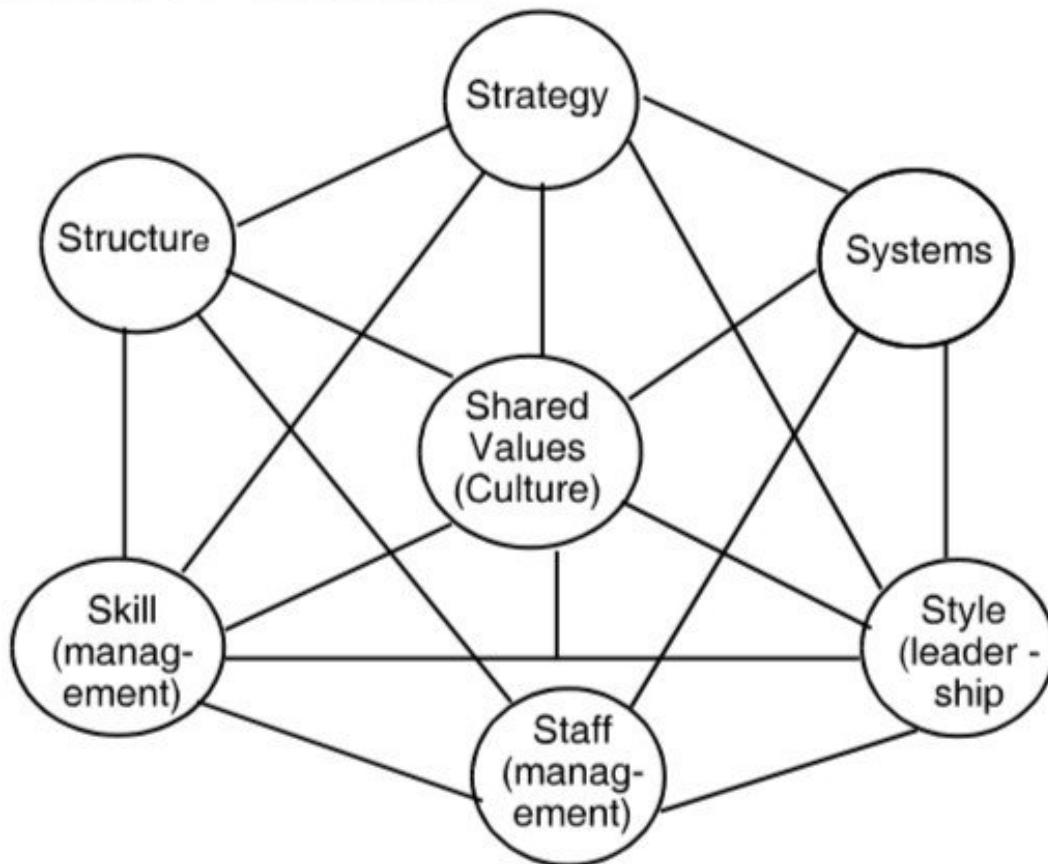
Strategy is dependent on many variables - Internal as well as external. All factors are interrelated.

- **Strategy :** A set of decisions and actions aimed at gaining a sustainable competitive advantage.
- **Structure:** The organisation chart and associated information that shows who reports to whom and how tasks are both divided and integrated.
- **Systems:** The flow of activities involved in the daily operation of a business, including its core processes and its support systems.
- **Style:** How managers collectively spend their time and attention and how they use symbolic behaviour. How management acts is more important than what management says.

- **Staff:** How companies develop employees and shape basic values.
- **Shared Values:** Commonly held beliefs, mind sets and assumptions that shape how an organisation behaves— its corporate culture.
- **Skills:** An organisation's dominant capabilities and competencies.

(c) **Principle of BPR:** BPR is achieving dramatic performance improvements through radical change in organizational processes, re-architecting) of business and management processes. It involves the redrawing of organizational boundaries, the reconsideration of jobs, tasks, and skills. This occurs with the creation and the use of models. Whether those be physical models, mathematical, computer or structural models, engineers build and analyze models to predict the performance of designs or to understand the behavior of devices. More specifically, BPR is defined as the use of scientific methods, models and tools to bring about the radical restructuring of an enterprise that result in significant improvements in performance.

Re-design, re-tooling and re-orchestrating form the key components of BPR that are essential for an organization to focus on the outcome that it needs to achieve. The outcome pursued should be an ambitious outcome (as for instance, are a 24 hour delivery to any customer anywhere in the world, approval of mortgage loans within 60 minutes of application, or ability to have on-line access to a patient's medical records no matter where they are in any major city in the world). These types of visionary goals require rethinking the way most organizations do business, careful redesign. They will additionally need very sophisticated supporting information systems and a transformation from a traditional organizational structure to a network type organization.

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2019 - Dec [9] Write short notes on of the following:

(a) Name the steps involved in the formulation of production strategy.
(b) Write a brief note on 'Behaviour Control' aspect of Strategic Control System.
(c) What are the various types of firms/organizations where BPR can be applied? **(4×3=12 marks)**

Answer:

(a) Steps involved in the formulation of production strategy are:

   (i)   Study the overall corporate plan and define the objectives.

   (ii) Analyse the present production operations and the present and future environment.

   (iii) Review sales - forecast and marketing.

   (iv) Make strategic decisions for production.

(b) 'Behaviour Control' aspect of Strategic Control System:

The establishment of a comprehensive system of rules and procedures to direct the actions or behaviour of divisions, functions and individuals is called behaviour control. The main purpose of having behaviour control is not to specify goals but to standardise the way of reaching them. It is felt that if rules are standardised then outcomes are predictable. It is of utmost importance that the management reviews behaviour controls over time. The rules that have been established tend to increase over time leading to inflexibility to react to the changing environment thereby adversely affecting the organisation's competitive advantage.

(c) Types of firms/organizations where BPR can be applied:

BPR could be implemented to all firms (manufacturing firms, retailers, services, etc.) and public organizations that satisfy the following criteria:

   - Minimum Number of employees: 20 (at least 4 in management positions).
   - Strong management commitment to new ways of working and innovation.
   - Well formed IT infrastructure.

Business Process Reengineering could be applied to companies that confront problems such as:

   - High operational costs
   - Low quality offered to customers
   - High level of "bottleneck" processes at pick seasons
   - Poor performance of middle level managers
   - Inappropriate distribution of resources and jobs in order to achieve performance, etc.

2022 - Dec [9] Write short notes on the following questions:
(a) Enumerate what are the characteristics of Core Competence.
(b) State what are the steps involved in formulation of production strategy.
(c) The **3-Rs** of **Re-Engineering** **(4 marks each)**

DESCRIPTIVE QUESTIONS

2013 - Dec [5] (a) Define 'Core Competency'. What tests are to be applied to identify core competence? Why core competencies are relevant?
(1+3+2 = 6 marks)

Answer :
Core competency is a unique skill of technology that creates distinct customer value. It not only integrates the technology but it also organises workforce and delivery of value.

