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CMA Inter Group - II **Paper-9** **Operations Management and Strategic Management**

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Delhi - 110092

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Best wishes for this final stretch of your journey. I'm confident you'll achieve success!

Warm regards,

Prof. Arun Kumar

Scanner is published in India by Shuchita Prakashan (P) Ltd.
Registered Office : Flat No. 4 Parivartan Apartment, In front of St. Anthony's Convent
School, Thornhill Road, Prayagraj - 211002.

Editor-in-chief : Mrs. Anjali

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First edition : July 1992
Sixty sixth edition : January 2025

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Published by: Shuchita Prakashan (P) Ltd., B-45/141, Street No. 5, Guru Nanak Pura
Laxmi Nagar, Delhi - 110092

Visit us: www.scanneradda.com

Contact: +91 7754818899 or email to care@scanneradda.com

Laser Typeset at : **Shuchita Prakashan (P) Ltd.**

Price : ₹ 275.00

ISBN : 978-93-5586-995-1

Acknowledgment

We extend our heartfelt gratitude to everyone who has contributed to the
development of this edition of the CMA Inter Scanner. This work would not
have been possible without the support and dedication of many individuals
and institutions.

First and foremost, we are deeply grateful to the students and educators who
have provided valuable feedback, helping us continuously improve the
Scanner and make it an essential tool for exam preparation. Your insights
and experiences have been instrumental in shaping this edition.

We would also like to thank our dedicated team of authors, editors, and
designers for their hard work and commitment. Their attention to detail,
meticulous research, and passion for excellence have ensured the accuracy
and relevance of the content provided.

A special thanks to our colleagues at Shuchita Prakashan Private Limited for
their relentless effort in ensuring the seamless production and publication of
this book. The continued trust and collaboration of booksellers and
distributors have been a cornerstone of our success, and we are immensely
thankful for their support.

Finally, we express our sincere appreciation to our families for their constant
encouragement, understanding, and patience throughout the preparation of
this book.

We hope this edition proves to be a valuable resource for CMA Inter
aspirants and helps them achieve their academic goals.

Thank you.

Paper - 9

Study Material Based Contents

Operations Management and Strategic Management

No.	Chapter Name	Page No.
Section A : Operations Management		
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5.	Productivity Management and Quality Management	133
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7.	Economics of Maintenance and Spares Management	181
Section B : Strategic Management		
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9.	Strategic Analysis and Strategic Planning	233
10.	Formulation and Implementation of Strategy	277
11.	Digital Strategy	309
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13.	Question Paper of December, 2024	385

Revision Tracker for Important Questions

Use this table to keep track of important questions you wish to revise before the examination. Simply note the chapter and page number. Mark revision No in front of it after revision.

No.	Chapter	Page	Revision no.	Chapter	Page	Revision no.
1.						
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Syllabus

Operations Management and Strategic Management
Paper - 9 (100 Marks)
(One Paper - Three Hours)

Syllabus Structure:

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

Module No.	Module Description	Weight
Section A	Operations Management	60%
1.	Introduction	5%
2.	Operations Planning	5%
3.	Designing of Operational Systems and Control	5%
4.	Application of Operation Research - Production Planning and Control	20%
5.	Productivity Management and Quality Management	5%
6.	Project Management, Monitoring Control	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%

Section A: Operations Management

1. Introduction
 - Scope, Characteristics of Modern Operations Functions, Recent Trends in Production and Operations Management
2. Operations Planning
 - Demand Forecasting, Capacity Planning, Facility Location and Layout, Resource Aggregate Planning, Material Requirements Planning, Manufacturing Resource Planning, Economic Batch Quality
3. Designing of Operational Systems and Control
 - Product Design, Process Design and Selection, Product Life Cycle, Process Planning and Selection, Design Thinking

4. Application of Operation Research - Production Planning and Control
 - 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, JIT
5. Productivity Management and Quality Management
 - 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
6. Project Management, Monitoring Control
 - Project Planning, Project Life Cycle, Gantt Charts, PERT and CPM, Basics of MS Project
7. Economics of Maintenance and Spares Management
 - Breakdown Maintenance, Preventive Maintenance, Routine Maintenance, Replacement of Machine, Spare Parts Management

Section B: Strategic Management

8. Introduction
 - Introduction to Strategy and Strategic Management, Alignment of Strategy with Vision, Mission, and Culture, Objective of Strategic Management
 - Organisational Genomics, Alignment with Individual Level Objective and Organisational Objective, Balance Score Card, EVA - Driven Responsibility Accounting
9. Strategic Analysis and Strategic Planning
 - 9.1 Analysis of Business Environment, PESTEL, Value Chain and Porter's 5 Framework, SWOTC Analysis (Industry Sector and Company), Portfolio Analysis and BCG Matrix, Stages in Strategic Planning, Alternatives in Strategic Planning
10. Formulation and Implementation of Strategy
 - 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
11. Digital Strategy
 - Introduction, Digital Transformation for Competitive Advantages, Innovations and Disruptive Business Models, Emerging Trends in Digital and Social Marketing Strategies

Preface to Scanner

Operations Management and Strategic Management constitute Paper – 9 of Inter Gr. II Examination conducted by the Institute of Cost Accountants of India. This book is intended to make the study interesting and scoring from the examination point of view.

It contains solved answers to various questions asked in the examination of Final level conducted by the Institute. The period covered is past 20 exams. The answers are presented in lucid and understandable language and style so that the reader can understand and memorise the contents and face the exams easily.

This book is not very academic in character and should always be supplemented with the study material supplied by the Institute for better and deeper comprehension of the subject.

Suggestions for improvement are always welcome.

With Best Wishes

Prof. Arun Kumar

CA (Dr.) Mohit Bahal

CS (Dr.) Himanshu Srivastava

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Submit your inputs by May 31st 2025, for the January 2025 edition.

To report a mistake, email us at care@scanneradda.com with the details or send WhatsApp +91 981 1097841

Thank you for helping us make the Scanner even better, and best of luck with your studies!

Detailed Content

No.	Chapter Name	Page No.				
		OQ	SN	DB	DQ	PQ
Section A : Operations Management						
1.	Operations Management-Introduction	-	-	-	2	-
2.	Operations Planning	-	18	-	19	23
3.	Designing of Operational Systems and Control	-	50	-	51	-
4.	Application of Operation Research - Production Planning and Control	-	66	-	67	82
5.	Productivity Management and Quality Management	-	-	134	135	149
6.	Project Management, Monitoring and Control	-	-	-	162	164
7.	Economics of Maintenance and Spares Management	-	-	182	183	190
Section B : Strategic Management						
8.	Strategic Management -Introduction	-	210	-	212	225
9.	Strategic Analysis and Strategic Planning	-	234	237	238	265
10.	Formulation and Implementation of Strategy	-	278	-	290	303
11.	Digital Strategy	-	-	-	310	-
12.	Objective Questions	317	-	-	-	-

Legend:

- OQ:** Objective Questions
- SN:** Short Notes
- DB:** Distinguish Between,
- DQ:** Descriptive Questions
- PQ:** Practical Questions

Revision Tracker for Important Questions

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IN THIS EDITION

Questions	Solutions
December - 2014 to December - 2024 Duly incorporated in chapters	December - 2014 to June - 2024 Duly incorporated in chapters
	December - 2024 on scanneradda.com → "My Books" for the Answers

UNIQUE FEATURES OF THIS EDITION

- Trend analysis for Paper and every chapter
- Questions are arranged according to the **subject/topic** in ascending order of examinations/years.
- **Graphical Presentation**
- Analytical Classification of every Chapter in **Four** Categories:
 - (1) Short Notes
 - (2) Distinguish Between
 - (3) Descriptive Questions
 - (4) Practical Questions
- Frequency table showing distribution of marks & compulsory questions to identify important chapters
- Time manager for Every Chapter to plan and study effectively
- **Quick Look** Weightage Analysis for
 1. Repeatedly Asked Questions
 2. Common Answered Questions
 3. Must Try Questions
- Complete Questions and Solutions.

Work with Us

Shuchita Prakashan (P) Ltd. is hiring subject experts.

Who can apply?

You can apply for the position of a subject expert if you:

- Teach CA, CS, or CMA students
- Have passed any of - CA, CS, or CMA courses recently
- Are final year student of CA, CS, or CMA
- Have experience as an author in this area

Responsibilities

The subject expert may take up one or more of below-mentioned responsibilities:

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2. Make Multiple Choice Questions (MCQs) of various subjects
3. Update a part of Scanner as per latest amendments
4. Update full scanners as per latest amendments
5. Write a new book
6. Create online content
7. Video recording of solutions of questions
8. Suggest innovative ideas

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- Popularity amongst students.

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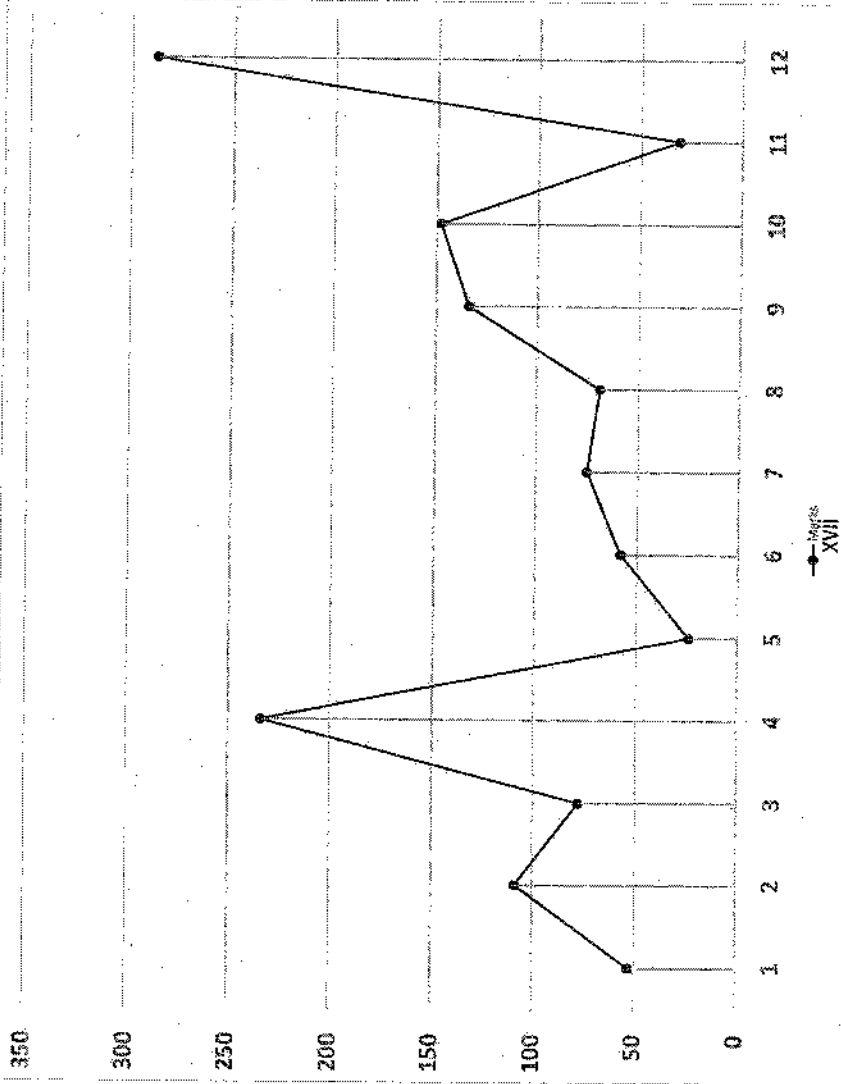
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20.										

Chapter Marks Trend Graph
Operations Management and Strategic Management
Line Chart Showing Relative Importance of Chapters



Chapter-wise Marks Analysis																
Chap. No.	Chapter Name	Years												Total	Ave.	
		16 Jun	18 Dec	19 Jun	19 Dec	21 Dec	22 Dec	23 Jun	23 Dec	24 Jun	24 Dec	24 Dec	24 Dec			
Section A : Operations Management																
1.	Operations Management-Introduction	6	6	6	7	1	8	5	7	7	7	-	53	5.3		
2.	Operations Planning	10	10	10	9	24	8	10	7	7	7	14	109	10.9		
3.	Designing of Operational Systems and	8	6	6	8	15	7	7	7	7	7	7	78	7.8		
4.	Application of Operation Research -....	32	26	36	16	17	25	19	21	21	21	21	234	23.4		
5.	Productivity Management and Quality	-	-	-	8	12	-	4	-	-	-	-	24	2.4		
6.	Project Management, Monitoring and	-	6	-	6	5	10	10	7	7	7	7	58	5.8		
7.	Economics of Maintenance and Spares....	8	10	6	10	9	6	5	7	7	7	7	75	7.5		
Section B : Strategic Management																
8.	Strategic Management -Introduction	4	12	8	8	3	6	7	7	7	7	7	69	6.9		
9.	Strategic Analysis and Strategic Planning	16	14	14	14	3	16	15	14	14	14	14	134	13.4		
10.	Formulation and Implementation of....	20	14	18	18	5	18	13	14	14	14	14	148	14.8		
11.	Digital Strategy	-	-	-	-	-	-	10	7	7	7	7	31	3.1		
12.	Objective Questions	28	28	28	28	33	28	25	30	30	30	30	288	28.8		

Chapter-Wise Compulsory Questions Analysis

Chap. No.	Chapter Name	Years						Total	Ave.	
		18 Jun	18 Dec	19 Jun	19 Dec	21 Dec	22 Dec			23 Jun
Section A : Operations Management										
1.	Operations Management-Introduction	-	-	-	-	-	-	0	0.0	
2.	Operations Planning	-	-	-	-	-	-	0	0.0	
3.	Designing of Operational Systems and	-	-	-	-	-	-	0	0.0	
4.	Application of Operation Research -	-	-	-	-	-	-	0	0.0	
5.	Productivity Management and Quality....	-	-	-	-	-	-	0	0.0	
6.	Project Management, Monitoring and....	-	-	-	-	-	-	0	0.0	
7.	Economics of Maintenance and Spares....	-	-	-	-	-	-	0	0.0	
Section B : Strategic Management										
8.	Strategic Management -Introduction	-	-	-	-	-	-	0	0.0	
9.	Strategic Analysis and Strategic Planning	-	-	-	-	-	-	0	0.0	
10.	Formulation and Implementation of....	-	-	-	-	-	-	0	0.0	
11.	Digital Strategy	-	-	-	-	-	-	0	0.0	
12.	Objective Questions	-	-	-	22	15	30	30	127	12.7

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Paper Trend Analysis

Paper-9 Operations Management and Strategic Management

Year	Q. No.	{C}	No.	Chapter Name	Mks.	Ctg.	No.	
Section A : Operations Management								
2022 Dec	1	a	{C}	12	Objective Questions	10	OQ	361
				12	Objective Questions	6	"	363
				12	Objective Questions	6	"	364
	2	a (i)		1	Operations Management - ...	4	DQ	9
				1	Operations Management - ...	4	"	12
		b		2	Operations Planning	8	PQ	41
				3	Designing Of Operational...	7	DQ	58
	4	a		4	Application Of Operation....	9	PQ	111
				4	Application Of Operation....	8	"	113
	5	b		4	Application Of Operation....	8	"	116
7				Economics Of Maintenance..	6	"	203	
2023 Jun	1	a		6	Project Management,...	10	"	172
				12	Objective Questions	8	OQ	366
	2	b		12	Objective Questions	4	"	368
				12	Objective Questions	3	"	369
				1	Operations Management - ...	5	DQ	14
		a		2	Operations Planning	4	"	22
				2	Operations Planning	6	PQ	42
	3	a		3	Designing Of Operational...	7	DQ	60
				4	Application Of Operation....	8	PQ	116
	4	b (i)		4	Application Of Operation....	5	"	118
4				Application Of Operation....	6	"	119	
5	(ii)		5	Productivity Management....	4	"	155	
			7	Economics Of Maintenance..	5	"	204	
	b		6	Project Management,...	10	"	174	