Some of the ways in which a firm can effectively employ its various 'distinctive' or 'core competencies' are as follows:

To identify a core competence, Prahlad and Hamel prescribe three tests:
  (i) it should be able to provide potential access to a wide variety of market;
  (ii) it should make a significant contribution to the perceived customers of the end product; and
  (iii) it should be difficult for the competitors to imitate.

Relevance of the Core Competencies: Core competencies are bundles of skills and competencies that are built over a very long period of time. Their main strength lies in the fact that such competencies are very much unique to the particular organisation and to the particular industry, in which the organisation operates. However, since the competencies are always skill-based, it is not possible for any competitor to copy the same. This gives the organisation an unbeatable competitive advantage.

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2016 - Dec [1] (j) List basic characteristics of Business Process Re-engineering. **(2 marks) [Sec. A]**

Answer:

The important characteristics of BPR are given below:

- View business as a set of customer (both internal and external) oriented processes rather than a set of departmental functions.
- Processes must have clear cut ownership.
- Non value adding activities within a process should be eliminated.
- Gather information only once at the point of origin.

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2017 - June [8] (a) Briefly discuss important features which Human Resource Strategy may bring to bear on the organization. **(6 marks)**

Answer :

The more important features which human resource strategy may bring to bear on the organisation are as follows:

(i) **Orientation of the members:** HRM strategy has to ensure that individuals employed in the organisation have necessary orientation so that the mission and objectives of the organisation are internalised by the members and they have a sense of identification with the values and culture of the organisation.

(ii) **Facilitation of organisational changes as and when called for:** The practices and procedures are required to be in conformity with the changing internal and external conditions. This is a vital role of HR strategy management.

(iii) **Coping with diversity of workforce:** Modern organisations with highly complex nature of jobs and processes generally have a highly diversified workforce differentiated in terms of age, sex, religion, professional and technical skills and educational background. To maintain a balanced workforce with harmonious relations and providing equitable incentives and rewards are aspects of HRM functions which can sustain an effective workforce. This is a responsibility of HR strategy managers.

(iv) **Maintaining competent and committed workforce in a competitive environment:** The intensity of market competition for enterprises has been growing fast with globalisation and liberaliation of economic policies. There are competitive strategies of low cost production and differentiation of products which may enable companies to secure a competitive edge. HRM has the responsibility of managing workforce so as to make it competent in ability as well as committed to organisational success.

(v) **Development of core competency:** An enterprise succeeds in achieving its strategic objectives mainly on the basis of capabilities in the technical, marketing or human skills in areas of crucial importance. These are known as core competencies of the organisation which are unique internal strengths not possessed by competitors. HRM is required to undertake building up of core competency by the organisation as to secure dynamic leadership in the product market.

(vi) **Empowered workforce as an active resource:** HR strategy is best managed when the members of an organisation are individually in control of their work and are able to realise their potentials with empowerment to take relevant decisions on their own. This is likely to secure enduring performance based achievements.

(vii) **Appropriate work culture and ethical norms:** No organisation can get the best contribution from its members unless individuals develop a liking for challenging jobs and follow the ethical norms of the organisation functionally. This may require redesigning of jobs and work processes as well as developing trust and confidence among individuals and work groups, as also emphasizing intrinsic motivation for improving performance. HRM encompasses creation of an appropriate work culture on the above lines.

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2017 - Dec [8] (a) Explain the terms:
   (i) Marketing Plan and
   (ii) Social Marketing. **(3 + 3 = 6 marks)**

Answer:

(i) **Marketing Plan:** Marketing plan is a written document that specifies in detail the firms marketing objectives and how marketing management will use the controllable marketing tools such as product design, channels, promotion and pricing to achieve these objectives. Marketing strategy means finding attractive opportunities and developing profitable ways to capture the market.

A marketing strategy specifies a target market and a related marketing mix. It is a big picture of what a firm will do in some market. The job of planning strategies to guide a whole company is called strategic planning. It is the managerial process of developing and maintaining a match between an organisation's resources and its market opportunities.

(ii) **Social Marketing:** Societal marketing concept calls for a customer orientation backed by integrated marketing aimed at generating customer satisfaction and long-run consumer welfare as the key to attaining long-run profitable volume.

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2018 - June [8] (b) Categorise major reasons of SBU approach.

(8 marks)

Answer:

Some of major reasons of using SBU approach are as follow:

- A scientific method of grouping the businesses of a multi-business corporation which helps the firm in strategic planning.
- An improvement over the geographical grouping of businesses and strategic planning based on locational units.
- An SBU is a grouping of related businesses that can be taken up for strategic planning distinct from the rest of the businesses.
- Grouping the businesses on SBU lines helps the firm in strategic planning by removing the ambiguity and confusion generally seen in grouping businesses.

- Each SBU is a separate business from the strategic planning standpoint. In the basic factors, viz., mission, objectives, competition and strategy-one SBU will be distinct from another.
- Each SBU will have its own distinct set of competitors and its own distinct strategy.
- Each SBU will have a CEO. He will be responsible for strategic planning for the SBU.

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2018 - Dec [8] (b) How does Matrix Organisation Structure differ from SBU Structure? Analyse related advantages and disadvantages of Matrix Organisation Structure. **(6 marks)**

Answer:

SBU Organisation Structure consist of flow of authority from top to bottom i.e. vertical flow whereas Matrix Organisation Structure contains both vertical and horizontal flow of communications or authority. This type of structure is frequently used in IT organization for managing different projects. Each individual project is managed by a project manager and projects manager will have his team arranged under him.

Advantages:
  (i) Useful for some specific industries like Information Technology, Healthcare etc.
  (ii) Employee can see visible results of their efforts
  (iii) Remove barrier to communications
  (iv) Managing projects are easy
  (v) Effective structures when environment is very dynamic

Disadvantages:
  (i) Complex structure as this contains both vertical and horizontal flow of information
  (ii) High cost approach due to more management positions
  (iii) Dual lines of authority
  (iv) Conflicts arises in the allocation of resources

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2019 - June [8] (b) State the various advantages and disadvantages of SBU structure. **(6 marks)**

Answer:

Various advantages and disadvantages of SBU structure:

Advantages:
  (i)   Promotes accountability since units' heads are responsible for individual SBU profitability
  (ii) Career development opportunities are further higher in this structure
  (iii) Allow better control of categories of products manufacturing, marketing and distributions
  (iv) Helps to expand in different related and unrelated businesses.

Disadvantages:
  (i)   May provide inconsistent approach to tackle customers, etc., because each unit may work in it's own way to handle situations
  (ii) High cost approach.

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2019 - Dec [8] (b) What are the three most important characteristics of SBU? List down major reasons of using SBU approach. **(3+3=6 marks)**

Answer:

Three most important characteristics of SBU are as follows:
• It is a single business or a collection of related businesses which offer scope for independent planning and which might feasibly stand-alone from the rest of the organisation.
• Has its own set of competitors.
• Has a manager who has responsibility for strategic planning and profit performance, and who has control of profit-influencing factors.

Major reasons of using SBU approach are:
• A scientific method of grouping the businesses of a multi-business corporation which helps the firm in strategic planning.
• An improvement over the geographical grouping of businesses and strategic planning based on locational units.
• An SBU is a grouping of related businesses that can be taken up for strategic planning distinct from the rest of the businesses.

- Grouping the businesses on SBU lines helps the firm in strategic planning by removing the ambiguity and confusion generally seen in grouping businesses,
- Each SBU is a separate business from the strategic planning standpoint. In the basic factors, viz., mission, objectives, competition and strategy-one SBU will be distinct from another.
- Each SBU shall have its own distinct set of competitors and its own distinct strategy.
- Each SBU shall have a CEO. He will be responsible for strategic planning for the SBU and its profit performance; he will also have control over most of the factors affecting the profit of the SBU.

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2021 - Dec [11] What do you mean by Marketing Strategy?

(1 mark) [Sec. B - SAQ]

Answer:
It is finding out attractive opportunities and developing profitable ways to capture the market.

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2021 - Dec [2] What are the disadvantages of Matrix Organization Structure?

(4 marks) [Sec. C - Four LAQ]

Answer:
Disadvantages of Matrix Organization Structure:
  (i)   Complex structure as this contains both vertical and horizontal flow of information
 (ii)   High-cost approach due to more management positions
(iii)   Dual lines of authority
 (iv)   Conflicts arises in the allocation of resources

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2022 - Dec [8] (b) Explain with examples, why do we need the Strategic Business Unit.

(6 marks)

PRACTICAL QUESTIONS

2013 - Dec [2] {C} (b) In a small town called Vellore in South Indian State of Tamilnadu, there is now one famous deemed university called the Vellore Institute of Technology (VIT). Its founder, Mr. Viswanathan, has adopted a unique model of building formidable Core Competencies. He has made huge investments in creating world-class infrastructure, which has attracted the best minds as students not only from various parts of India, but also from other countries of the world, including developed countries like Canada and several African nations. What has really mattered is that the quality of teaching has improved, as VIT has been able to attract high calibre teachers from all over the country. The National and International seminars that it has been able to conduct, very regularly, has opened up many vistas of knowledge, and opened up many doors, in the international arena, through very innovative tie-ups with foreign universities. In fact, VIT is just one example of a deemed university that has made India proud. Since, it supplies high quality information technology professionals to all IT companies world-wide, VIT has already made a name for itself, among such companies. The campus recruitments are one hundred percent. This has made it a very formidable learning centre in India.

There are few tests useful for identifying a core competence. Does it fit to VIT?   **(1 × 4 = 4 marks)**

Answer :

There are few tests useful for identifying a core competence. A core competence should:

   (i)   Provide access to a wide variety of markets.
   (ii) Contribute significantly to the end-product benefits.
   (iii) Be difficult for competitors to imitate; and
   (iv) It should be valuable.

Yes, It fits for VIT.

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2014 - Dec [4] From peak sales of over 27,000 units in the January-March 2012 quarter to under 4,000 in the three months to December 2013, Tata Motors' Nano hasn't quite lived up to the hype and expectations built up since its launch in mid-2009. To combat with the situation now it launched Nano Twist, a 'smart city car' costing just under ₹ 2.36 lakhs.

Answer the following questions:

(a) What is strategic decision? What are its characteristics?

(b) Strategic decisions are complex in nature-explain.

(c) Explain how this strategic decision will help Tata Motors to repositioning themselves in the market. **(1 + 7 + 5 + 2 = 15 marks) [CMAFG - III]**

Answer:

(a) Strategic decisions are the decisions that are concerned with whole environment in which the firm operates the entire resources and the people who form the company and the interface between the two.

The characteristics of strategic decision are as follows:

(i) Strategic decisions are likely to affect the long-term direction of an organisation.

(ii) Strategic decisions are normally about trying to achieve some advantage for the organisation.

(iii) Strategic decisions are likely to be concerned with the scope of an organization's activities: Does (and should) the organisation concentrates on one area of activity or does it have many? The issue of scope of activity is fundamental to strategic decisions because it concerns the way in which those responsible for managing the organisation conceive its boundaries. It is to do with what they want the organisation to be like and to be about.

(iv) Strategy is to do with the matching of the activities of an organisation to the environment in which it operates.

(v) Strategy can also be seen as 'stretching' an organization's resources and competencies to create opportunities or capitalize on them. It is not just about countering environmental threats and taking advantage of environmental opportunities; it is also about matching organizational resources to these threats and opportunities. There would be little point in trying to take advantage of some new

opportunity if the resources needed were not available or could not be made available or if the strategy was rooted in an inadequate resource-base.

(vi) Strategic decisions therefore often have major resource implications for an organisation. In the 1980s a number of UK retail firms had attempted to develop overseas with little success and one of the major reasons was that they had underestimated the extent to which their resource commitments would rise and how the need to control them would take on quite different proportions. Strategies, then, need to be considered not only in terms of the extent to which the existing resource-base of the organisation is suited to the environmental opportunities but also in terms of the extent to which resources can be obtained and controlled to develop a strategy for the future.

(vii) Strategic decisions are therefore likely to affect operational decisions.

(viii) The strategy of an organisation will be affected not only by environmental forces and resource availability, but also by the values and expectations of those who have power in and around the organisation. In some respects, strategy can be thought of as a reflection of the attitudes and beliefs of those who have the most influence on the organisation. Whether a company is expansionist or more concerned with consolidation, and where the boundaries are drawn for a company's activities, may say much about the values and attitudes of those who influence strategy -- the stakeholders of the organisation. The beliefs and values of these stakeholders will have a more or less direct influence on the organisation.

(b) Strategy is the direction and scope of an organisation over the long term, which achieves advantage for the organisation through its configuration of resources within a changing environment, to meet the needs of markets and fulfill stakeholder expectations.

Strategic decisions are, then, often complex in nature: it can be argued that what distinguishes strategic management from other aspects of management in an organisation is just this complexity.

The complexity arises for atleast three reasons.

1. Strategic decisions usually involve a high degree of uncertainty: they may involve taking decisions on the basis of views about the future which is impossible for managers to be sure about.
2. Strategic decisions are likely to demand an integrated approach to managing the organisation. Unlike functional problems, there is no one area of expertise or one perspective that can define or resolve the problems.

   Managers, therefore, have to cross functional and operational boundaries to deal with strategic problems and come to agreements with other managers who, inevitably, have different interests and perhaps different priorities. This problem of integration exists in all management tasks but is particularly problematic for strategic decisions.
3. As has been noted above, strategic decisions are likely to involve major change in organizations. Not only is it problematic to decide upon and plan those changes, it is even more problematic actually to implement them. Strategic management is therefore distinguished by a higher order of complexity than operational tasks.

(c) Tata developed the Nano car world's cheapest car. Tata want to provides car to all common man but unfortunately that didn't go down with buyers too well. From the start, Tata Nano car faced trouble in factory establishment and many other issues. But now Tata comes out stronger on other side and ready to offer Nano automatic transmission. With the new Nano Twist and the Nano-Max a few months back, Nano portfolio stands true to its brand essence: of a youthful, exciting car offering great value but, at the same time, builds in a different set of features to suit differing customer needs.