Year	Q. No.	{C}	No.	Chapter Name	Mks.	Ctg.	No.		
2023	1	a	{C}	12	Objective Questions	30	OQ	371	
Dec	2	a		1	Operations Management - ...	7	DQ	15	
		b		3	Designing Of Operational...	7	"	62	
	3	a		4	Application Of Operation....	7	"	81	
		b		2	Operations Planning	7	PQ	43	
	4	a		4	Application Of Operation....	7	"	120	
		b		4	Application Of Operation....	7	"	123	
	5	a		7	Economics Of Maintenance..	7	"	205	
		b		6	Project Management,...	7	"	176	
	2024	1	a	{C}	12	Objective Questions	30	OQ	374
	Jun	2	a		1	Operations Management - ...	7	DQ	15
b				3	Designing Of Operational...	7	"	63	
3		a		4	Application Of Operation....	7	"	81	
		b		2	Operations Planning	7	PQ	44	
4		a		4	Application Of Operation....	7	"	124	
		b		4	Application Of Operation....	7	"	126	
5		a		7	Economics Of Maintenance..	7	"	207	
		b		6	Project Management,...	7	"	177	
2024		1	a	{C}	12	Objective Questions	30	OQ	378
Dec		2	a		2	Operations Planning	7	DQ	23
	b			3	Designing Of Operational...	7	"	63	
	3	a		4	Application Of Operation....	7	"	82	
		b		2	Operations Planning	7	PQ	45	
	4	a		4	Application Of Operation....	7	"	128	
		b		4	Application Of Operation....	7	"	128	
	5	a		7	Economics Of Maintenance..	7	"	208	
		b		6	Project Management,...	7	"	179	

Year	Q. No.	{C}	No.	Chapter Name	Mks.	Ctg.	No.		
Section B : Strategic Management									
2022	6			12	Objective Questions	6	OQ	365	
Dec	7	a		8	Strategic Management - ...	6	DQ	221	
		b		9	Strategic Analysis And...	6	"	257	
	8	a		9	Strategic Analysis And...	6	"	258	
		b		10	Formulation And Impleme...	6	"	296	
	9	a		10	Formulation And Impleme...	4	SN	288	
		b		10	Formulation And Impleme...	4	"	288	
		c		10	Formulation And Impleme...	4	"	288	
		d		9	Strategic Analysis And...	4	"	237	
	2023	6	a		12	Objective Questions	4	OQ	369
	Jun		b		12	Objective Questions	3	"	370
c				12	Objective Questions	3	"	370	
a (i)				8	Strategic Management - ...	1	DQ	221	
7		(ii)		8	Strategic Management - ...	6	"	221	
		b		9	Strategic Analysis And...	8	"	259	
8		a (i)		9	Strategic Analysis And...	7	"	260	
		b		10	Formulation And Impleme...	8	"	296	
9		a		10	Formulation And Impleme...	5	"	297	
		b (i)		11	Digital Strategy	4	"	310	
		(ii)		11	Digital Strategy	6	"	310	
2023	6	a		8	Strategic Management - ...	7	DQ	222	
Dec		b		11	Digital Strategy	7	"	312	
		a		9	Strategic Analysis And...	7	"	261	
	7	b		9	Strategic Analysis And...	7	"	262	
		a		10	Formulation And Impleme...	7	"	298	
	8	b		10	Formulation And Impleme...	7	"	299	

Year	Q. No.	{C}	No.	Chapter Name	Mks.	Ctg.	No.
2024 Jun	6	a	8	Strategic Management -...	7	DQ	223
		b	11	Digital Strategy	7	"	313
	7	a	9	Strategic Analysis And...	7	"	263
		b	9	Strategic Analysis And...	7	"	263
	8	a	10	Formulation And Impleme...	7	"	301
		b	10	Formulation And Impleme...	7	"	301
2024 Dec	6	a	8	Strategic Management -...	7	DQ	224
		b	11	Digital Strategy	7	"	314
	7	a	9	Strategic Analysis And...	7	"	265
		b	9	Strategic Analysis And...	7	"	265
	8	a	10	Formulation And Impleme...	7	"	303
		b	10	Formulation And Impleme...	7	"	303

Legend:

OQ: Objective Question

SN: Short Notes

DB: Distinguish Between

DQ: Descriptive Questions

PQ: Practical Questions

Star Rating of Chapter

No.	Chapter Name	No. of Attempts	Maximum Marks	Compulsory Questions
1.	Operations Management-Introduction	★★★★		
2.	Operations Planning	★★★★★	★	
3.	Designing of Operational Systems and Control	★★★★★		
4.	Application of Operation Research - Production Planning and Control	★★★★★	★★★★	
5.	Productivity Management and Quality Management	★		
6.	Project Management, Monitoring and Control	★★★		
7.	Economics of Maintenance and Spares Management	★★★★★		
8.	Strategic Management - Introduction	★★★★★		
9.	Strategic Analysis and Strategic Planning	★★★★★	★★	
10.	Formulation and Implementation of Strategy	★★★★★	★★★★	
11.	Digital Strategy	★★		
12.	Objective Questions	★★★★★	★★★★★	★★★★★

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

Legend



Objective



Short Notes



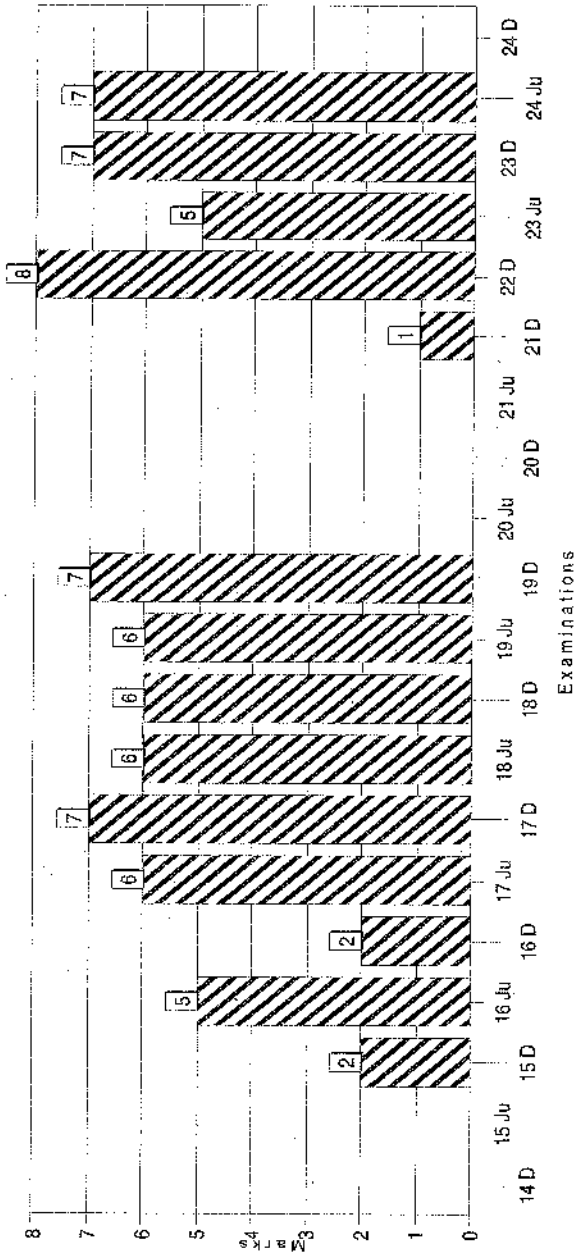
Distinguish



Descriptive



Practical



1

CHAPTER	1	Operations Management- Introduction
THIS CHAPTER INCLUDES		
1. Scope	2. Characteristics of Modern Operations Functions	3. Recent Trends in Production and Operations Management

QUICK LOOK	<i>Weightage Analysis</i>
Repeatedly Asked Questions	
2015 - Dec [1] (a), 2016 - June [II] 1. (b)	
2017 - Dec [2] (a), 2019 - Dec [2] (a)	
2022 - Dec [2] (a) (ii), 2023 - Dec [2] (a)	

PAST YEAR QUESTIONS AND ANSWERS

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.

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. 2

2016 - Dec [1] (d) List categories of processes in a production system.

(2 marks) [Sec. A]

Answer:

Basically, processes can be categorised as:

- 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.
- Manufacturing processes:** Can be categorised into (a) Forming processes, (b) Machining processes and (c) Assembly processes.
- Testing processes:** Which involve inspection and testing of products (sometimes considered as part of the manufacturing processes.)

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

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.

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.

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.

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:**

- (a) Location of Facilities.
- (b) Plant layouts and Material Handling.
- (c) Product Design.
- (d) Process Design.
- (e) Production Planning and Control.
- (f) Quality Control.
- (g) Materials Management.
- (h) Maintenance Management.

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

Answer:

Please refer 2017 - Dec [2] (a) on page no. 5.

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

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

Answer:

Following are the activities, which are listed under Production and Operations Management functions:

1. **Location of Facilities:** 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 utilization 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.

A bad location, on the other hand, is a severe handicap for any enterprise and it finally bankrupts it. It is, therefore, very essential that utmost care should be exercised in the initial stages to select a proper place. Once a mistake is made in locating a plant it becomes extremely difficult and costly to correct it.

2. **Plant layouts and Material Handling:** 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. An economic activity centre can be anything that consumes space, a person or group of people, a machine, a work station, a department, a store room and so on. The goal of layout planning is to allow workers and equipments to operate more effectively.

3. **Product Design:** Production or operations strategy is directly influenced by product design for the following reasons:
 - (a) As products are designed, all the detailed characteristics of each product are established.
 - (b) Each product characteristic directly affects how the product can be made or produced (i.e., process technology and process design) and
 - (c) How the product is made determines the design of the production system (production design) which is the heart of production and operations strategy.

Further, product design directly affects product quality, production costs and customer satisfaction. Hence, the design of product is crucial to success in today's global competition. 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.

4. **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:
- the nature of the product,
 - the materials used,
 - the quantities to be produced and
 - the existing physical layout of the plant.

5. **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 utilization 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. To control work-in-process effectively it becomes necessary to control not only the flow of material but also the utilization of people and machines.

6. **Quality Control:** Timely execution of orders will be meaningful when the quality of the output is not below expectations. To ensure quality, inspection should be conducted at different stages of manufacture. An ideal layout provides ample space to carryout inspection to ensure better quality control.
7. **Materials Management:** Materials management is a core function of supply chain management, involving the planning and execution of supply chains to meet the material requirements of a company or organisation. The primary purpose of materials management is to ensure that manufacturers have all the raw materials they need to make goods. Materials management also focuses on ensuring that no components are wasted and optimizing inventory maintenance and management.
8. **Maintenance Management:** Maintenance management can be defined as the process of maintaining a company's assets and resources and its main objectives are controlling costs, controlling time, managing resources and ensuring regulatory compliance. It helps companies maintain their resources while controlling time and costs to ensure maximum efficiency of the manufacturing process, the utilities and related facilities.

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)**

Answer:

Recent trends in production/operations management relate to global competition and the impact it has on manufacturing firms. Some of the recent trends are :

- Global Market Place:** Globalization of business has compelled many manufacturing firms to have operations in many countries where they have certain economic advantage. This has resulted in a steep increase in the level of competition among manufacturing firms throughout the world.

2. **Production/Operations Strategy:** More and more firms are recognizing the importance of production/ operations strategy for the overall success of their business and the necessity for relating it to their overall business strategy.
 3. **Total Quality Management (TQM):** TQM approach has been adopted by many firms to achieve customer satisfaction by a never-ending quest for improving the quality of goods and services.
 4. **Flexibility :** The ability to adapt quickly to changes in volume of demand, in the product mix demanded, and in product design or in delivery schedules, has become a major competitive strategy and a competitive advantage to the firms. This is sometimes called as agile manufacturing.
 5. **Time Reduction:** Reduction of manufacturing cycle time and speed to market for a new product provide competitive edge to a firm over other firms. When companies can provide products at the same price and quality, quicker delivery (short lead times) provide one firm competitive edge over the other.
 6. **Technology:** Advances in technology have led to a vast array of new products, new processes and new materials and components. Automation, computerization, information and communication technologies have revolutionized the way companies operate. Technological changes in products and processes can have great impact on competitiveness and quality, if the advanced technology is carefully integrated into the existing system.
 7. **Worker Involvement:** The recent trend is to assign responsibility for decision making and problem solving to the lower levels in the organisation. This is known as employee involvement and empowerment. Examples of worker involvement are quality circles and use of work teams or quality improvement teams.
 8. **Re-engineering:** This involves drastic measures or break-through improvements to improve the performance of a firm. It involves the concept of clean-slate approach or starting from scratch in redesigning the business processes.
 9. **Environmental Issues:** Today's production managers are concerned more and more with pollution control and waste disposal which are key issues in protection of environment and social responsibility. There is increasing emphasis on reducing waste, recycling waste, using less-toxic chemicals and using biodegradable materials for packaging.
 10. **Corporate Downsizing (or Right Sizing):** Downsizing or right sizing has been forced on firms to shed their obesity. This has become necessary due to competition, lowering productivity, need for improved profit and for higher dividend payment to shareholders.
 11. **Supply-Chain Management:** Management of supply-chain, from suppliers to final customers reduces the cost of transportation, warehousing and distribution throughout the supply chain.
 12. **Lean Production:** Production systems have become lean production systems which use minimal amounts of resources to produce a high volume of high quality goods with some variety. These systems use flexible manufacturing systems and multi-skilled workforce to have advantages of both mass production and job production (or craft production).
- 2023 - June [2] (a) List down various major decision areas under Production and Operations management. (Any Ten) (5 marks)**
- Answer:**
- Major decision areas under Production & Operation Management:**
1. Product selection
 2. Facility Location selection
 3. Demand Forecasting
 4. Process selection & Layout decision
 5. Capacity planning
 6. Aggregate Planning, Master Production Schedule
 7. MRP/MRP 1/DRP/ERP
 8. Inventory Management
 9. Supplier Selection/Sourcing
 10. Process Management
 11. Quality Management

- 12. Maintenance
- 13. Warehousing/Transportation
- 14. Reverse Logistics
- 15. Working Capital Management
- 16. Skill Management

2023 - Dec [2] (a) "Recent trends in Production and Operations Management related to global competition and the impact it has on manufacturing firms." In this context, state in brief the recent trends in production and operations management. (Any seven) **(7 marks)**

Answer:

Please refer 2022 - Dec [2] (a) (ii) on page no. 12

2024 - June [2] (a) "The Production Management of To-day presents certain characteristics which make it look totally different from what it was during the past. Specifically, To-day's production system is characterized by at least Four Features". In this Context Summarize the Said Features. **(7 marks)**

Answer:

Today's production system is characterized by the following features as discussed below:

1. Manufacturing as Competitive Advantage:

Unlike the past, today 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, Time-Based Competition. Business Process Re-engineering (BPRE), Just-in-Time. Focused Factory, Flexible Manufacturing Systems, Computer Integrated Manufacturing and the Virtual Corporation are but only some techniques which the companies are employing to gain competitive advantage.

2. Services Orientations:

Service sector is gaining greater relevance these days. The production system, therefore, needs to be organized keeping in mind the peculiar requirements of the service component. The entire manufacturing needs




to be geared to serve (a) intangible and perishable nature of the services, (b) constant interaction with clients or customers, (c) small volumes of production to serve local markets, and (d) need to locate facilities to serve local markets.