Focus on youth: The attempt over the past years has been to attract youngsters. To build a youthful and aspirational value around the brand, Tata Motors through its 'awesomeness' branding and marketing campaign launched Nano Twist. The make over campaign is an attempt to get youngsters to look at the Nano as a fashion accessory. The company promises more on-ground activities and showcases at colleges to woo the youth.

Fresh positioning: From a people's car and the world's cheapest, the Nano is now positioned as the smart city car for young achievers. While the perception of a cheap car has still not gone away, the profile of the consumer has tremendously improved - along with the features in the car. Based on market research, Tata Motors has segmented potential customers into first-time buyers, those looking for a replacement or an additional car and others who want more features and performance. Near-term plans include a variant with automated transmission to strengthen the smart city car positioning. With all the significant product changes, it is a really easy-to drive car, great to maneuver, with a distinct individuality and color and offering what no car can in this price range - a great style, entertainment and music, industry-leading power steering and more. The repositioning will make the product cater to a larger number of customer segments.

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11 DIGITAL STRATEGY

THIS CHAPTER INCLUDES

- Introduction
- Digital Transformation for Competitive Advantages

- Innovations and Disruptive Business Models
- Emerging Trends in Digital and Social Marketing Strategies

CHAPTER AT A GLANCE

Digital technologies include electronic tools, systems, devices and resources that generate store or process data. In scientific terms, digital technology is a technology in which information is represented in digital form, i.e., as 0s and 1s. Some of the example of digital technologies or online games, multimedia, social media and mobile phones.

Common elements of Digital Strategy

Choose a Leader -This is arguably the most important part of creating a digital strategy, but choosing the right person will depend on company culture, structure and priorities.

Attack vs. Defend- McKinsey & Company emphasizes that companies would do well to categorize their potential threats and opportunities in digital business, then compare these against their own purpose. This clarifies whether a proactive or defensive stance needs to guide new initiatives.

Take a Measured Approach - Digital strategy often incorporates a process for assessing whether new technology will really complement or grow the current business.

Future Proof - The goal of digital transformation is to create an appropriate foundation for digital business.

This means creating an organization that can continue to reinvent itself as necessary to keep up with changes in technology and customer expectations.

Layers of Digital Transformation

- The following seven layers simplify the task of DT
- Data aggregation - Aggregation of business relevant data from reliable sources, including conversion of analogue data to digital form and store for easy retrieval.
- Data management - Categorising and organising the digitised data and making it ready for application of further processes.
- Workflow automation - Application of algorithms and utilising the data for the business process to be envisioned.
- Process component - Application of algorithms and start utilising the data for the business process.
- Platform interface integration - Integrating the digital system with the core systems for smoother operations.
- End to end processing - Conducting end to end processing and ensure error free transformation.
- Front end software - Integrating with the front end of stakeholders' devices so that she/he can get seamless services in a technologically collaborated mode.

Big Data

- Big data is a collection of data that is huge in volume and is growing exponentially with time.
- It is a data with so large size and complexity that none of traditional data management tools can store it or process it efficiently.
- Big data is also a data but with huge size. Examples of Big Data include stock exchange, social networking site, jet engine, etc.
- There are three types of Big Data namely, structured, unstructured and semi-structured.
- A 'structured data' is any data that can be stored, accessed and processed in the form of fixed format.
- An unstructured data is one with unknown form or structure. In addition to the size being huge, un-structured data poses multiple challenges in terms of its processing for deriving value out of it.
- A semi-structured data can contain both the forms of data. Example of semi-structured data is a data represented in an XML file.

Cloud Computing

- Cloud computing is a general term for anything that involves delivering hosted services over the internet.
- These services are divided into three main categories or types of cloud computing: infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS).
- IaaS providers, such as Amazon Web Services (AWS), supply a virtual server instance and storage, as well as application programming interfaces (APIs) that let users migrate workloads to a virtual machine (VM).
- In the PaaS model, cloud providers host development tools on their infrastructures. Users access these tools over the internet using APIs, web portals or gateway software.
- SaaS is a distribution model that delivers software applications over the internet; these applications are often called web services. Users can access SaaS applications and services from any location using a computer or mobile device that has internet access.

A cloud can be private or public.

- A public cloud sells services to anyone on the internet.
- A private cloud is a proprietary network or a data center that supplies hosted services to a limited number of people, with certain access and permissions settings.

Artificial Intelligence

- Artificial intelligence (AI) is intelligence exhibited by machines and systems, with machines imitating functions which are mostly related with human cognition.
- There are three levels of AI namely; Narrow AI, General AI/human-level and Super AI.
- Narrow AI refers to the current state-of-the-art with existing software that automates a traditionally human activity and often outperforms humans in efficiency and endurance in one specialized area, e.g., forecasting the weather, autonomous driving, etc.

- General AI/human-level AI describes the capacity of machines to understand their environment and reason and act accordingly, just as a human would in all activities across all dimensions, including scientific creativity, general knowledge, and social skills.
- Super AI, the highest level of AI, is reached when AI becomes much smarter than the best human brains in practically every field.
- Super AI systems can make deductions about unknown environments.

Blockchain

Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network. An asset can be tangible (house, car, cash, land, etc.) or intangible (intellectual property, patents, copyrights, branding). Virtually anything of value can be tracked and traded on a blockchain network, reducing risk and cutting costs for all involved.

Internet of Things: The internet of things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. A thing in the internet of things can be anything from a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an Internet Protocol (IP) address and is able to transfer data over a network.

Social Media Marketing Platforms

Todays' consumers are highly reliant on social media platforms such as Instagram, Facebook, LinkedIn, and Snapchat. This is why it is essential that brands are active across accounts. Social media platforms allow marketers to reach their prospects in a myriad of ways.

Influencer Marketing

Another effective way to harness digital channels to reach target audiences is with influencer marketing. Brands can partner with celebrities, sites, or

others that are considered experts in their field, that share similar values. Brands can then reach these influencers' followers with branded content and offers.

Email Marketing

Email marketing campaigns allow organizations to stay connected with prospects and customers, sending them customized newsletters or offers based on past shopping history or brand engagements.

Content Marketing

Content marketing allows marketing teams to be proactive in answering their users' questions. Marketing teams create content, videos, and other assets to answer questions or provide context to consumers throughout the three stages of the buyer's journey:

(i) **The awareness stage:** Buyer realizes they have a need

(ii) **The consideration stage:** Buyer determines a course of action to meet this need

(iii) **The decision stage:** Buyer decides on a product / service to purchase to meet the need

Search Engine Optimization (SEO) Marketing

Search engine optimization often goes hand in hand with content marketing. When the customer from the above example is conducting research for which gym shoes to buy, they will probably click on one of the first three results that appear on Google. With this in mind, the athletic shoes' marketing team wants to ensure their article appears in those top results. This is done by optimizing content for user experience and ensuring the technical elements are in place to enable search engine crawlers to easily find and index this content.