3. Disappearance of Smokestacks:

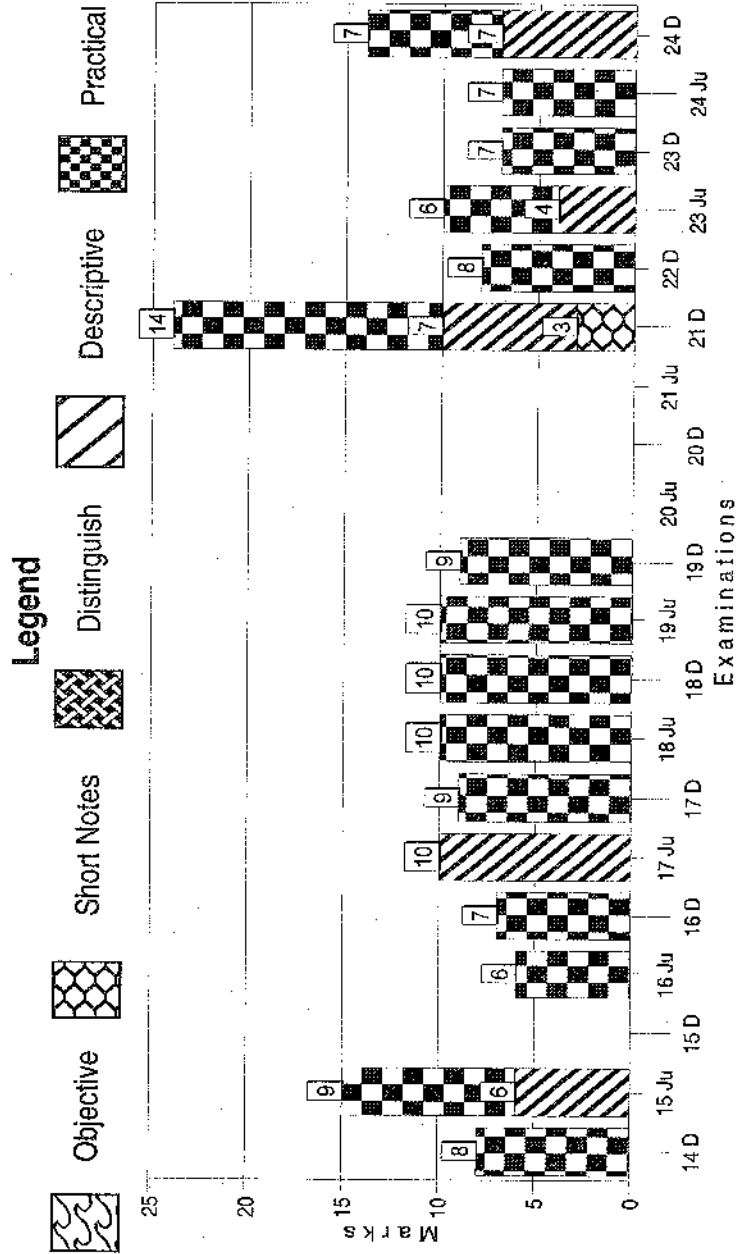
Protective labour legislation, environmental movement and gradual emergence of knowledge based organizations have brought total transformation in the production system. Today's factories are aesthetically designed and built, environment friendly - in fact, they are homes away from homes. Going to factory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

4. Small has Become Beautiful:

E.F. Schumacher, in his famous book Small is Beautiful, opposed giant organizations and increased specialization. He advocated, instead, intermediate technology based on smaller working units, community ownership, and regional workplaces utilizing local labor 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 organizations and mass production systems.

Paper 9 Operations Management and Strategic Management		
<p style="margin: 0;">Feedback</p> 	<p style="margin: 0;">I Need More</p> 	<p style="margin: 0;">Scanner Preparation Key</p> 
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Marks of Objective, Short Notes, Distinguish Between, Descriptive & Practical Questions



CHAPTER	Operations Planning	
2		
THIS CHAPTER INCLUDES		
1. Demand Forecasting	5. Material Requirements Planning	
2. Capacity Planning	6. Manufacturing Resource Planning	
3. Facility Location and Layout	7. Economic Batch Quantity	
4. Resource Aggregate Planning		

PAST YEAR QUESTIONS AND ANSWERS

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

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:

- Process layout;
- Product layout;
- Fixed position layout;
- Cellular Manufacturing (CM) layout;
- A combination of the above.

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:
 - (a) 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.
 - (b) 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.
 - (c) 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.
 - (d) 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.

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.

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:

- Usage rate: The rate of production of parts should match with the rate of usage of these parts in the assembly line.
- 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.
- Cost of deterioration and obsolescence: Higher the lot size, higher will be the possibility of loss due to deterioration (items deteriorating)

2023 - June [2] (b) (i) Discuss with appropriate examples, various properties of aggregate planning. (4 marks)

Answer:

Properties of Aggregate Planning:

- Both output and sales should be expressed in a logical overall unit of measuring. For example, an automobile manufacturing Company can say 1000 vehicles per year, without giving number of each variety of vehicle. Similarly, a paint industry can say 10000 litres of paint and does not mention quantities of each variety of colour.
- Acceptable forecast for some reasonable planning period, say one year.
- A method of identification & fixing the relevant costs associated with the plant. Availability of alternatives for meeting the objective of the organization.
- Ability to construct model that will permit to take optimal or near optimal decisions for the sequence of planning periods in the planning horizon.
- Facilities that are considered fixed to carry out the objective.

2024 - Dec [2] (a) "The Plant Layout selected in conformity with Layout Principles should be an ideal one" — In this context, align those Plant Layout Principles. **(7 marks)**

PRACTICAL QUESTIONS

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

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

2013 - Dec [4] (c) If a firm sells 5,000 units, its loss is ₹ 10,000. But if it sells 9,000 units, its profit is ₹ 10,000. Calculate its (i) Fixed Cost; (ii) BEP2.

(2 marks)

Answer:

- Change in quantity of output = 9,000 - 5,000 = 4,000 units
Change in profit = ₹ 10,000 - (- ₹ 10,000) = ₹ 20,000
Unit contribution = $\frac{\text{Change in profit}}{\text{Change in output}} = \frac{20,000}{4,000} = ₹ 5$
So, when output is 9,000 units
Total Contribution = Fixed cost + Profit = ₹ (5 × 9,000) = ₹ 45,000
but given Profit, P = ₹ 10,000
Therefore, Fixed Cost = Total Contribution - Profit = ₹ 45,000 - ₹ 10,000 = ₹ 35,000

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

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:

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

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

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	4,000 pieces	3,000 pieces
Set up cost / year	₹ 300	₹ 1,500
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/-	₹ 1,500/-
Operating hours / set-up	4,000/10 = 400 hours	3,000/15 = 200 hours
Operating cost	400 × 20 = ₹ 8,000	200 × 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 × 300 = ₹ 1,500	10 × 1,500 = ₹ 15,000
No. of units produced per year	2,000 × 10 = ₹ 20,000	2,000 × 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.

2014 - June [4] (b) Monthly demand for a component is 1,000 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

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

$$= \sqrt{\frac{2 \times 12,000 \times 120}{\text{₹}2}} = 1,200 \text{ units}$$

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 'Y' represent export. In order to use the normal equations for the least square line, we need $\sum X$, $\sum Y$, $\sum XY$ and $\sum X^2$. To simplify the calculation arrange X in such a way that $\sum X = 0$.

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
$\sum X = 0$	$\sum Y = 257$	$\sum X^2 = 60$	$\sum XY = 204$

The normal equations are:

$$\sum y = a_0 N + a_1 \sum X$$

$$\sum XY = a_0 \sum X + a_1 \sum X^2$$

$$\sum X = 0 \text{ and } \sum y = a_0 N \text{ and } \sum XY = a_1 \sum X^2$$

Therefore,

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

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

The equation of a straight line fitting the data is:

$$Y = 28.56 + 3.4 X$$

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

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

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:

	Location A	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)

Units	Location A			Location B			Location C		
	F.C.	V.C.	T.C.	F.C.	V.C.	T.C.	F.C.	V.C.	T.C.
5,000	35	17.5	52.5	55	12.5	67.5	30	20	50
10,000	35	35.0	70.0	55	25.0	80.0	30	40	70
15,000	35	52.5	87.5	55	37.5	92.5	30	60	90
20,000	35	70.0	105.0	55	50.0	105.0	30	80	110
22,000	35	77.0	112.0	55	55.0	110.0	30	88	118
25,000	35	87.5	122.5	55	62.5	117.5	30	100	130

- (A) Up to 10,000 units most suitable location is **Location C**.
 Between 10,000 to 20,000 units most suitable location is **Location A**.
 Above 20,000 units most suitable location is **Location B**.
 (B) At a volume of production/sales of 22,000 **Location B** is best to choose as it has least cost ₹ 110 lakh.

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 85% then number of hours worked = 480×0.85
 = 408 hours.
 = 24,480 Minutes
 Number of components can be produced in a month = $\frac{24,480}{36}$
 = 680 Nos.

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	$325 \times 5 = 1,625$
B	450	4.0	$450 \times 4 = 1,800$
C	550	6.0	$550 \times 6 = 3,300$
			Total = 6,725

Annual production capacity of one machine in standard hours

$$= 8 \times 288 = 2,304 \text{ hours/ year}$$

Number of machines required

$$= \text{Work load per year/Production capacity per machine}$$

$$= \frac{6,725}{2,304}$$

$$= 2.92 \text{ machines} = 3 \text{ machines.}$$

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

$$= 8 \times 250$$

$$= 2,000 \text{ hours per year}$$

$$\text{Number of machines required} = \frac{3,800}{2,000}$$

$$= 1.9 \text{ machines}$$

$$= 2 \text{ machines.}$$

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

$$(2.0 + 2x/60) \times 20 = (1.5 + 5x/60) \times 12$$

Or, $40 + 2x/3 = 18 + x$

Or, $x - 2x/3 = 40 - 18 = 22$

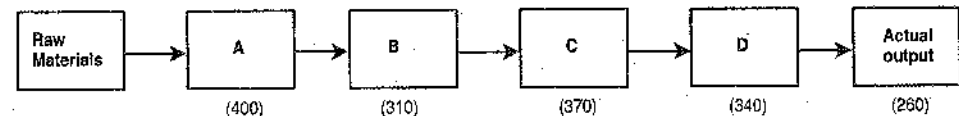
Or, $x/3 = 22$

Or, $x = 66 \text{ units.}$

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.

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



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

2018 - June [2] (b) The monthly requirement of raw material for a company is 3,200 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) $D = 3,200 \times 12 = 38,400$ units per annum
 $C_o = 28$
 $C_h = 2.5 + 25\% \text{ of } 24 = 8.5$
 $EOQ = \sqrt{[(2 \times 28 \times 38,400) / 8.5]} = 502.97 = 503$ 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;

$C_o = 28$;

$C_h = 2.5 + 25\% \text{ of } 22.56 = 8.14$

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

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

$= [(38,400 \times 28) / 514] + (38,400 \times 22.56) + [(514 \times 8.14) / 2]$

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

- (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;

$C_o = 28$

$C_h = 2.5 + 25\% \text{ of } 20.4 = 7.6$

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

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

$= [(38,400 \times 28) / 532] + (38,400 \times 20.4) + [(532 \times 7.6) / 2]$

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

- (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.

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:

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

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

$$= 290/70 = 4.143 \text{ approx.}$$

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

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

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

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

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

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

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						-

- (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 = $310/350 \times 100$ (i.e. maximum possible output) = 88.57%.

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

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

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

Hence, regression equation comes to $Y = 110 + 5x$

Sales forecast for the next years, i.e. 2011 to 2017

$$Y_{2011} = 110 + 5(+7) = 110 + 35 = ₹ 145 \text{ lakh}$$

$$Y_{2012} = 110 + 5(+9) = 110 + 45 = ₹ 155 \text{ lakhs}$$

$$Y_{2013} = 110 + 5(+11) = 110 + 55 = ₹ 165 \text{ lakhs}$$

$$Y_{2014} = 110 + 5(+13) = 110 + 65 = ₹ 175 \text{ lakhs}$$

$$Y_{2015} = 110 + 5(+15) = 110 + 75 = ₹ 185 \text{ lakhs}$$

$$Y_{2016} = 110 + 5(+17) = 110 + 85 = ₹ 195 \text{ lakhs}$$

$$Y_{2017} = 110 + 5(+19) = 110 + 95 = ₹ 205 \text{ lakhs}$$

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 (EBQ)

- Annual holding cost per component: ₹ $0.15 \times 12 = 1.8$
- $EBQ = \sqrt{(2 \times 25,000 \times 350) / 1.8}$
- $EBQ = \sqrt{(1,75,00,000) / 1.8}$
- $EBQ = \sqrt{97,22,222.22}$
- $EBQ = 3118$ units

- (ii) Interval between consecutive runs

- interval = $(3118 / 25,000) \times 3610$
- Interval = 45 days

- (iii) Minimum inventory holding cost
- Average inventory level = $3118 / 2 = 1,559$ units
 - Annual holding cost = $1,559 * 1.8$
 - Annual holding cost = ₹ 2,806.2

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)**

Answer:

- (i) Fit a straight line
- We use the equation of a straight line $y = a + bx$, where y is the production and x is the year.
- Step-by-Step Calculation:
- Assign X values (years):
 - $X = \text{Year} - 2013$
 - $X = 0, 2, 3, 4, 5, 6, 9$
 - Calculate the sums:
 - Sum of X : $0 + 2 + 3 + 4 + 5 + 6 + 9 = 29$
 - Sum of Y : $70 + 75 + 90 + 98 + 85 + 91 + 100 = 609$
 - Sum of XY : $(0 * 70) + (2 * 75) + (3 * 90) + (4 * 98) + (5 * 85) + (6 * 91) + (9 * 100) = 2190$
 - Sum of X squared: $(0 \text{ squared}) + (2 \text{ squared}) + (3 \text{ squared}) + (4 \text{ squared}) + (5 \text{ squared}) + (6 \text{ squared}) + (9 \text{ squared}) = 185$
 - Calculate a and b:
 - $b = (7 * 2190 - 29 * 609) / (7 * 185 - 29 \text{ squared})$
 - $b = (15330 - 17661) / (1295 - 841)$
 - $b = 267 / 454$

- b is approximately 3.146
- $a = (609 - 3.146 * 29) / 7$
- $a = (609 - 91.234) / 7$
- $a = 517.766 / 7$
- a is approximately 73.966
- so, the equation is $Y = 73.966 + 3.146x$

(ii) Estimate Production for 2020 and 2025

1. For 2020:

- $X = 2020 - 2013 = 7$
- Y for 2020 = $73.966 + 3.146 * 7$
- Y for 2020 is approximately 95.988 thousand tonnes

2. For 2025:

- $X = 2025 - 2013 = 12$
- Y for 2025 = $73.966 + 3.146 * 12$
- Y for 2025 is approximately 111.718 thousand tonnes

2023 - June [2] (b) (ii) The Sales of CTV (₹ In Million) of SONTON LTD. For the 5 years are given below:

Year	2014	2016	2018	2020	2022
Sales of CTV (₹ In Million)	18	21	23	27	16

Required:

Estimate the Trend values of Sales of CTV for the year of 2021, 2024 and 2026. **(6 marks)**

Answer:

Computation of Trend values

Years	Time deviation from 2018 (X)	Sales of CTV (₹ In millions) (Y)	Square of Time Deviation (X ²)	Product of Time deviation and Sales (XY)
2014	-4	18	16	-72
2016	-2	21	4	-42
2018	0	23	0	0

2020	2	27	4	54
2022	4	16	16	64
Total		105	40	4

Regression Equation of Y on X : $Y = a + bX$

To find the values of 'a' and 'b' ;

$a = \text{total of } Y / n = 105/5 = 21$; $b = \text{total of } XY / \text{total of } X^2 = 4/40 = 0.1$

Hence, the regression equation comes to $Y = 21 + 0.1X$

With the help of this equation, we can project the trend values for years 2021, 2024 and 2026

For year 2021, $X = 3$. So $Y = 21 + 0.1(3) = 21 + 0.3 = 21.3$ (in millions ₹) of sales

For year 2024, $X = 6$. So $Y = 21 + 0.1(6) = 21 + 0.6 = 21.6$ (in millions ₹) of sales

For year 2026, $X = 8$. So $Y = 21 + 0.1(8) = 21 + 0.8 = 21.8$ (in millions ₹) of sales

2023 - Dec [3] (b) The following table gives the age of cars of SKODA Make and its Annual Maintenance Cost.