Pay-per-click (PPC)

Pay-per-click is a form of paid advertising that allows marketing teams to essentially purchase traffic to their website. Marketers place ads on websites or search engines such as Google and Microsoft Bing, and pay a fee each time the ad is clicked on.

Affiliate Marketing
Affiliate marketing is similar to referral programs; it involves working with outside individuals or companies under the agreement that they promote your product in exchange for a commission from each sale that can be attributed to their efforts.
Mobile Marketing
Mobile marketing initiatives can include many of the digital marketing strategies mentioned above, and typically will leverage a combination of text messages, social media, email, push notifications, and mobile applications.

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TOPIC NOT YET ASKED BUT EQUALLY IMPORTANT FOR EXAMINATION

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DESCRIPTIVE QUESTIONS

Q1. List down the steps that an organisation should take for digital transformation.

Answer:

One of the most critical tasks for saving the entity from drowning is implementation of digital transformation (DT) befitting the emerging way of living and operating in the new world order. This is a journey and not a destination to be reached just for once. Any organisation can lay the foundation of digital transformation on 4Ds, viz., Discover, Design, Deliver and De-risk as suggested by McKinsey; 2 Ps, i.e., People and Process and 1 T, i.e., Tools. Basu (2020)

The following measures can be listed for orchestrated planning and execution across hierarchical levels, length and breadth of the organisation:

- Integration of digital technologies with functional areas that will bring metamorphosis in the process of conducting business operations with the ultimate objective of improving stakeholders' relationship and experience management.
- Challenging the status quo of policies and standard operating practices for driving towards the inevitable metamorphosis.

- Training of existing human capital with different capabilities and redeployment for dealing with digital tools consciously being mindful of the requirement of cultural change and removing fear of unknown to embrace the new.
- Conducting experiments with digital technologies to assess suitability vis-à-vis the specificities of the needs of business and its stakeholders with the ultimate objective of incremental contributions for profit and profitability.
- Approaching the long-drawn task with a mindset of creative destruction of long-standing business policies and processes in favour of relatively new digitally driven practices that are still being defined, adopted, and stabilised.
- Providing the DT team, a free environment with committed assistance for innovative applications of various digital tools, if not 'innoventing' new tools, and establishing collaboration with man and digitally operated machines, which are artificially intelligent.
- Ensuring data privacy, cyber security, and information safety as an integral part of the entity's policy and processes for risk-enabled performance management.
- Permitting implementation team to make mistakes and not penalising them for the same. Instead incentivise every attempt irrespective of success or failure so that the environment is congenial for innovating and delivering the best.
- Unwavering commitment of funds and other resources, as well as extending help and support to the dedicated DT team by every single functional area of the organisation

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Q2. Explain the merits and demerits of Cloud Computing.
Answer:
Cloud computing benefits to modern businesses including the following:

- **Cost management:** Cloud infrastructure can reduce capital costs, as organisations don't have to spend massive amounts of money buying and maintaining equipment. Moreover, companies don't need large IT teams to handle cloud data center operations because they can rely on the expertise of their cloud providers' teams. Cloud computing also cuts costs related to downtime

- **Data and workload mobility:** Cloud computing allows users to access data from anywhere with any device with just an internet connection. That means users don't have to carry around USB drives, an external hard drive or multiple CDs to access their data. Users can access corporate data through smart phones and other mobile devices, enabling remote employees to stay up to date with co-workers and customers. End users can easily process, store, retrieve and recover resources in the cloud. In addition, cloud vendors provide all the upgrades and updates automatically, saving time and effort.

- **Business continuity and disaster recovery (BCDR):** The biggest worry for organisations in the present digital landscape is data loss. Storing data in the cloud guarantees that users can always access their data even if their devices, e.g., laptops or smart phones, are inoperable. With cloud-based services, organisations can quickly recover their data in the event of emergencies, such as natural disasters or power outages. This benefits BCDR and helps ensure that workloads and data are available even if the business suffers damage or disruption.

The demerits of cloud computing

In spite of the fact that cloud computing has huge benefits yet, it has its own causes of concern as follows:

- **Cloud security:** There is a clear lack of transparency regarding how and where sensitive information entrusted to the cloud provider is handled. When relying on the cloud, organisations risk data breaches, hacking of APIs and interfaces, compromised credentials and authentication issues.

- **Cost unpredictability:** The concept Pay-as-you-go subscription plans for cloud use, along with scaling resources to accommodate fluctuating workload demands, can make it tough to define and predict final costs.

- **Lack of capability and expertise:** With cloud-supporting technologies rapidly advancing, organisations are struggling to keep up with the growing demand for tools and employees with the proper skill sets and knowledge needed to architect, deploy, and manage workloads and data in a cloud.
- **IT governance:** The emphasis on do-it-yourself capability in cloud computing can make IT governance difficult, as there is no control over provisioning, de provisioning and management of infrastructure operations.
- **Compliance with industry laws:** When transferring data from on-premises local storage into cloud storage, it can be difcult to manage compliance with industry regulations through a third party.
- **Management of multiple clouds:** Every cloud is different, so multi-cloud deployments can disjoint efforts to address more general cloud computing challenges.
- **Cloud performance:** Network and provider outages can interfere with productivity and disrupt business processes if organisations are not prepared with contingency plans.
- **Building a private cloud:** Architecting, building and managing private clouds whether for its own purpose or for a hybrid cloud goal can be a daunting task for IT departments and staff.
- **Cloud migration:** The process of moving applications and other data to a cloud infrastructure often causes complications. Migration projects frequently take longer than anticipated and go over budget.

—— Space to write important points for revision ————————————

Q3. What are the important components of Block Chain?
Answer:
The important components of a block chain includes
Distributed ledger technology
All network participants have access to the distributed ledger and its immutable record of transactions. With this shared ledger, transactions are recorded only once, eliminating the duplication of effort that's typical of traditional business networks.

Immutable records

No participant can change or tamper with a transaction after it's been recorded to the shared ledger. If a transaction record includes an error, a new transaction must be added to reverse the error, and both transactions are then visible.

Smart contracts

A smart contract is stored on the blockchain and executed automatically. A smart contract can define conditions for corporate bond transfers; include terms for travel insurance to be paid and much more. A smart contract acts a set of rules and allows fastest transactions.

—— Space to write important points for revision ——

Q4. What are the benefits of blockchain network?

Answer:

The benefits of blockchain network

Increased trust

As block chain is used by only the members who are within a defined network. This assures the members that the data being received by them is accurate and timely data. Moreover, the confidential blockchain records will be shared only with network members to whom one has specifically granted access.

Greater security

The increase security in blockchain network arises from the fact that consensus on data accuracy is required from all network members, and all validated transactions are immutable because they are recorded permanently. No one, not even a system administrator, can delete a transaction.

Increased efficiencies

With a distributed ledger that is shared among members of a network, time-wasting record reconciliations are eliminated. The smart contract enables automated transactions thereby saving on time.