Age of Cars in Years (X)	2	4	6	8
Maintenance cost (in thousand of ₹)(Y)	10	20	25	30

Required:

- (a) Fit a Linear Regression of Y on X
- (b) Estimate: (i) Maintenance Cost for Age of Cars of 10 years
(ii) Age of car in years for Maintenance cost of ₹ 50,000
(7 marks)

Answer:

Age of Cars in Years (X)	Maintenance Cost (in thousand of Rupees) (Y)	Squares of Age of Cars (X^2)	Product of Age and Maintenance Cost (XY)
2	10	4	20
4	20	16	80

6	25	36	150
8	30	64	240
$\Sigma X = 20$	$\Sigma Y = 85$	$\Sigma X^2 = 120$	$\Sigma XY = 490$

Regression equation of Y on X is:

$$Y = a + bX$$

$$\Sigma Y = na + b \Sigma X$$

$$\Sigma XY = a \Sigma X + b \Sigma X^2$$

By putting the values we have,

$$85 = 4a + 20b \dots\dots\dots(1)$$

$$490 = 20a + 120b \dots\dots\dots(2)$$

Solving (1) and (2) we have, $a = 5$ and $b = 3.25$

Required equation is $Y = 5 + 3.25X$

Maintenance cost for age of cars of 10 years

$$Y = 5 + 3.25 \times 10$$

$$Y = 5 + 32.5 = ₹ 37.5 \text{ thousand or ₹ } 37,500$$

Age of car in years for maintenance cost of ₹ 50,000

$$50 = 5 + 3.25X$$

$$3.25X = 45$$

$$X = \frac{45}{3.25} = 13.85 \text{ years.}$$

2024 - June [3] (b) **RONTEX Ltd.**, a medium size manufacturing Company has provided productions analysis of Coriander powder (in Lakh tonnes) for the years 2015 to 2023 as follows:

Year	2015	2017	2019	2021	2023
Productions of Coriander powder (in Lakh Tonnes)	54	63	69	81	48

(Present Calculation up to two decimal Points)

Required:

- (i) Using the methods of least Squares Analyze a Straight line value.
- (ii) Assess the estimated Production (in Lakh Tonnes) of Coriander Powder for the years 2014 and 2028.
(7 marks)

Answer:

Years	Time Deviation X	Production (In Lakh Tonnes) y	X ²	Xy
2015	-4	54	16	-216
2017	-2	63	4	-126
2019	0	69	0	0
2021	+2	81	4	+162
2023	+4	48	16	+192
n = 5	Σx = 0	Σy = 315	ΣX ² = 40	Σxy = +12

$Y = a + bx$

$a = \frac{\sum y}{n} = \frac{315}{5} = 63$

$b = \frac{\sum xy}{\sum x^2} = \frac{12}{40} = 0.3$

$y = 63 + 0.3x$

(Which is the equation of Straight line Trend)

(ii) **Assessment of Sales (in Lakh Tonnes) for:**

Year 2014 = $63 + 0.30 \times (-5) = 63 - 1.5 = 61.50$ Lakh Tonnes.

Year 2028 = $63 + 0.30 \times 9 = 63 + 2.7 = 65.70$ Lakh Tonnes.

2024 - Dec [3] (b) METRO-WALLS ICE CREAM PARLOUR observed that during summer months the daily sales of its ice cream depends on the average day temperature as shown in the following Table:

Average Day Temperature in Centigrade (X)	20	25	30	35	40
Daily Sale of Ice Cream (in Thousand ₹) (Y)	10	20	30	40	50

Required:

- (i) Fit a linear regression of Y on X.
- (ii) Estimate the trend values of daily sales of ice cream for average day temperature of 32 and 42 centigrade.
- (iii) Estimate the Average Day Temperature (in Centigrade) for the daily sale of ice cream of ₹ 60 thousands. **(7 marks)**

Paper 9 Operations Management and Strategic Management		
Feedback	I Need More	Scanner Preparation Key
		
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Checklists for Operations Planning

- **Understand Key Aspects of Operations Planning:**
 - **Forecasting:** Predict future demand using qualitative and quantitative methods.
 - **Capacity Planning:** Ensure the organization has the ability to meet demand.
 - **Scheduling:** Allocate resources effectively over time.
 - **Inventory Planning:** Balance inventory levels to avoid stockouts or overstocking.
 - **Resource Planning:** Align human, material, and financial resources.

Key Models and Techniques:

- Aggregate Planning.
- Master Production Schedule (MPS).
- Material Requirements Planning (MRP).
- Enterprise Resource Planning (ERP).
- Review Real-Life Examples:
 - Just-in-Time (JIT) inventory by Toyota.
 - Demand forecasting by Amazon.

Fun Flows

- **Make the concepts easier to understand with simple diagrams or mnemonics:**
Forecasting - Aggregate Planning - Scheduling - Execution - Feedback.
Demand - Resource Allocation - Capacity Utilization - Output.

Challenges in Operations Planning

- **Unpredictable Demand:**
Fluctuations in customer preferences or market conditions.
- **Limited Resources:**
Balancing capacity and demand with constrained resources.
- **Coordination Issues:**
Miscommunication between departments or teams.
- **Supply Chain Disruptions:**
Delays in procurement or logistics.
- **Technological Adaptation:**
Challenges in implementing ERP systems or automation tools.

Motivational Quotes

- "Failing to plan is planning to fail." – Alan Lakein
- "A goal without a plan is just a wish." – Antoine de Saint-Exupéry
- "Good planning without good working is nothing." – Dwight D. Eisenhower

Smart Study Tips

- **Visual Learning:**
Use flowcharts to connect concepts like capacity planning and scheduling.
- **Relate to Practical Scenarios:**
Think about how companies like McDonald's plan their inventory and schedules.

- **Group Discussions:**

Discuss problems like demand forecasting methods or bottleneck identification with peers.

- **Case Study Approach:**

Analyze how operational planning helped companies succeed or fail.

- **Mock Planning Exercises:**

Try creating a simple operational plan for a fictional business.

Keywords to Focus On

- Aggregate planning.
- Capacity utilization.
- Scheduling techniques (Gantt charts, Critical Path Method).
- Demand forecasting.
- Resource leveling.
- Lead time.
- Load balancing.
- Bottleneck analysis.

How to Perform Well in Exams

- **Break Down Questions:**

Understand if the question focuses on forecasting, scheduling, or capacity planning.

- **Answer Structurally:**

Begin with definitions, proceed with explanations, and conclude with applications.

- **Use Graphs and Charts:**

Visual aids like Gantt charts or demand-supply graphs can enhance answers.

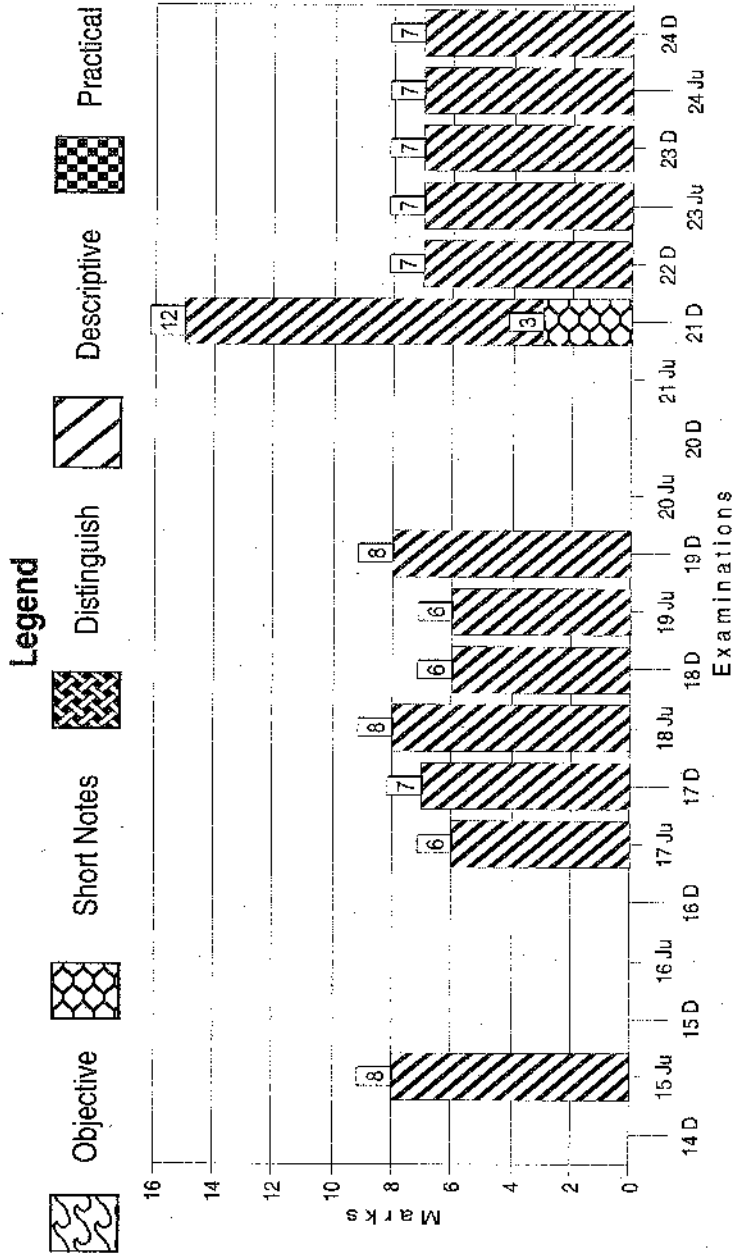
- **Prioritize High-Value Questions:**

Spend more time on case-study-based or numerical questions.

- **Revise Key Formulas:**

For demand forecasting (e.g., Moving Average, Exponential Smoothing).

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



CHAPTER	<h1>3</h1>	<h2>Designing of Operational Systems and Control</h2>
THIS CHAPTER INCLUDES		
1. Production Design	3. Product Life Cycle	
2. Process Design and Selection	4. Process Planning and Selection	
	5. Design Thinking	

Quick Look	<i>Weightage Analysis</i>
Repeatedly Asked Questions	
2022 - Dec [3] (a), 2024 - June [2] (b)	

PAST YEAR QUESTIONS AND ANSWERS

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:

- (a) How much variety of products or services will the system need to handle?
- (b) What degree of equipment flexibility will be needed?
- (c) What is the expected volume of output?

- (c) To reduce the development time and cost to the minimum.
- (d) To reduce the cost of the product.
- (e) To ensure productibility or manufacturability (design for manufacturing and assembly).

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:

1. Translating customer needs and wants into product and service requirements (marketing).
2. Refining existing products (marketing).
3. Developing new products (marketing, product design and production).
4. Formulating quality goals (quality assurance, production).
5. Formulating cost targets (accounting).
6. Constructing and testing prototype (marketing, production).
7. Documenting specifications (product design).

Objectives of Product Design:

- (a) The overall objective is profit generation in the long run.
- (b) To achieve the desired product quality.

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.

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.**

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.

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.

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:

1. Translating customer needs and wants into product and service requirements (marketing).
2. Refining existing products (marketing).
3. Developing new products (marketing, product design and production).
4. Formulating quality goals (quality assurance, production).
5. Formulating cost targets (accounting).
6. Constructing and testing prototype (marketing, production).
7. Documenting specifications (product design).

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.

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:

1. Characteristics of the product or service offered to the customers.
2. Expected volume of output.
3. Kinds of equipments and machines available in the firm.
4. Whether equipments and machines should be of special purpose or general purpose.
5. Cost of equipments and machines needed.
6. Kind of labour skills available, amount of labour available and their wage rates.
7. Expenditure to be incurred for manufacturing processes.

8. Whether the process should be capital-intensive or labour-intensive.
9. Make or buy decision.
10. Method of handling materials economically.

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

2021 - Dec [17] What is the term "Aesthetics"? (1 mark) [Sec. B - SAQ]

Answer:

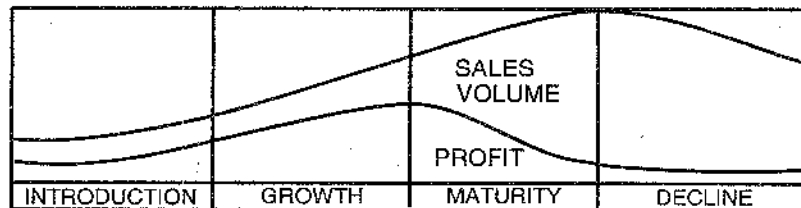
This includes style, colour, look, feel, etc. which appeals to the human sense and adds value to the product.

2021 - Dec [2] State the reasons, why Production or Operations Strategy is directly influenced by product design? (4 marks) [Sec. C - One LAQ]

Answer:

- (a) As products are designed, all the detailed characteristics of each product are established.
- (b) Each product characteristic directly affects how the product can be made or produced and
- (c) How the product is made determines the design of the production system (production design) which is the heart of production and operations strategy.

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.

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

Answer:**Characteristics of Good Product Design**

A good product design must ensure the following:

1. **Function or performance:** The function or performance is what the customer expects the product to do to solve his/her problem or offer certain benefits leading to satisfaction. For example, a customer for a motor bike expects the bike to start with a few kicks on the kick peddle and also expects some other functional aspects such as pick-up, maximum speed, engine power and fuel consumption etc.
2. **Appearance or aesthetics:** This includes the style, colour, look, feel, etc. which appeals to the human sense and adds value to the product.
3. **Reliability:** This refers to the length of time a product can be used before it fails. In other words, reliability is the probability that a product will function for a specific time period without failure.
4. **Maintainability:** Refers to the restoration of a product once it has failed. High degree of maintainability is desired so that the product can be restored (repaired) to be used within a short time after it breaks down. This is also known as serviceability.
5. **Availability:** This refers to the continuity of service to the customer. A product is available for use when it is in an operational state. Availability is a combination of reliability and maintainability. High reliability and maintainability ensures high availability.
6. **Productibility:** This refers to the ease of manufacture with minimum cost (economic production). This is ensured in product design by proper specification of tolerances, use of materials that can be easily processed and also use of economical processes and equipments to produce the product quickly and at a cheaper cost.
7. **Simplification:** This refers to the elimination of the complex features so that the intended function is performed with reduced costs, higher quality or more customer satisfaction. A simplified design has fewer parts which can be manufactured and assembled with less time and cost.

8. **Standardization:** Refers to the design activity that reduces variety among a group of products or parts. For example, group technology items have standardized design which calls for similar manufacturing process steps to be followed. Standard designs lead to variety reduction and results in economies of scale due to high volume of production of standard products. However, standardised designs may lead to reduced choices for customers.
9. **Specification:** A specification is a detailed description of a material, part or product, including physical measures such as dimensions, volume, weight, surface finish etc. These specifications indicate tolerances on physical measures which provide production department with precise information about the characteristics of products to be produced and the processes and production equipments to be used to achieve the specified tolerances (acceptable variations). Interchangeability of parts in products produced in large volumes (mass production and flow-line production) is provided by appropriate specification of tolerances to facilitate the desired fit between parts which are assembled together.
10. **Safety:** The product must be safe to the user and should not cause any accident while using or should not cause any health hazard to the user. Safety in storage, handling and usage must be ensured by the designer and a proper package has to be provided to avoid damage during transportation and storage of the product. For example, a pharmaceutical product while used by the patient, should not cause some other side effect threatening the user.

2023 - June [3] (a) The Design Thinking can be thought of as a five stage process. Are these stages performed in a sequential order?

Examine each stage of Design Thinking.

(7 marks)

Answer:

Design thinking is a non-linear, iterative process that seeks to understand users' needs, challenge assumptions, redefine problems and create innovative solutions to prototype and test. This is involving 5 phases – Empathize, Define, Ideate, Prototype and Test – it is most useful to tackle problems that are ill defined or unknown.

The 5 stages of Design Thinking:

The Hasso Plattner Institute of Design at Stanford (a.k.a the d. school) describes design thinking as a 5 stage process. It is to be noted that these stages are not always sequential and teams often run them in parallel, out of order and repeat them in an iterative fashion.

Stage 1 – Empathize – Research your users’ needs:

Here, you should gain an empathetic understanding of the problem you’re trying to solve, typically through user research. Empathy is crucial to a human centered design process such as design thinking because it allows you to set aside your own assumptions about the world and gain real insight into users and their needs.

Stage 2 – Define – state your users’ needs and problems:

It’s time to accumulate the information gathered during the Empathize stage. You then analyse your observations and synthesize them to define the core problems you and your team have identified. These definitions are called problem statements. You can create personas to help keep your efforts human centered before proceeding to ideation.

Stage 3 – Ideate – Challenge assumptions and create ideas:

Now you are ready to generate ideas. The solid background of knowledge from the first two phases means you can start to “think outside the box”, look for alternative ways to view the problem and identify innovative solutions to the problem statement you’ve created. Brainstorming is particularly useful here.

Stage 4 – Prototype – start to create solutions:

This is an experimental phase. The aim is to identify the best possible solution for each problem found. Your team should produce some inexpensive, scaled down versions of the product (or specific features found within the product) to investigate the ideas you’ve generated. This could involve simply paper prototyping.

Stage 5 – Test – Try your solutions out:

Evaluators rigorously test the prototypes. Although this is the final phase, decision making is iterative. Teams often use the results to redefine one or more further problems. So you can return to previous stages to make further iterations, alterations and refinements – to find or rule out alternative solutions.

2023 - Dec [2] (b) You are working as a Production Manager in a Manufacturing unit. You are required to determine whether resources are to be organized around products or process in order to implement the flow strategy. In this context, describe in brief the basic process types to be chosen. (Any seven) **(7 marks)**

Answer:

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

These major process decisions are discussed in detail in the following paragraphs:

Process Choice: The production manager has to choose from five basic process types — (i) job shop, (ii) batch, (iii) repetitive or assembly line, (iv) continuous and (v) project.

- 1. 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 frms. A job shop uses a flexible flow strategy, with resources organised around the process.
- 2. 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.
- 3. Repetitive process:** This is used when higher volumes of more standardised goods or services are needed. This type of process is 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 include 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.

4. **Continuous process:** This is used when a very highly standardised product is desired in high volumes. These systems have almost no variety in output and hence there is no need for equipment flexibility. A continuous process is the extreme end of high volume, standardised production with rigid line flows. The process often is capital intensive and operate round the clock to maximise equipment utilisation and to avoid expensive shut downs and shut ups. Examples of products made in continuous process systems include petroleum products, steel, sugar, flour, paper, cement, fertilisers etc.
5. **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.

2024 - June [2] (b) “Customers pay for the products that best fulfil their requirements and provide them the desired value”. In this Context append the characteristics of a good product design. **(7 marks)**

Answer:

Please refer 2022 - Dec [3] (a) on Page no. 58

2024 - Dec [2] (b) What is Design Thinking? Briefly discuss the five stages of Design Thinking. **(7 marks)**

Paper 9 Operations Management and Strategic Management		
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Marks of Objective, Short Notes, Distinguish Between, Descriptive & Practical Questions

Legend



Objective



Short Notes



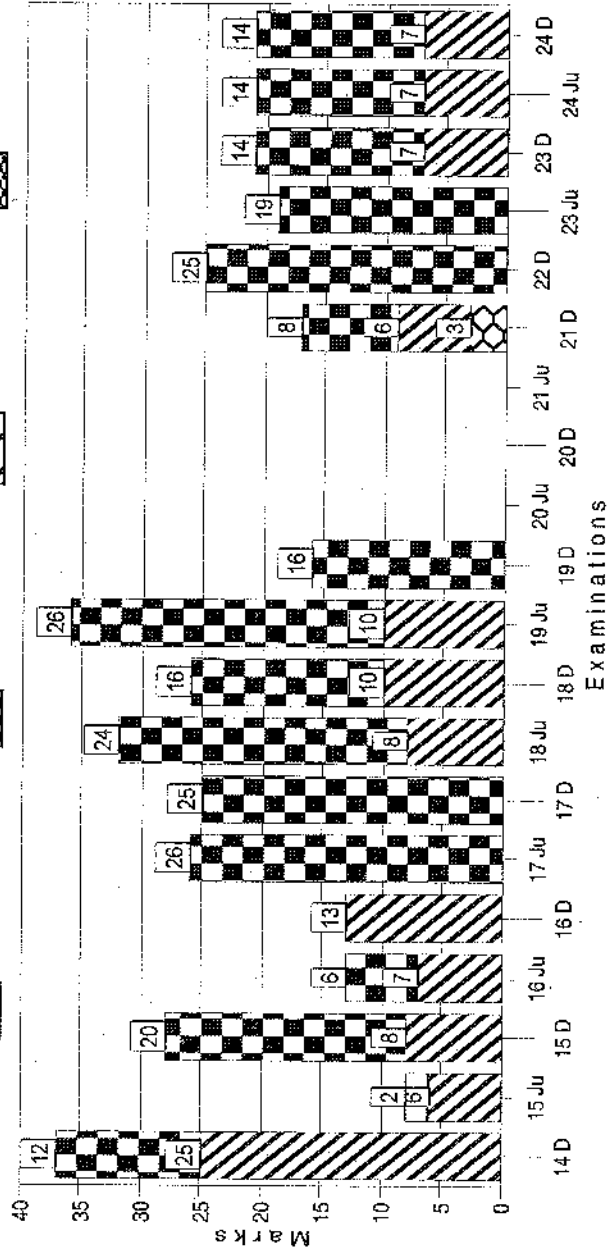
Distinguish



Descriptive



Practical



CHAPTER 4	Application of Operation Research-Production Planning and Control
THIS CHAPTER INCLUDES	
<ol style="list-style-type: none"> 1. Introduction 2. Production Planning and Control 3. Control Measures -Time & Motion Study, Method Study, Work Study 4. Optimum Allocation of Resources - LLP 	<ol style="list-style-type: none"> 5. Transportation 6. Job Evaluation, Job Allocation - Assignment 7. Scheduling and Queuing Models 8. Simulation and Line Balancing 9. Lean Operations 10. Just-In-Time (JIT)

Quick Look	<i>Weightage Analysis</i>
Repeatedly Asked Questions	
2019 - June [3] (b), 2023 - Dec [3] (a)	

PAST YEAR QUESTIONS AND ANSWERS

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

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

Answer:**Phases of the simulation process:**

- Definition of the problem and statement of objectives.
- Construction of an appropriate model.
- Experimentations with the model constructed.
- Evaluations of the results of simulations.

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:

- Estimating
- Routing
- Scheduling
- Loading

2014 - Dec [2] Answer the question:

- (ii) List the advantages of Method Study. (6 marks)
- (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)
- (i) Classify the functions of Production Planning & Control. (9 marks)
- (i) What are the managerial considerations in Scheduling? (3 marks)

Answer:

(a) (ii) **Advantages of Method Study:**

- Work simplification.
- Improved working method.
- Improvement of quality of the products.
- The improvement of factory, shop and workplace layout.
- The improvement of the design of plant and equipment.
- Better working conditions/environment.
- Better material handling and lesser material handling cost.
- The improvement of processes and procedures.
- Improvements in the use of materials, machines and manpower.
- Less fatigue to operator.
- Optimum utilization of all resources.
- Higher safety to workmen.
- Shorter production cycle time.
- The improvement of the design of plant and equipment.
- 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.

(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.
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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	<ul style="list-style-type: none"> 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.
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<ul style="list-style-type: none"> 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.
<ul style="list-style-type: none"> In all these scheduling tasks, different criteria may be used in deciding which of several schedules is best.
<ul style="list-style-type: none"> 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.
<ul style="list-style-type: none"> 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:
<ul style="list-style-type: none"> (a) Providing the product or service when the customer wants it. (b) Minimising the length of time taken to produce that product or service. (c) Minimising the level of work-in-progress (WIP) inventories. (d) Minimising the amount of idle time of equipment or machine. (e) Minimising the amount of idle time of employees; and (f) Minimising costs.

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:

(a)	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.
(b)	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.
(c)	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.

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:

- Definition of the problem and statement of objectives
- Construction of an appropriate model
- Experimentations with the model constructed
- Evaluations of the results of simulations.

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.

2016 - June [1] Answer the question:

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

(i) \bigcirc (ii) \Rightarrow

(2 marks)

Answer:

- Operation
- Transportation or movement

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.,

- Effective use of the operator
- Arrangement of the workplace
- Tools are equipment.

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:

1. 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.
2. 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.
3. 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.
4. Manpower	Planning for man power (labour, supervisory and managerial levels) having appropriate skills and expertise.
5. 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.
6. Estimating	Establishing operation times leading to fixation of performance standards both for workers and machines.
7. 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.

8. 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.
9. 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.
10. 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.
11. Evaluating	The objective of evaluation is to improve performance. Performance of machines, processes and labour is evaluated to improve the same.
12. Cost Control	Manufacturing cost is controlled by wastage reduction, value analysis, inventory control and efficient utilization of all resources.

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

(5 marks) [Sec. B]

Answer:

Objectives of Scheduling are given below:

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

- (c) 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.
- (d) To fix up delivery dates for various manufacturing activities and for the finished products.
- (e) To increase the efficiency of production or productivity.

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.

2018 - Dec [3] (b) Describe the objectives of Production Planning and Control. **(10 marks)**

Answer:

Objectives of Production Planning and Control are as follows:

1. Analysing the orders to determine the raw materials and parts that will be required for their completion,
2. Answering questions from customers and salesmen concerning the status of their orders,
3. Assisting the costing department in making cost estimates of orders,
4. Assisting the human resource departments in the manpower planning and assignment of men to particular jobs,
5. Controlling the stock of finished parts and products,
6. Determining the necessary tools required for manufacturing,
7. Direction and control of the movement of materials through production process,
8. Initiating changes in orders as requested by customers while orders are in process,
9. Issuing requisitions for the purchase of necessary materials,
10. Issuing requisitions for the purchase or manufacture of necessary tools and parts,

11. Keeping the up-to-date records scheduled and in process,
12. Maintaining stocks of materials and parts,
13. Notifying sales and accounting of the acceptance of orders in terms of production feasibility,
14. Preparing the route sheets and schedules showing the sequence of operation required to produce particular products,
15. Production of work orders to initiate production activities,
16. Receiving and evaluating reports of progress on particular orders and initiating corrective action, if necessary,
17. Receiving orders from customers,
18. Revising plans when production activities cannot conform to original plans and when revisions in scheduled production are necessary because of rush orders.

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

(10 marks)

Answer:

Production Control can be of six types:

1. **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.
2. **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.
3. **Load Control:**
Load control is typically found wherever a particular bottleneck machine exists in the process of manufacturing.

4. **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.

5. **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.

6. **Batch Control:**

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

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:

- (a) Produce only the products (goods or services) that customers want.
- (b) Produce products only as quickly as customers want to use them.
- (c) Produce products with perfect quality.
- (d) Produce in the minimum possible lead times.
- (e) Produce products with features that customers want and no others.
- (f) Produce with no waste of labour, materials or equipment, designate a purpose for every movement to leave zero idle inventory.

2023 - Dec [3] (a) Summarize the Basic types of Production Control. **(7 marks)**

Answer:

Please refer 2019 - June [3] (b) on page no. 79

2024 - June [3] (a) "Production Control involves the various functions". In accordance with this align these said functions. **(7 marks)**

Answer:

The Functions involved in Production Control are discussed follows:

1. Planning the production operations in detail.
2. Routing, i.e., laying down the path for the work to follow and the order in which the various operations will be carried out,
3. Scheduling, i.e., establishing the quantity of work to be done, and fixing the time table for performing the operations,
4. Dispatching, i.e., issuing the necessary orders, and taking necessary steps to ensure that the time targets set in the schedules are effectively achieved,
5. Follow-up, taking necessary steps to check up whether work proceeds according to predetermined plans and how far there are variances from the standards set earlier,
6. Inspection, i.e., conducting occasional check-ups of the products manufactured or assembled to ensure high quality of the production.

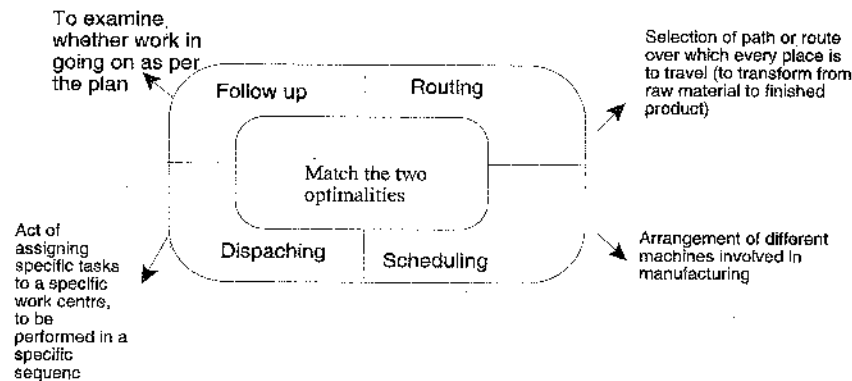


Figure: Techniques of Production Control

2024 - Dec [3] (a) "Production Planning and Control fulfils its various objectives by focusing on the several important points/issues." With reference to this statement, append those said important points/issues. (Any Ten) **(7 marks)**

PRACTICAL QUESTIONS

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. **(1x5 =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.

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 outliers 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 outliers 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
 $= 7.96 + \frac{13}{100} \times 7.96 + \frac{4}{100} \times 7.96$
 $= 7.96 + 1.035 + 0.318$
 $= 9.313$ minutes

If 25% incentive allowance is given, total time allowed under incentive scheme = $9.313 + \frac{25}{100} \times 9.313$
 $= 9.313 + 2.328 = 11.641$ 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

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 = $9.0 \times 0.90 = 8.1$ minutes
 Standard Time = $\frac{8.1}{1 - 0.15} = 9.53$ 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 $60 \times 100 / 423 = 14.18$ 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 $60 \times 100/323 = 18.58$ 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 $7/16 \times 100 = 44$ (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.

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	= 2,597
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.

(7 marks)

Answer:

Actual working time in the duration of 100 hours = $100 \times \frac{2,000}{2,597} = 77.01$ hours

Time taken per article = $\frac{77.01 \times 60}{5,000} = 0.924$ minute

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

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

Normal labour time per unit = Observed time/unit \times Rating factor
= $0.693 \times 1.20 = 0.8316$ 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

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	7,000
No. of Idle activities	1,200
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 (T_o) = $\frac{\text{Duration of study}}{\text{Number of jobs produced during study}} = \frac{120 \times 60}{800} = 9$ min.

(b) Effective time per piece (T_e) = $T_o \times \frac{\text{Production observation}}{\text{Total observation}} = 9 \times \frac{5,800}{7,000} = 7.46$ min.

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

Machine controlled time per piece (T_m) = $7.46 \times 1/4 = 1.87$ min.

Hand controlled time per piece (T_h) = $7.46 \times 3/4 = 5.59$ min.

Normal time per piece = $T_m + T_h \times \text{performance rating} = 1.87 + 5.59 \times 1.2 = 8.58$ min.

Standard time per piece = $8.58 (1 + 0.17) = 10.04$ minutes.

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:

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

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

$$\begin{aligned} \text{Standard time per unit} &= 6 + 1.8 \\ &= 7.8 \text{ minutes /units} \end{aligned}$$

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

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:

- Actual working time in the duration of 100 hours = $100 \times (2,000/2,600)$
= 76.923 hours
- Time taken per article = $(76.923 \times 60)/5,000 = 0.923$ minute
- Observed manual labour time per article = $0.923 \times (3/4) = 0.6922$ minute
- Observed machine time per article = $0.923 \times (1/4) = 0.230$ minute
- Normal labour time per unit = Observed time/unit \times Rating factor =
 $0.6922 \times 1.20 = 0.8306$ minute
- Standard labour time per unit = $0.8306 + (15/100) \times 0.8306 = 0.9552$ minute
- Standard time per unit of article produced = $0.9552 + 0.230 = 1.185$ minutes.

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
	$\Sigma f = 50$	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

$$\text{Average weekly demand} = \frac{114}{10} = 11.4$$

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

Calculate the amount of

- Incentive bonus and
- 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
- 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 = $40 \times 10 = 400$, working time = $8 - 3 = 5$ hours = 300 minutes.