—— Space to write important points for revision ——

Q5. Explain Robotic Process Automation and list the benefits of RPA.
Answer:
Robotic Process Automation: Robotic Process Automation (RPA) is a form of business process automation that allows anyone to define a set of instructions for a robot or 'bot' to perform. RPA boats are capable of mimicking most human-computer interactions to carry out a ton of error-free tasks, at high volume and speed.

Robotic process automation is not a physical or mechanical robot. RPA is the process by which a software bot uses a combination of automation, computer vision, and machine learning to automate repetitive, high-volume tasks that are rule-based and trigger-driven. Robotic process automation tools are best suited for processes with repeatable, predictable interactions with IT applications.

The benefits of RPA solutions not only reduce cost but also include:
- Decreased cycle times
- Flexibility and scalability
- Improved accuracy
- Improved employee morale
- Detailed data capture

—— Space to write important points for revision ——

2012 - Dec [1] {C} (a) In each of the cases/statements given below, one of four alternatives is correct. Indicate the correct answer:

(I) Most Indian companies did not have a mission statements till recently because
   (A) It was not a statutory requirement
   (B) Companies were not professionally managed
   (C) Growth options were controlled by the Government
   (D) All of the above

(iii) Outsourcing is the
   (A) Spinning of a value-creating activity to create a new firm
   (B) Selling of a value-creating activity to other firms
   (C) Purchases of a value-creating activity from external supplier
   (D) Use of competitors to obtain value-creating data from the internet

(v) For Cash Cow BCG Matrix analysis following is correct
   (A) High market growth and high market share
   (B) Low market growth and high market share
   (C) High market growth and low market share
   (D) Low market growth and low market share

(viii) In the following is not a limitation of environmental analysis
   (A) It is not a sufficient guarantee of organisational effectiveness
   (B) It does not keep the firm static
   (C) It does not foretell the future, nor does it eliminate uncertainty for any organisation
   (D) Managers place uncritical faith in the data without thinking of its verifiability or accuracy   **(1 mark each)**

(b) State whether the following statements, based on the quoted terms, are 'TRUE' or 'FALSE' with justifications for your answer. If any statement is false, you are required to give the correct terms, duly quoted. No credit will be given for any answer without justification:

9.346

(iii) 'Concentric Diversification' consists of making entirely new products for new classes of customers.

(v) 'Glaxo India' is an example of a company whose portfolio strategy is influenced by the 'portfolio strategy of the parent'.

(1 mark each)

(c) Define/meaning the following terms (in not more than two sentences):

(v) Strategic intent **(1 mark)**

Answer:

(a) (i) (C) Growth options were controlled by the government

(iii) (C) Purchase of a value creating activity from external supplier

(v) (B) Low market growth and high market share

(viii) (B) It does not keep the firm static

Answer:

(b) III. False. 'Concentric Diversification' occurs when a firm adds related products or markets for achieving strategic fit.

V. **True.** The portfolio strategy of subsidiaries may be influenced by the portfolio strategy of the parent'.

Answer:

(c) V. Strategic intent is demonstrated when a company relentlessly or aggressively pursues an ambitious strategic objective and concentrates its full resources and competitive actions on achieving that objectives

—— Space to write important points for revision ——

2013 - June [1] {C} (a) In each of the cases/statements given below, one out of four alternatives is correct. Indicate the correct answer:

(i) The role of leadership can be best evaluated by looking at

(a) Vision

(b) Strategy

(c) Succession Planning

(d) All of the above

(ii) Successful differentiation strategy allows the company to

(a) Gain buyer loyalty to its brand

(b) Charge to high a price premium

(c) Depend only on intrinsic product attributes

(d) Segment a market into distinct group of buyers

(vii) 'Swift Desire' model of Maruti Ltd. provides interesting example to fit in the BCG matrix as

(a) Star

(b) Question Mark

(c) Cash Cow

(d) Dog **(1 mark each)**

(b) State whether the following statements, based on the quoted terms, are 'TRUE' or 'FALSE', justifying your answer. If any statement is false, you are required to give the correct terms. No credit will be given for any answer without justification:

(i) 'Maturity' stage of PLC is characterized by decreasing rate of increase is sales volume.

(v) 'Goals' are stated in broad, general terms, timeless and deal with matters of image, style and self-perception. **(1 mark each)**

(c) Define the following terms (in not more than two sentences) :

(i) Grand Strategy **(1 mark)**

Answer:

(a) (i) D – All of the above

(ii) A – Gain buyer loyalty to its brand

(vii) A – Star

Answer:

(b) (i) True

(v) **False:** "Objectives"

—— Space to write important points for revision ——

2013 - June [5] {C} (a) In each of the cases/statements given below, one out of four alternatives is correct. Indicate the correct answer:

(i) Portfolio Management reduces

(a) Systematic risk

(b) Unsystematic risk

(c) Inflation risk

(d) Interest rate risk **(1 mark)**

Answer:

(a) (i) A – Systematic risk

——— Space to write important points for revision ———

2016 - Dec [1] (a) State whether the following statements are **True** or **False**. Give reasoning for your answers. No credit will be given for answers without reasoning. If the statement is False, give the correct statement:

  (i)   The "Vision" statement of a company answers the question "What it stands for" i.e., what broad products or services it intends to offer to its customers.

  (v) In BCG Matrix, products with low market share but high growth potential are referred to as "Dogs". **(1 mark each)** *[CMA Final Gr. III]*

Answer:

(a) (i) **False.** The correct statement is: The **"Mission"** statement of a company answers the question "what it stands for" i.e., what broad products or services it intends to offer to its customers.

  (v) **False.** The correct statement is: In BCG Matrix, products with low market share but **limited growth potential** are referred to as "Dogs".

——— Space to write important points for revision ———

2016 - Dec [1] (c) Define the following terms in just one or two sentence(s):

  (ii) Business Process Re-engineering (BPR)

                                        (1 mark) *[CMA Final Gr. III]*

Answer:

(c) (ii) **BPR** means aims to help organizations fundamentally to re-think as how they should do their work in order to dramatically improve customer services, cut operational costs and become world-class competitors.

——— Space to write important points for revision ———

2016 - Dec [1] {C} (d) In each of the case/statement given below, one of four alternatives is correct. Indicate the correct answer:

  (i) Addition of "Broad Band" to the existing "Telephone Services" facility by BSNL an example of

    (A) Concentratic diversification
    (B) Unrelated diversification
    (C) Merger diversification
    (D) Acquisition diversification

 (ii) 'Jio' by Reliance Jio Infocomm Limited (RJIL) provides interesting example to fit in the BCG Matrix as
    (A) Star
    (B) Question Mark
    (C) Cash Cow
    (D) Dog   **(1 mark each)** *[CMA Final Gr. III]*

Answer:
(d) (i) (A) Concentratic diversification
   (ii) (A) Star

—— Space to write important points for revision ——

2017 - June [6] Choose the correct answer:
 (i) Benchmarking is
    (a) the analytical tool to identify high cost activities based on the 'Pareto Analysis'.
    (b) the search for industries best practices that lead to superior performance.
    (c) the simulation of cost reduction schemes that helps to build commitment and improvement of actions.
    (d) the process of marketing and redesigning the way a typical company works.
    (e) the framework that earmarks a linkage with suppliers and customers.
 (ii) Successful differentiation strategy allows the company to
    (a) gain buyer loyalty to its brands.
    (b) charge too high a price premium.
    (c) depend only on intrinsic product attributes.
    (d) have product quality that exceeds buyers' needs.
    (e) segment a market into distinct group of buyers.