Performance = $(400 \times 100) / 300 = 133.34\%$ or 0.3333

- Incentive bonus = $0.3333 \times 5 \times 5 = ₹ 8.33$ for five hours on measured work
- Guaranteed wage for 8 hours = $8 \times 5 = ₹ 40$;
Total earnings for the day = ₹ $(8.33 + 40) = ₹ 48.33$
- Net labour productivity = Output in units/Net person hours = $10 / 5 = 2$ sets per hour.

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:

- Average Queue Length
- Average Length of non-empty queues
- Average number of workers in system including the worker being attended **(3 × 3 = 9 marks)**

Answer:

Arrival Rate: $\lambda = 60/60$ per second = 1 per minute

Service Rate: $\mu = 60/48$ per second = 1.25 per minute

- Average Queue Length:

$$L_q = (\lambda/\mu) \times [\lambda/(\mu - \lambda)] = (1/1.25) \times [(1/(1.25 - 1))] \\ = 1/(1.25 \times 0.25) \\ = 16/5 \\ = 3.2 \text{ workers}$$

- Average Length of non-empty queues:

$$L_n = [\mu/(\mu - \lambda)] = 1.25/(1.25 - 1) \\ = 1.25/0.25 \\ = 5 \text{ workers}$$

- Average Number of workers in system:

$$L_s = [\lambda/(\mu - \lambda)] = 1/(1.25 - 1) \\ = 1/0.25 \\ = 4 \text{ workers}$$

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.,

- FCFS
- EDD
- LS
- SPT
- 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

- (a) **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.
- (b) **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).
- (c) **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)

- (d) **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)

- (e) **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)

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 x 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

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	8	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.

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:

- The average number of machinists being served or waiting to be served at any given time.
 - The average time a machinist spends waiting for service.
 - The total cost of operating the system for an eight-hour day.
 - 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: $= \lambda = 3$ per hour

Service Rate: $= \mu = 4$ per hour

- The average number of machinists being served or waiting to be served at any given time:

$$L_n = [\lambda / (\mu - \lambda)] = 3 / (4 - 3) = 3$$

- The average time a machinist spends waiting for service:

$$W_q = [(\lambda / \mu) \times 1 / (\mu - \lambda)] = (3 / 4) \times 1 / (4 - 3) = 0.75 \text{ hours} = 45 \text{ minutes.}$$

- Average time in the system:

$$W_s = [1 / (\mu - \lambda)] = 1 / (4 - 3) = 1 \text{ hr.}$$

Average number of machinists in the system = 3 [As per (i) above]

Cost of three machinists being away from work = $5 \times 3 = 15$ 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 :

$$17 \times 8 = 136$$

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

= 6 per hour.

=> Now $\lambda = 3$ per hour

$\mu = 6$ 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.

= $(1/3) \times 60 = 20$ minutes.

Machinists Cost = $1/3$ hour $\times 5 =$	1.67
Attendant Cost	4.00
Total Cost	5.67

Cost per 8 hour day = $5.67 \times 8 = 45.36$

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

	C	D	E	B	A	F
Sequence =	- 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

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_i - > Warehouse

F_i - > 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				150
F2	60	210			270
F3		120	250		370
F4			10	220	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
	$\sum f = 50$	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: $162/10 = 16.2$

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	Job			
	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.

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:

- System utilization
- Percentage of time the server (agent) will be idle.
- The expected number of customers waiting to be served
- The average time customers will spend in the system. **(8 marks)**

Answer:

Arrival Rate = $\lambda = 18$ customers per hour

Service Rate = $\mu = 1/\text{service time} = (1 \text{ customer} / 2.5 \text{ minutes}) \times 60$
minutes per hour = 24 customers per hour

- System Utilisation = $p = \lambda / \mu = 18 / (1 \times 24) = 0.75$
- Percentage idle time = $1 - p = 1 - 0.75 = 0.25$, or 25 percent
- Expected no. of customers waiting to be served = $L_q = \lambda^2 / \mu(\mu - \lambda)$
 $= (18)^2 / [24 \times (24 - 18)] = 2.25$ customers
- Average time customers will spend in the system =
 $W_s = (L_q / \lambda) + (1 / \mu) = (2.25 / 18) + (1 / 24) = 0.1667 \text{ hrs} = 10 \text{ minutes.}$

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

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_i = 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	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 ₹

(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 = $135/10 = 13.5$

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

We need to determine the sequence for performing the jobs that would minimize the total elapsed time (T).

Steps to Find the Optimal Sequence:

1. Identify the shortest processing time among all jobs.
2. If the shortest time is on Machine A, place that job as early as possible in the sequence.
3. If the shortest time is on Machine B, place that job as late as possible in the sequence.
4. Remove the scheduled job from the list and repeat the process until all jobs are scheduled.

Step-by-Step Process:

1. Identify the shortest time: Job 4 on Machine A: 1 hour
2. Place Job 4 first in the sequence: Sequence: Job 4, Remaining Jobs: 1, 2, 3, 5, 6
3. Identify the next shortest time: Job 2 on Machine B: 2 hours
4. Place Job 2 last in the sequence: Sequence: Job 4, ..., Job 2, Remaining jobs: 1, 3, 5, 6
5. Identify the next shortest time: Job 6 on Machine B: 2 hours
6. Place Job 6 before Job 2 in the sequence: Sequence: Job 4, ..., Job 6, Job 2, Remaining jobs: 1, 3, 5
7. Identify the next shortest time: Job 3 on Machine A : 3 hours
8. Place Job 3 after Job 4 in the sequence: Sequence: Job 4, Job 3, ..., Job 6, Job 2, Remaining jobs: 1, 5
9. Identify the next shortest time: job 1 on Machine B: 4 hours
10. Place Job 1 before Job 6 in the sequence: Sequence: Job 4, Job 3, Job 1, Job 6, Job 2, Remaining jobs: 5
11. Place the remaining job: Sequence: Job 4, Job 3, Job 1, Job 5, Job 6, Job 2

Final Sequence:

Job 4, Job 3, Job 1, Job 5, Job 6, Job 2

Calculate Total Elapsed Time (1):

Job 4: Machine A : 1 hour (0 to 1), Machine B: 6 hours (1 to 7)

Job 3: Machine A: 3 hours (1 to 4), Machine B: 8 hours (7 to 15)

Job 1: Machine A: 6 hours (4 to 10), Machine B: 4 hours (15 to 19)

Job 5: Machine A: 9 hours (10 to 19), Machine B: 5 hours (19 to 24)

Job 6: Machine A: 7 hours (19 to 26), Machine B: 2 hours (26 to 28)

Job 2: Machine A: 5 hours (26 to 31), Machine B: 2 hours (31 to 33)

Summary:

The value of T, the total elapsed time, is 33 hours.

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 come 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)

Answer:

- (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	C	E	B	D	A
Number of days until due date	2	4	7	8	12

- (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	Number of days until due date	Number of days of work remaining	Slack (days)
A	12	13	12-13 = -1
B	7	9	7-9 = -2
C	2	5	2-5 = -3
D	8	4	8-4 = 4
E	4	1	4-1 = 3

Sequence

Job	C	B	A	E	D
Slack	-3	-2	-1	3	4

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.

Job	E	D	C	B	A
Processing time (days) / Number of days of work remaining	1	4	5	9	13

- (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.

Job	A	B	C	D	E
Processing time (days) / Number of days of work remaining	13	9	5	4	1

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)

Answer:

Relative Loss Matrix

Sales Man \ City	A	B	C	D
I	0	7	14	21
II	12	17	22	27
III	12	17	22	27
IV	18	22	26	30

As this is a problem of Maximization, the same is converted to one of Minimization by forming a Relative Loss Matrix where all the elements of the given matrix are subtracted from the highest element of the matrix (which is 47 in this case).

Matrix after Row Operation

Sales Man \ City	A	B	C	D
I	0	7	14	21
II	0	5	10	15
III	0	5	10	15
IV	0	4	8	12

Matrix after Column Operation

Sales Man \ City	A	B	C	D
I	0	3	6	9
II	0	1	2	3
III	0	1	2	3
IV	0	0	0	0

Here minimum no. of horizontal and vertical straight lines to cover all the zeros = 2 ≠ Order of the matrix (4)
So the solution is non optimal.

Improved Matrix (Non Optimal)

Sales Man \ City	A	B	C	D
I	0	2	5	8
II	0	0	1	2
III	0	0	1	2
IV	1	0	0	0

Here minimum no. of horizontal and vertical straight lines to cover all the zeros = 3 ≠ Order of the matrix (4)
So the solution is non optimal.

Further Improved Matrix [Optimal Solution (i)]

Sales Man \ City	A	B	C	D
I	0	2	4	7
II	0	0	0	1
III	0	0	0	1
IV	2	1	0	0

Here minimum no. of horizontal and vertical straight lines to cover all the zeros = 4 = Order of the matrix. So the solution is optimal.

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)

Answer:

Arrival rate = 25 customers per hour ; Service Time = 60/2 = 30 customers per hour.

- (i) System Utilization = $25/30 = 0.83$
- (ii) Percentage of time the server (Agent) will be idle = $1 - 0.83 = 0.17$ or 17%
- (iii) Expected number of customers waiting to be served = $[(25)^2] / [30(30-25)] = 625/150 = 4.167$ customers
- (iv) Average time customers will spend in the system = $(4.167/25) + (1/30) = 0.167 + 0.033 = 0.20$ hours = $(0.20 \times 60) = 12$ minutes

2023 - June [3] (b) Below 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.

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

Further Improved Matrix [Optimal Solution (ii)]

Sales Man \ City	A	B	C	D
I	0	2	4	7
II	0	0	0	1
III	0	0	0	1
IV	2	1	0	0

(ii)

₹ in lakh					
Assignment as per Solution (i)			Assignment as per Solution (ii)		
Sales man	City	Sales	Sales man	City	Sales
I	A	47	I	A	47
II	B	30	II	C	25
III	C	25	III	B	30
IV	D	17	IV	D	17
Total		119	Total		119

Required:

Sequence the jobs according to priority established by:

- (i) Early Due Date (EDD) Rule **(2 marks)**
- (ii) Least Slack (LS) Rule **(2 marks)**
- (iii) Longest Processing Time (LPT) Rule **(2 marks)**
- (iv) Critical Ratio Rule **(2 marks)**

Answer:

- (i) **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	C	B	A	E	D
Number of days until due date	2	4	6	7	8

- (ii) **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	Number of days until due date	Number of days of work remaining	Slack (days)
A	6	3	6 - 3 = 3
B	4	8	4 - 8 = -4
C	2	5	2 - 5 = -3
D	8	6	8 - 6 = 2
E	7	2	7 - 2 = 5

Sequence

Job	B	C	D	A	E
Slack	-4	-3	2	3	5

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

- (iii) **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.

Job	B	D	C	A	E
Processing time (days) / Number of days of work remaining	8	6	5	3	2

- (iv) **Critical Ratio Rule:**
Critical Ratio = Number of days until due date / Number of days of work remaining
Critical ratio for Job A = 6/3 = 2
Critical ratio for Job B = 4/8 = 0.5
Critical ratio for Job C = 2/5 = 0.4
Critical ratio for Job D = 8/6 = 1.33
Critical ratio for Job E = 7/2 = 3.5
Job having least critical ratio is given the first priority and so on.

Job	C	B	D	A	E
Critical Ratio	0.4	0.5	1.33	2	3.5

2023 - June [4] (a) A factory of SPON LTD. Manufactures 3 products which are processed through 3 different production stages. The time required to manufacture one unit of each of the three products and the daily capacity of the stages are given in the following table:

State	Time/Unit in minutes			Stage capacity (minutes)
	Product 1	Product 2	Product 3	
1	1	2	1	430
2	3	-	2	460
3	1	4	-	420
Profit/Unit	₹ 3	₹ 2	₹ 5	

- Required :**
Develop a linear programming model to determine how many products to be manufactured to maximize profit. **(5 marks)**

Answer:

Let number of units to be manufactured of Product 1 be X, Product 2 be Y and Product 3 be Z

Linear Programming Problem (LPP) is

Objective Function:

$$\text{Maximize } Z = 3X + 2Y + 5Z$$

Subject to constraints:

$$X + 2Y + Z \leq 430$$

$$3X + 2Z \leq 460$$

$$X + 4Y \leq 420$$

$$X, Y, Z \geq 0$$

2023 - June [4] (b) (i) TANEESA, a car rental Agency has collected the following parameters on the demand for five-seater vehicles over the past 50 days.

Daily demand	5	6	7	8	10
No. of days	4	10	16	14	6

The agency has only 7 cars currently.

[Given: Random numbers: 15, 48, 71, 56, 90]

Required:

- Using the Random numbers stated supra, develop 5 days of demand for the car rental agency.
- Calculate the average number of cars rented per day for the 5 days.
- Assess how many rentals will be lost over the 5 days. (4+1+1 marks)

Answer:**Random Number Coding**

Daily Demand	Number of days	Probability	Cumulative Probability	Random Number Coding
5	4	0.08	0.08	00-07
6	10	0.20	0.28	08-27
7	16	0.32	0.60	28-59
8	14	0.28	0.88	60-87
10	6	0.12	1.00	88-99
Total	50			

(i) Calculation of daily demand based on random numbers given:

Days	Random Number	Daily Demand
1	15	6
2	48	7
3	71	8
4	56	7
5	90	10

- Average number of cars rented per day = 6.8 Cars
- Rentals those shall be lost = 4 Nos.

2023 - Dec [4] (a) In a job shop operation of ZINT Ltd., five jobs may be performed on any four machines. The hours are required for each job on each Machine are presented in the following table.

Machine \ Job	1	2	3	4
A	6	2	5	2
B	2	5	8	7
C	7	8	6	9
D	6	2	3	4
E	9	3	8	9

The plant foreman would like to assign the jobs so that the total time is minimized.

Required:

Develop the Optimal assignment of jobs to Machines and Assess the Corresponding Total Time (in hours) and also identify the job which will be left unassigned. (7 marks)

Answer:

Step 1:

Since the number of Jobs are not equal to the number of Machines, a dummy Machine - 5 is created. The time (in hours) Consumed by any Job for the dummy Machines - 5 is 0.

Machines Job	1	2	3	4	5
A	6	2	5	2	0
B	2	5	8	7	0
C	7	8	6	9	0
D	6	2	3	4	0
E	9	3	8	9	0

Step 2:

Column Operation

Machines Job	1	2	3	4	5
A	4	0	2	0	0
B	0	3	5	5	0
C	5	6	3	7	0
D	4	0	0	2	0
E	7	1	5	7	0

Here, minimum no. of Horizontal and Vertical Straight lines to cover all the Zeros = 4* order of Matrix (5), So, Solution is non optimal.

STEP - 3:

Subtract 1 from every uncovered value and add 1 to every value at the intersection of two lines. Draw the number of lines to cover all Zeros.

Improved Matrix

Machines Job	1	2	3	4	5
A	4	0	2	0	1
B	0	3	5	5	1
C	4	5	2	6	0
D	4	0	0	2	1
E	6	0	4	6	0

Here, minimum no. of Horizontal and Vertical Straight lines to cover all the Zeros = 5 order of Matrix.

So, the solution is optimal.

Hence, the optimal assignment is made in the matrix below.

Machines Job	1	2	3	4	5
A	4	0	2	0	1
B	0	3	5	5	1
C	4	5	2	6	0
D	4	0	0	2	1
E	6	0	4	6	0

The optimal assignment and corresponding Time are as follows:

Jobs	Machine	Time (in hours)
A	4	2
B	1	2
C	5 (Dummy)	0
D	3	3
E	2	3
		10

Minimum Time is 10 hours and Unassigned Job is C.

2023 - Dec [4] (b) RAGON (P) & Co. has a single machinist in a repair shop. He works eight hours a day and on an average four machines break each day. It takes on the average one hour to repair a machine. Simple queue conditions exist.

Required:

- (i) Identify the expected number of machines on the repair shop.
 - (ii) Determine the expected number of machines in the shop on which the machinist has not started to work.
 - (iii) Assess the average down-time (waiting for repairs or undergoing repairs) per machine?
 - (iv) The average time a machine waits for service would be how much?
- (7 marks)**

Answer:

Mean arrival rate: $\lambda = 1/2h$; Mean service rate: $\mu = 1/1h$

Traffic intensity (or utilization factor): $p = \frac{\lambda}{\mu} = \frac{1/2}{1} = \frac{1}{2}$

1. **The expected number of machines in the repair shop:**

$$L_s = \frac{\lambda}{\mu - \lambda} = \frac{1/2}{1 - 1/2} = 1$$

2. **The expected number of machines in the shop on which the mechanist has not started to work:**

$$L_q = \frac{p^2}{1 - p} = \frac{(1/2)^2}{1 - 1/2} = 0.5$$

3. **The average down time (waiting for repairs or undergoing repairs) per machine:**

$$W_s = \frac{1}{\mu - \lambda} = \frac{1}{1 - 1/2} = 2 \text{ hours}$$

4. **The average time a machine waits for service:**

$$W_q = \frac{p}{(\mu - \lambda)} = \frac{1}{2} \times 2 = 1 \text{ hour.}$$

2024 - June [4] (a) In a Book Sales Emporium of PRANTIK (B) Ltd., four Salesmen A,B,C and D are available in four Counters P,Q,R and S. Each Salesman can handle any counter. Their Services (in hours) of each counter, when manned by each Salesman is given below:

		Counter			
Salesman		P	Q	R	S
A		30	46	34	22
B		11	20	11	5
C		28	43	28	18
D		14	23	17	8

Required:

- (i) Analyze and Assign the Salesmen to appropriate counters so as to minimize the service time.
 - (ii) Assess the total service times (in hours).
- (7 marks)**

Answer:

Step-1: Matrix after Row Operation.

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

Step- 2: Matrix after Column Operation.

Counter					
Salesman	P	Q	R	S	
A	2	9	6	0	
B	0	0	0	0	
C	4	10	4	0	
D	0	0	0	0	(1)

The numbers of allocated cells are not equal to the number of rows. Hence, the solution is not optimal.

- 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.

Counter					
Salesman	P	Q	R	S	
A	0	7	4	0	
B	0	0	0	2	
C	2	8	2	0	
D	0	0	3	2	(1)

Tables-3

- Minimum number of lines to cover all zeros equal 4 which matches with the order to the Matrix (as shown in Table-3). Assignments made are shown with squares as shown in Table - 4.

Counter					
Salesman	P	Q	R	S	
A	0	7	4	0	
B	0	0	0	2	

C	2	8	2	0	
D	0	0	3	2	(2)

The optimal assignment is:

Salesman	Counter	Service time(Hours)
A	P	30
B	R	11
C	S	18
D	Q	23
	Total	82

2024 - June [4] (b) A production line of ZFORD (M) Ltd., turns out about trucks per day; fluctuations occur for many reasons. The production can be described by a probability distribution as follows:

Production Per day	Probability	Production per day	Probability
45	0.03	51	0.15
46	0.05	52	0.10
47	0.07	53	0.07
48	0.10	54	0.05
49	0.15	55	0.03
50	0.20		

Finished trucks transported by a Train at the end of the day. The train capacity is only 51.

[Given : Random number: 37,35,63,25,50,71,95,16,55 and 53]

Required:

- Using the Random numbers stated Supra, Simulate the productions and waiting of trucks in the factory for the first 10 days.
- Evaluate the average number of trucks waiting in the Factory.
- Assess what will be the average number of empty space on the train.

(7 marks)

Answer:

1. Statement showing allocation of Random Numbers

Production per Day	Probability	Cumulative Probability	Random Number Assigned
45	0.03	0.03	00-02
46	0.05	0.08	03-07
47	0.07	0.15	08-14
48	0.10	0.25	15-24
49	0.15	0.40	25-39
50	0.20	0.60	40-59
51	0.15	0.75	60-74
52	0.10	0.85	75-84
53	0.07	0.92	85-91
54	0.05	0.97	92-96
55	0.03	1.00	97-99

Simulation Work Sheet:

Sl. No.	Random No.	Production Per day	Capacity of Train	No. of Trucks waiting in the Factory	Trucks Shipped	No. of Empty space on the Train
01.	37	49	51	-	49	2
02.	35	49	51	-	49	2
03.	63	51	51	-	51	--
04.	25	49	51	-	49	2
05.	50	50	51	-	50	1
06.	71	51	51	-	51	--
07.	95	54	51	3	51	--

08.	16	48	51	-	51	3
09.	55	50	51	-	50	1
10.	53	50	51	-	50	1
Total				3		12

2. Average number of Trucks waiting in the factory = 0.30

3. Average number of empty space in the train = 1.20

2024 - Dec [4] (a) A project of GREEN IP Ltd., consists of four major jobs, for which four contractors have submitted tenders. The tender amounts, in thousands of rupees, are given below:

Contractors	JOBS			
	A	B	C	D
1	39	70	37	50
2	20	27	47	63
3	25	37	58	49
4	43	48	46	50

(Each Contractor has to be assigned only one Job)

Required:

- Analyze and assign the Jobs to appropriate Contractors so as to minimize the Total Cost of the Project.
- Assess the Total Costs of the Project. **(7 marks)**

2024 - Dec [4] (b) Home Town Interior Decoration Ltd., uses a costly drier while painting the fire protection doors. The drier is highly volatile. It cannot be stored. In order to meet the requirement of drier, the exact quantity is purchased every day and consumed. The Management of the Company wants to Simulate the demand of the drier. For this the Management of the Company collected data for past 100 days for the application of the drier on the number of doors and the same data are shown in the table below:

Daily Demand (No. of Driers)	Number of Days
0	20
1	30
2	20
3	10
4	6
5	4
6	10

Consider the following Table of two Digit Random Numbers:

Random Numbers	03	23	36	93	69	43	87	51	11	08
-----------------------	----	----	----	----	----	----	----	----	----	----

Required:

- (i) Using the following generated random numbers in Sequence, generate the demand of driers for next ten days.
- (ii) Assess the average demand of drier per day. **(7 marks)**

Paper 9 Operations Management and Strategic Management		
Feedback	I Need More	Scanner Preparation Key
		
Scan to Share your Experience	Scan for Quick Assistance	Scan & go to "My Books"

Checklists for Application of Operational Systems and Control

- **Key Areas of Application:**
 - **Manufacturing:** Assembly lines, quality control, lean operations.
 - **Retail:** Inventory management, customer flow, point-of-sale systems.
 - **Service Industry:** Queue management, service quality, scheduling.
 - **Healthcare:** Patient flow, resource allocation, compliance monitoring.
- **Steps for Implementation:**
 - Understand business objectives and customer needs.
 - Develop customized operational systems.
 - Integrate controls like feedback loops and KPIs.
 - Train staff on system usage and monitoring.
 - Conduct regular audits and reviews for improvement.
- **Essential Tools:**
 - Statistical Process Control (SPC).
 - Enterprise Resource Planning (ERP) systems.
 - Real-time dashboards for monitoring.
 - Lean and Six Sigma methodologies.
- **Evaluation Metrics:**
 - Efficiency (Output/Input ratio).
 - Effectiveness (Goal achievement).
 - Quality (Defect rates, customer satisfaction).

Fun Flows for Better Understanding

- **Operational System Workflow:**
 - Planning - Implementation - Monitoring - Adjustment - Optimization.
- **Feedback Control Loop:**
 - Input - Process - Output - Feedback - Corrective Action.
- **Implementation Steps:**
 - Understand Objectives - Develop System - Test - Launch - Monitor - Improve.

Challenges in Application

- **Complexity in Integration:**
Linking new systems with existing processes and technologies.
- **Resistance to Change:**
Employees may be hesitant to adopt new systems.
- **Cost Constraints:**
High investment in system design, implementation, and training.
- **Data Management:**
Managing and analyzing large volumes of operational data.
- **Customization Issues:**
Adapting generic systems to unique organizational needs.

Motivational Quotes

- "An operational system is only as good as its weakest link." – Unknown
- "Innovation distinguishes between a leader and a follower." – Steve Jobs
- "Systems create leverage; leverage creates impact." – Unknown

Smart Study Tips

- **Practical Application Focus:**
Relate theoretical concepts to real-world applications, like McDonald's assembly-line kitchens or Amazon's inventory systems.
- **Flowchart Practice:**
Regularly draw and label operational workflows to improve understanding.
- **Group Discussions:**
Share examples from different industries to broaden your knowledge.
- **Case Study Analysis:**
Break down case studies of companies implementing operational systems successfully.
- **Simulate a Business Scenario:**
Create and analyze an operational system for a small business idea.

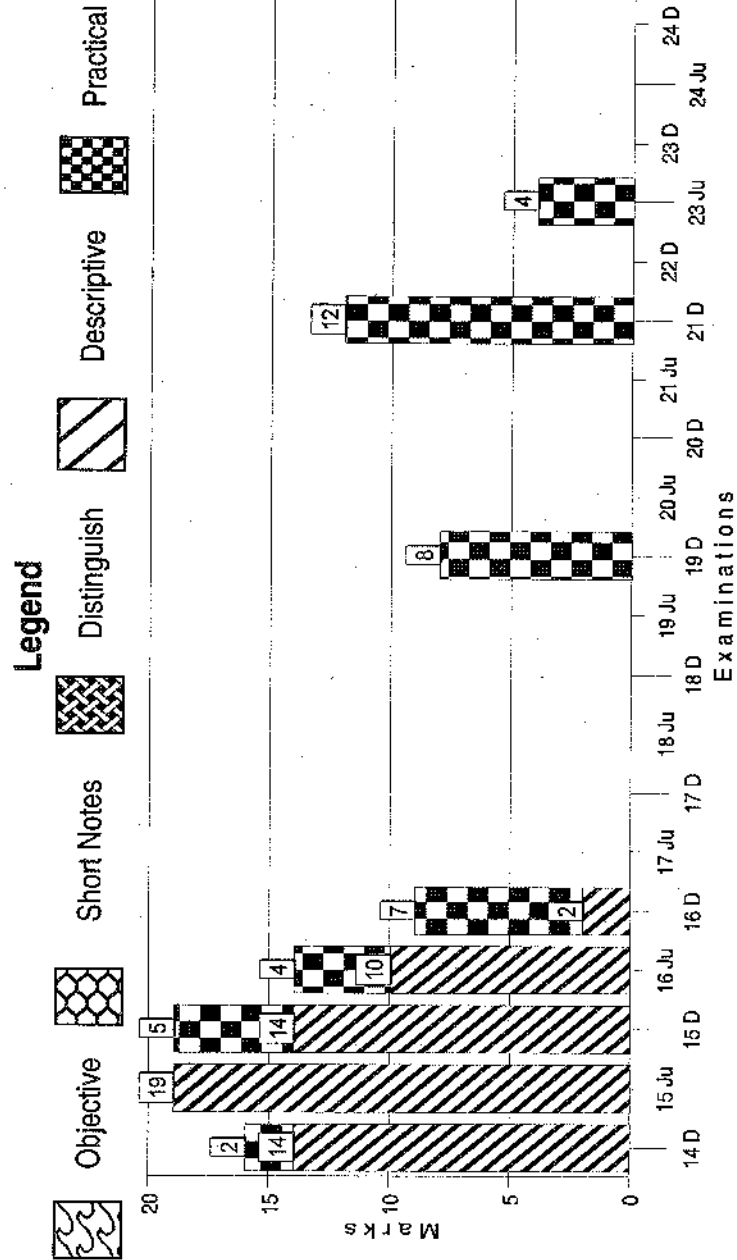
Keywords to Focus On

- Operational efficiency.
- Continuous Improvement.
- Process optimization.
- Resource utilization.
- Feedback loops.
- Customer satisfaction.
- Key Performance Indicators (KPIs).
- Bottleneck resolution.

How to Perform Well in Exams

- **Understand Practical Questions:**
Expect case-based questions that test application knowledge.
- **Structure Answers Effectively:**
Use Introduction ? Example ? Benefits ? Conclusion for structured answers.
- **Draw Diagrams:**
Include process maps, feedback loops, or SPC charts wherever applicable.
- **Incorporate Real-World Examples:**
Mention companies like Toyota, Amazon, or Starbucks to show practical understanding.
- **Highlight Key Points:**
Use bold or underline for terms like "lean systems" or "efficiency metrics."

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



133

CHAPTER	<h1>5</h1>	<h2>Productivity Management and Quality Management</h2>
THIS CHAPTER INCLUDES		
1. Measurement Techniques of Productivity Index	5. Productivity of other factors	
2. Productivity of Employee	6. Productivity Improving Methods	
3. Productivity of Materials	7. TQM Basic Tools and Certification	
4. Productivity of Management Resources	8. ISO Standard Basics	

QUICK LOOK	<i>Weightage Analysis</i>
Repeatedly Asked Questions	
2014 - June [2] (c), 2016 - June [3] (b)	

PAST YEAR QUESTIONS AND ANSWERS

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:

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

- (b) The presence of technological opportunities in the industry leads to better R & D efforts.
- (c) The philosophy and genuine efforts of the management are necessary for successful R & D efforts.
- (d) The contribution of individual researchers to R & D has been found to be quite substantial.
- (e) R & D efforts are likely to be more effective where growth prospects are good and profits are likely to be high.
- (f) Diversification is positively related to the R & D efforts, as there is scope of their utilization.
- (g) 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.

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

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.

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.

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:	
<ul style="list-style-type: none"> • Quality documentation to be developed • Objective of the system • Pertinent ISO 9001: 2008 section 	

	<ul style="list-style-type: none"> • Person or team responsible • Approval required • Training required • Resources required • Estimated completion date
Step 7: Developing a Quality Management System Documentation	<p>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:</p> <ul style="list-style-type: none"> • 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	<p>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.</p>
Step 9: Implementation	<p>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.</p>

	<p>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.</p>
Step 10: Internal Quality Audit	<p>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:</p> <ul style="list-style-type: none"> • 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	<p>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.</p>
Step 12: Pre-assessment Audit	<p>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.</p>

<p>Step 13: Certification and Registration</p>	<p>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.</p>
<p>Step 14: Continual Improvement</p>	<p>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:</p> <ul style="list-style-type: none"> • Quality policy • Quality objectives • Audit results • Analysis of data • Corrective and preventive actions • Management review <p>ISO 9001: 2008 provides a methodology for continual improvement.</p>

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.

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

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:

<p>1. Basic research</p>	<p>It is research for the advancement of scientific knowledge that has no specific commercial uses.</p>
<p>2. Applied research</p>	<p>It is research for the advancement of scientific knowledge that has specific potential commercial uses.</p>
<p>3. Development</p>	<p>It is technical activity concerned with translating basic or applied research results into products or processes.</p>
<p>4. Implementation</p>	<p>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.</p>

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 factors 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 of 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.

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.

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.

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:

1. Make a master plan for automation.
2. Find out the risks in going for automation.
3. Establish a new production technology or technology development department.
4. Allow plenty of time for the completion of automation projects.
5. Do not try to automate everything at once.
6. People are the key to the successful implementation of automation projects.
7. Companies moving too slowly in adopting new production technology, may be left behind others.

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.

2015 - Dec [1] Answer the question:

- (d) Define Quality Trilogy under Total Quality Management. **(2 marks)**

Answer:

Quality Trilogy: 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:

- Quality planning,
- Quality control and
- Quality improvement.

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:

- 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.
- The factory earns more profit because of the reduction in costs.
- 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:

- Higher profits earned by factories will bring more revenue to the government by taxation.
- Export trades may develop bringing more foreign exchange to the nation.
- Overall higher productivity will raise an all-round standard of labour.

2015 - Dec [2] Answer the question:

- (c) (ii) Explain 'Eight Steps Benchmarking Process'. **(6 marks)**

Answer:

Eight Steps Benchmarking Process:

- Select Benchmarking subject and appropriate team
- Identify performance indicators and Drivers

- Select Benchmark partners
- Determine data collection method and collect data
- Analyse performance gaps.
- Communicate Findings and identify projects to close gaps
- Implement plans and monitor results
- Recalibrate benchmarks.

2016 - June [I] Answer the question:

- (d) Write the formula for Input Efficiency. **(2 marks)**

Answer:

$$\text{Input Efficiency} = \frac{\text{Actual Consumption}}{\text{Desired or Standard Consumption}}$$

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.