(iii) The essential ingredients of Business Process Re-engineering (BPR) are
  (a) continuous improvements of products, processes and technologies.
  (b) planning for the technologies, processes and strategic partnerships etc.
  (c) fundamental re-thinking and radical redesign of business process to achieve dramatic results.
  (d) generation, comparison and evolution of many ideas to find one worthy of development.
  (e) identification and selection of lay-outs most suited for products and processes.

(iv) Marketing Research Studies are undertaken
  (a) to measure brand loyalty of a class of consumers.
  (b) to predict market potential of a product on a future date.
  (c) to understand product-price relationship.
  (d) to make out a case for revision of an existing strategy.
  (e) all of the above.

(v) Organisation culture is
  (a) appreciation for the arts in the organisation.
  (b) ability of the organization to act in a responsible manner to its employees.
  (c) combination of (a) and (b) above
  (d) deeper level of basic assumptions and beliefs that are shared by the members of the firm.
  (e) none of the above.

(vi) Innovation strategy is
  (a) defensive strategy
  (b) offensive strategy
  (c) responding to anticipating customers and market demands
  (d) guerrilla strategy
  (e) harvesting strategy   **(1× 6 = 6 marks)**

Answer:
  (i) (b) the search for industries best practices that lead to superior performance.
  (ii) (a) gain buyer loyalty to its brands.

(iii) (c) fundamental re-thinking and radical redesign of business process to achieve dramatic results.

(iv) (e) all of the above.

(v) (d) deeper level of basic assumptions and beliefs that are shared by the members of the firm.

(vi) (c) responding to anticipating customers and market demands.

—— Space to write important points for revision ——————————

2017 - Dec [6] Choose the correct answer:

(i) Board of directors has certain basic tasks as follows:
(a) To monitor plans and programs of production.
(b) To design the course of strategic options and appointment of top management.
(c) To control utilization of resources.
(d) To monitor courses of actions for marketing management.

(ii) A Strategic Business Unit (SBU) is defined as a division of an organization:
(a) That helps in the marketing operation.
(b) That helps in the choice of technology.
(c) That enables managers to have better control over the resources.
(d) That helps in identifying talents and potentials of people.

(iii) Mckinsey's 7-s framework consists of:
(a) Structure, Strategy, Software, Skills, Styles, Staff and Supervision
(b) Structure, Strategy, Systems, Skills, Styles, Syndication and Shared values
(c) Structure, Strategy, Systems, Skills, Steering power, Styles and Shared values
(d) Structure, Strategy, Staff, Skills, Systems, Shared values, Style
(e) None of the above

(iv) What are enduring statements of purpose that distinguish one business from other similar Firms?
(a) Policies
(b) Mission statements
(c) Objectives
(d) Rules
(e) Nature of ownership

(v) Outsourcing is the
   (a) spinning off of a value-creating activity to create a new firm.
   (b) selling of a value-creating activity to other firms.
   (c) purchase of a value-creating activity from an external supplier.
   (d) use of computers to obtain value-creating data from the Internet.
(vi) For an actress in Bollywood, her pretty face would be a/an
   (a) Asset
   (b) Strategic asset
   (c) Core competency
   (d) Capability
   (e) All of the above   **(1 × 6 = 6 marks)**

Answer:
   (i)   (b)
   (ii)   (c)
   (iii) (d)
   (iv)   (b)
   (v)   (c)
   (vi)   (b)

—— Space to write important points for revision ——

2018 - June [6] Choose the correct answer:
   (i) Which one of the following does NOT seem to be an advantage of the strategic management?
       (a) Discharges board responsibility
       (b) Provides a framework for decision-making
       (c) Forces an objective assessment
       (d) It can be expensive
   (ii) Which of the following analyses 'products and businesses by market share and market growth'?
       (a) SWOT Analysis
       (b) BCG Matrix
       (c) PEST Analysis
       (d) Portfolio Analysis
   (iii) Which one of the following is NOT part of the McKinsey's 7-5 framework?
       (a) Skills   (b) Staff
       (c) Systems   (d) Supervision

(iv) Which one of the following statement is NOT correct?
    (a) Vision is the statement of the future.
    (b) The corporate mission is the purpose or reason for its existence.
    (c) Targets are formed from vision and mission statement of organizations.
    (d) Goals are objectives that are scheduled for attainment during planned period.

(v) Which of the following can NOT be the called as a strength of an organization?
    (a) Good Industrial relations
    (b) Incentives from State Government
    (c) Financially very sound
    (d) Raw materials source at a distance

(vi) Strategic Business Unit (SBU) structure does NOT experience one of the following as an advantage:
    (a) Higher career development opportunities
    (b) Better control of categories of products manufacturing, marketing and distributions
    (c) High cost approach
    (d) Help in expanding in different related and unrelated businesses

(1 × 6 = 6 marks)

Answer:
   (i)   (d)
  (ii)   (b)
 (iii)   (d)
 (iv)   (c)
  (v)   (d)
 (vi)   (c)

2018 - Dec [6] Choose the correct answer.
   (i) A corporate strategy can be defined as
    (a) A list of actions about operational planning and statement of organisation structure and control system.
    (b) A statement of how to compete, direction of growth and method of assessing environment.
    (c) Abatement of organisation's activities and allocation of resources.

    (d) A course of action or choice of alternatives, specifying the resources required to achieve certain stated objectives.

(ii) The existence of price-wars in the airline industry in India indicates that

    (a) customers are relatively weak because of the high switching costs created by frequent flyer programmes.

    (b) the industry is moving towards differentiation of services.

    (c) the competitive rivalry in the industry is severe.

    (d) the economic segment of the external environment has shifted, but the airline strategies have not changed.

(iii) Business Process Re-engineering is

    (a) eliminating loss-making process.

    (b) redesigning operational processes.

    (c) redesigning the product and services.

    (d) recruiting the process engineers.

(iv) Which one or more of the following are appropriate as a judicious mix for a Product line, which is a group of products?

    (a) That are closely related.

    (b) That are marketed through the same channel.

    (c) That perform a similar function for being sold to the same customers.

    (d) All of the above.

(v) The Product Market matrix comprising of Strategies of Market Penetration, Market Development, Product Development, and Diversification was first formulated by

    (a) Ansoff   (b) Drucker

    (c) Porter   (d) Prahlad

(vi) Price fixation for the first time takes place when

    (a) a company develops or acquires a new product.

    (b) introducing existing product into a new geographic area or a new distribution channel.

    (c) a service, the company bids for a new contract work.

    (d) All of the above.   **(6 marks)**

Answer:

(i) (d) A course of action or choice of alternatives, specifying the resources required to achieve certain stated objectives.

(ii)   (c) The competitive rivalry in the industry is severe.
(iii)   (b) Redesigning operational processes.
(iv)   (d) All of the above.
(v)   (a) Ansoff.
(vi)   (d) All of the above.

2019 - June [6] Choose the correct answer:

(i)   Offensive strategy is a strategy
  (a) for small companies that consider offensive attacks in the market.
  (b) for those companies that search for new inventory opportunities to create competitive advantage.
  (c) for the market leader who should attack the competitor by introducing new products that make existing ones obsolete.
  (d) for those companies who are strong in the market but not leaders and might capture a market share from the leader.

(ii) The BCG growth matrix is based on the two dimensions:
  (a) Market Size and Market Share
  (b) Market Size and Profit Margins
  (c) Market Size and Competitive Intensity
  (d) None of the above

(iii) For an entrepreneur
  (a) Vision is before the mission.
  (b) Mission is before the vision.
  (c) Both are developed simultaneously.
  (d) Vision or mission are un-important issues.

(iv) Benchmarking is
  (a) the analytical tool to identify high cost activities based on the 'Pareto Analysis'.
  (b) the search for industries best practices that lead to superior performance.
  (c) the simulation of cost reduction schemes that help to build commitment and improvement of actions.
  (d) the process of marketing and redesigning the way a typical company works.

(v) Strategic analysis is concerned with stating the position of the organisation in terms of
  (a) Mission, choice of market segments, product selection, financial targets and external appraisal.
  (b) Mission, goals, corporate appraisal, position audit and gap analysis.
  (c) Mission, goals, identification of key competitors, SWOT and environmental appraisal.
  (d) Mission, targeted ROI, manpower planning and position audit.
(vi) Intensity of competition is _____ in low return industries.
  (a) low
  (b) non-existent
  (c) high
  (d) not important   **(1 × 6 = 6 marks)**

Answer:
Choose the correct answer:
  (i)   (d) For those companies who are strong in the market but not leaders and might capture a market share from the leader.
  (ii) (d) None of the above
  (iii) (a) Vision is before the mission
  (iv) (b) The search for industries best practices that lead to superior performance.
  (v)   (b) Mission, goals, corporate appraisal, position audit and gap analysis.
  (vi) (c) high.
—— Space to write important points for revision ————————————

2019 - Dec [6] Choose the correct answer:
  (i) Which of the following statements can be closely related with the Mission?
    (a) It includes definition of products & services the organization provides.
    (b) It specifies management policies towards customers and societies.
    (c) It provides a roadmap to company's future.
    (d) It indicates the kind that company management is trying to create for future.

(ii) Portfolio Analysis is a term used
   (a) to identify what strategy is needed to maintain a strong position or improve a weak one.
   (b) to find out a best alternative out of various alternatives available.
   (c) to analyse products and business by market share and market growth.
   (d) to make managers more adaptable to unforeseen changes,

(iii) Which one of the following is NOT a role of Marketing?
   (a) It helps in sustaining and improving the existing levels of employment.
   (b) It helps in the economic growth of a country.
   (c) It helps in the discovery of entrepreneurial talent.
   (d) It diminishes potential aggregate demand and thus reduces the size of the market.

(iv) Which one of the following in NOT the benefit of a Vision?
   (a) It helps in the creation of common identity and a shared sense of purpose.
   (b) It fosters risk taking and experimentation.
   (c) It fosters short-term thinking.
   (d) It represents integrity.

(v) The competitive position of a company's SBU or product line can NOT be classified as one of the following:
   (a) Dominant
   (b) Strong
   (c) Favourable
   (d) Volatile

(vi) The best test of a successful Strategy implementation is
   (a) whether the strategies and procedures are observed in the strategy supportive fashion.
   (b) whether the structure is well-matched to strategy.
   (c) whether actual organizational performance matches or exceeds the targets spelt out in the strategic plan.
   (d) whether it is made after the strategy is formulated, so that it is supportive to the strategy. **(1×6=6 marks)**

Answer:
  (i)   (a) It includes definition of products & services the organization provides.
 (ii) (a) To identify what strategy is needed to maintain a strong position or improve a weak one.
(iii) (d) It diminishes potential aggregate demand and thus reduces the size of the market.
(iv) (c) It fosters short-term thinking.
 (v) (d) Volatile
(vi) (c) Whether actual organizational performance matches or exceeds the targets spelt out in the strategic plan.

2021 - Dec [1] "The PEST Analysis looks at the external factors and is primarily used for market research". Is this statement correct?

(1 mark) [Sec. B SAQ]

Answer:
Yes.

2021 - Dec [4] "Desired states or outcomes are objectives". Is this correct?

(1 mark) [Sec. B SAQ]

Answer:
Yes

2021 - Dec [9] "Production strategy plays crucial role in shaping the ultimate success of a firm". Is this correct?   **(1 mark) [Sec. B SAQ]**

Answer:
Yes

2021 - Dec [14] "Strategy is likely to be concerned with the short-term direction of an organization".Is this correct?   **(1 mark) [Sec. B SAQ]**

Answer:
No.

2021 - Dec [20] "Seasonal/ Climatical demand of products" and "Global markets for company"s products/services" may be the probable threats which may drive or to be faced by the organization. Is this correct?

(1 mark) [Sec. B SAQ]

Answer:
No.

2022 - Dec [6] Choose the correct answer from the given four alternatives (You may write only the Roman numeral and alphabet chosen for your answer):

(i) Strategic Management can be defined as:
   (a) the direction and scope of an organization over the long run.
   (b) a stream of decisions and actions which leads to the development of an effective strategy or strategies to help achieve objectives.
   (c) the statement of the future.
   (d) a statement of the activities or steps needed to support a strategy.
   (1 mark)

(ii) PEST analysis refers to the following factors:
   (a) Political, environmental, structural and technical
   (b) Portfolio, energy, solar and transformation
   (c) Purchase, economic, supply and transportation
   (d) Political, economical, social and technological   **(1 mark)**

(iii) Business Process Reengineering could be applied to companies that confront problems such as:
   (a) low operational costs.
   (b) high performance of middle level managers.
   (c) appropriate distribution of resources and jobs in order to achieve maximum performance etc.
   (d) low quality offered to customers.   **(1 mark)**

(iv) Vision is associated with:
   (a) Types of markets
   (b) Customer need or requirement
   (c) Road map to Company's future
   (d) Distinctive competencies   **(1 mark)**

(v) While performing SWOT analysis, which one of the following can be treated as a Threat?
   (a) Price cutting war   (b) Reduction in financing cost
   (c) Lesser competition   (d) Industrial stability   **(1 mark)**

(vi) Which one of the following `S' is not a part of McKinsey's 7s Framework?
   (a) Skills   (b) Style
   (c) Synergy   (d) Structure   **(1 mark)**

❀