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.

PRACTICAL QUESTIONS

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 :

$$\text{Partial productivity of labour} = \frac{\text{Total Output}}{\text{Labour hour}} = \frac{2,00,00,000}{20,000} = ₹ 1,000$$

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:

$$\text{Productivity per machine hour} = \frac{\text{Number of Units Produced}}{\text{Machine hours}}$$

$$\text{Productivity per machine hour for March} = \frac{99,000}{90,000} = 1.1 \text{ units}$$

$$\text{Productivity per machine hour for April} = \frac{1,00,000}{1,00,000} = 1 \text{ unit}$$

$$\text{Productivity per machine hour for May} = \frac{1,35,000}{1,50,000} = 0.9 \text{ unit}$$

Interpretation:

Though the total production in number of units is increasing, the productivity is declining.

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:

$$\begin{aligned} \text{Productivity} &= \frac{\text{Standard hours of output}}{\text{Clockhours Scheduled}} \\ &= \frac{6}{11} \times 100 = 54.55\% \end{aligned}$$

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, $p = \frac{\text{Productivity per machine hour}}{\text{Number of units produced / Machine hours}}$

For July $p = \frac{99,000}{90,000} = 1.1$

August $p = \frac{1,00,000}{1,00,000} = 1$

September $p = \frac{1,35,000}{1,50,000} = 0.9$

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 $= \frac{99,000}{88,000} = 1.125$

February $= \frac{1,00,000}{99,000} = 1.01$

March $= \frac{1,25,000}{1,27,600} = 0.9796$

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

$P = \frac{\text{Productivity per machine hour}}{\text{Number of units produced / Machine hours}}$

$= \frac{\text{Number of units produced}}{\text{Machine hours}}$

For July $P = \frac{95,000}{81,900} = 1.160$

August $P = \frac{1,00,000}{91,800} = 1.089$

September $P = \frac{1,30,000}{1,31,100} = 0.992$

Interpretation: Though, the total production in number of units is increasing, the productivity is declining.

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:

- Per cent absenteeism
- Efficiency of utilization of labour
- Productive efficiency of labour
- Overall productivity of labour in terms of units produced per man per month. **(2 × 4 = 8 marks)**

Answer:

- Percent absenteeism = $\frac{[(\text{No. of Hrs. lost in absenteeism in a month}) / (\text{Total working hours per month})] \times 100}{(36 \times 8) / (16 \times 25 \times 8)}$
 $= 0.09 \times 100 = 9\%$
- Efficiency of utilization of labour = $\frac{[(\text{Standard labour hour to produce 300 units}) / (\text{Total labour hour})] \times 100}{(300 \times 8) / (16 \times 25 \times 8)}$
 $\times 100 = 75\%$
- Determination of Productive efficiency of labour:**
 Standard time required to produce 300 units = $300 \times 8 = 2,400$ labour hours. In June 2019, man hours lost = $36 \times 8 = 288$
 In June 2019, Idle time (in hours) = 260 Total loss of time = 548 hrs.
 Productive hours available in June 2019 = $16 \times 25 \times 8 = 3,200$ hrs.
 Less, Total loss of time: 548 hrs.
 Actual Labour hours = $3,200 - 548 = 2,652$ hrs
 Productive efficiency of labour = $\frac{[(\text{Standard Labour hours}) / (\text{Actual labour hours})] \times 100}{(2,400 / 2,652) \times 100}$
 $= 90.497\%$
 $= 90.50\%$ (approx.)
- 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 $\frac{[(25 - 18.75) / 25] \times 100}{25} = 25\%$

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:

- What are all those broad activities that you have to consider for such responsibility?
- 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?
- In which scenarios, ISO certification is a must, and is particularly helpful?
- When is it reviewed?

(3+3+3+3 = 12 marks) [Sec. D - Case Study Question]

Answer:

- 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.
- 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.

2023 - June [4] (b) (ii) The Quantitative Parameters pertaining to a machine extracted from the records of a manufacturing unit of SONIX Ltd. are as given below:

Working days per month	25
Hours worked per day	8
Standard Minutes per unit of production:	
Operator Time (Minutes)	12
Machine Time (Minutes)	36
Total time per unit (Minutes)	48
Number of Operators	1
Number of Machines	1

(No. of Units to be rounded off to the nearest integer)

Required:

- (1) If the plant is operated at 80% efficiency and the operator is working at 100% efficiency, calculate the output (units) per month.
- (2) If the Machine productivity is reduced by 10% over existing level, assess the output (in units) per month. **(4 marks)**

Answer:

If plant is operated at 80% efficiency,

Output per month = 200 units

If the machine productivity is reduced by 10% over existing level,

Output per month = 184 units.

Given Data:

Working days per month: 25

Hours worked per day: 8

Standard minutes per unit of production:

– Operator time: 12 minutes

– Machine time: 36 minutes

– Total time per unit: 48 minutes

Number of operators: 1

Number of machines: 1

Efficiency:

– Plant efficiency: 80%

– Operator efficiency: 100%

To Find:

1. Output (units) per month at 80% efficiency.
2. Output (units) per month if machine productivity is reduced by 10%.

Calculations:

1. Output per month at 80% efficiency:

Step-by-Step Process:

1. Calculate total working minutes per month:

– Total working hours per month = 25 days * 8 hours/day = 200 hours

– Total working minutes per month = 200 hours * 60 minutes/hour = 12,000 minutes

2. Calculate effective working minutes considering plant efficiency:

– Effective working minutes = Total working minutes per month * Plant efficiency

– Effective working minutes = 12,000 minutes * 80% = 12,000 * 0.8 = 9,600 minutes

3. Calculate output units per month:

- Total time per unit = 48 minutes (sum of operator time and machine time)
- Output units = Effective working minutes / Total time per unit
- Output units = 9,600 minutes / 48 minutes per unit = 200 units

So, the output per month at 80% efficiency is 200 units.

2. **Output per month if machine productivity is reduced by 10%:**

Step-by-Step Process:

1. Calculate new machine time per unit:

- Machine time is reduced by 10%, so new machine time = 36 minutes * 110% = 36 * 1.1 = 39.6 minutes ≈ 40 minutes

2. Calculate new total time per unit:

- New total time per unit = Operator time + New machine time
- New total time per unit = 12 minutes + 40 minutes = 52 minutes

3. Calculate new output units per month:

- Output units = Effective working minutes / New total time per unit
- Output units = 9,600 minutes / 52 minutes per unit = 184 units

Checklists for Productivity Management

• **Understand Key Concepts:**

- **Productivity:** The ratio of output to input.
- **Efficiency:** Doing things right.
- **Effectiveness:** Doing the right things.

• **Factors Affecting Productivity:**

- **Labor:** Skills, training, and morale.
- **Technology:** Automation and innovation.
- **Processes:** Streamlined workflows.
- **Resources:** Availability and utilization.

• **Key Tools for Productivity Management:**

- Time-motion studies.
- Lean management.
- Total Productive Maintenance (TPM).
- Key Performance Indicators (KPIs).

• **Metrics to Track Productivity:**

- **Labor Productivity:** Output per labor hour.
- **Machine Productivity:** Output per machine hour.
- **Total Factor Productivity:** Output relative to all inputs.

Paper 9 Operations Management and Strategic Management		
Feedback	I Need More	Scanner Preparation Key
		
Scan to Share your Experience	Scan for Quick Assistance	Scan & go to "My Books"

Checklists for Quality Management

• **Core Principles:**

- Customer focus.
- Leadership commitment.
- Continuous improvement (Kaizen).

• **Key Quality Management Tools:**

- Total Quality Management (TQM).
- Six Sigma.
- Statistical Process Control (SPC).
- ISO Standards.

• **Quality Assurance vs. Quality Control:**

- **Assurance:** Preventing defects.
- **Control:** Identifying and fixing defects.

- **Quality Metrics:**

- Defect rate.
- Customer satisfaction scores.
- First-pass yield (FPY).

Fun Flows

- **Productivity Management Cycle:**
Plan - Optimize Resources - Monitor Performance - Improve Processes - Repeat.
- **Quality Management Cycle (PDCA):**
Plan - Do - Check - Act.
- **Continuous Improvement Flow:**
Identify Problem - Analyze Root Cause - Implement Solutions - Evaluate Results.

Challenges in Productivity and Quality Management

Balancing Cost and Quality:

Reducing costs without compromising quality.

Resistance to Change:

Employees might resist new productivity measures or quality standards.

Technology Integration:

Adapting to automation or advanced quality tools.

Sustainability:

Balancing productivity with eco-friendly practices.

Global Standards Compliance:

Adhering to ISO or Six Sigma standards.

Motivational Quotes

- "Quality is not an act, it is a habit." – Aristotle
- "Productivity is being able to do things that you were never able to do before." – Franz Kafka
- "Excellence is the gradual result of always striving to do better." – Pat Riley

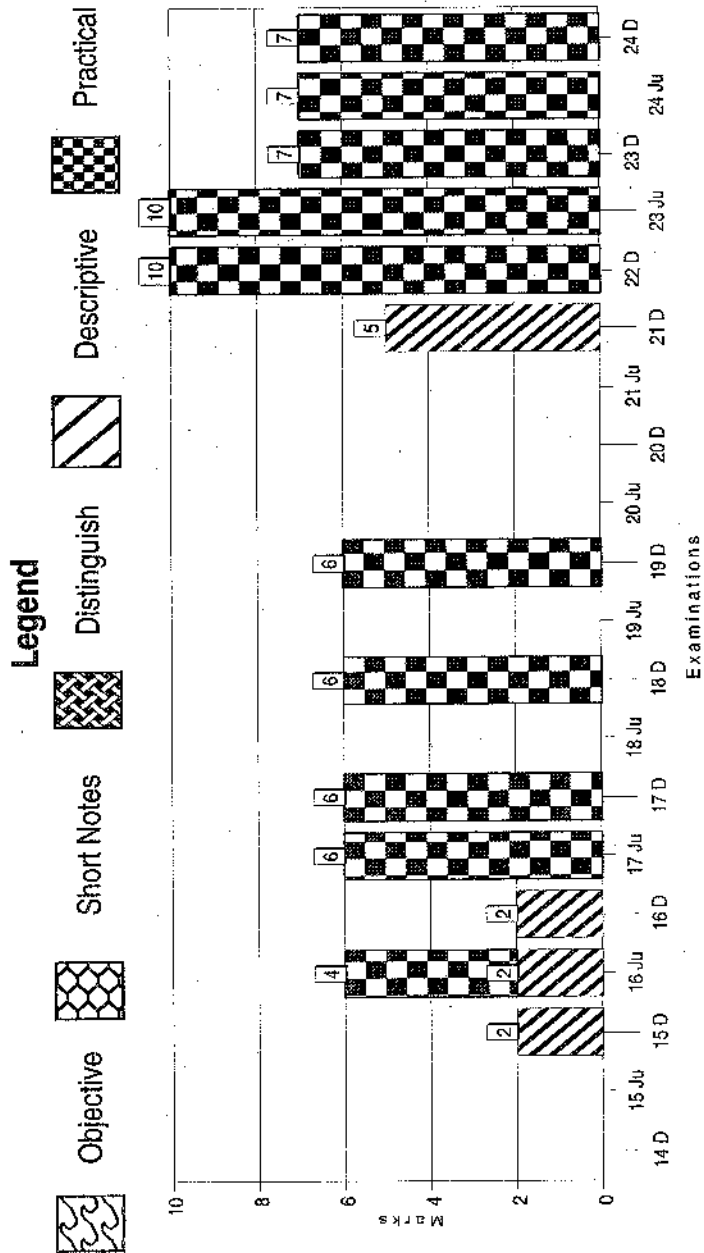
Smart Study Tips

- **Create Comparison Tables:**
Compare tools like TQM, Six Sigma, and SPC for easy memorization.
- **Use Case Studies:**
Study real-life applications of productivity and quality management in companies like Toyota or Amazon.
- **Visual Aids:**
Draw flowcharts to link productivity and quality processes.
- **Practice Numerical Problems:**
Focus on productivity ratios and defect calculations.
- **Group Discussions:**
Share insights on industry practices and challenges with peers.
- Productivity metrics.
- Lean manufacturing.
- Total Quality Management (TQM).
- Continuous improvement.
- Six Sigma.
- Key Performance Indicators (KPIs).
- Root Cause Analysis (RCA).
- Statistical Process Control (SPC).

How to Perform Well in Exams

- **Understand Question Categories:**
Theory Questions: Focus on explaining tools, principles, and challenges.
Numerical Questions: Prepare for productivity ratios and defect analysis.
- **Use Examples:**
Include real-world applications like Toyota's Kaizen practices or Starbucks' quality assurance.
- **Incorporate Diagrams:**
Add PDCA cycles, SPC charts, or Pareto analysis to your answers.

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



CHAPTER	6	Project Management, Monitoring and Control

THIS CHAPTER INCLUDES	
1. Project Planning	4. PERT and CPM
2. Project Life Cycle	5. Basic of MS Project
3. Gantt Charts	

QUICK LOOK	<i>Weightage Analysis</i>
Repeatedly Asked Questions	
2014 - June [6] (a), 2016 - June [II] (4) (a)	

PAST YEAR QUESTIONS AND ANSWERS

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.

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.

2021 - Dec [2] Draw a Circle and Arrow Diagram to show two activities, that cannot be started until the first activity has been completed.

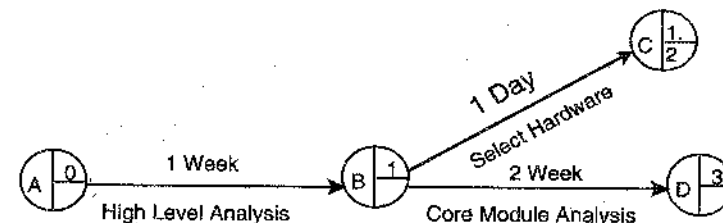
(4 marks) [Sec. C - Five LAQ]

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 until the first activity has been completed.



2016 - June [1] 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.

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.

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.

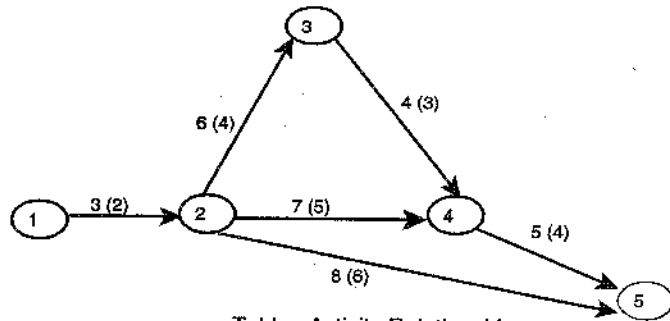
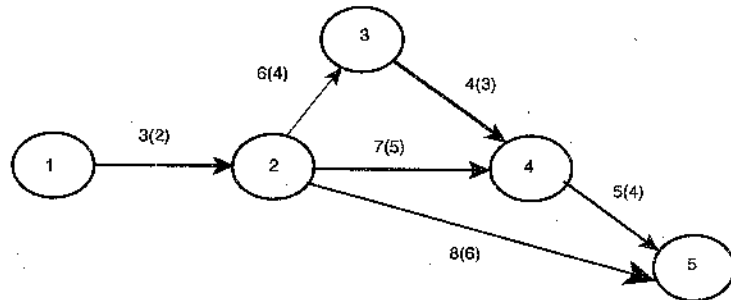


Table : Activity Relationship

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 Cost-Normal Cost (a)	Normal Time-Crash Time (b)	Cost Slope (a)/(b)
	Time (days)	Cost (₹)	Time (days)	Cost (₹)			
1-2	3	300	2	400	100	1	100
2-3	6	480	4	520	40	2	20
2-4		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
 = 4,100 + (20 × 2 + 1 × 20 + 1 × 40) + 14 × 95 = ₹ 5,530

The total project cost with normal activities (without crashing)
 = Normal Cost + Indirect Cost for 18 days = 4100 + (18 × 95) = ₹ 5,810

Therefore, the optimum cost of the project is ₹ 5,530.

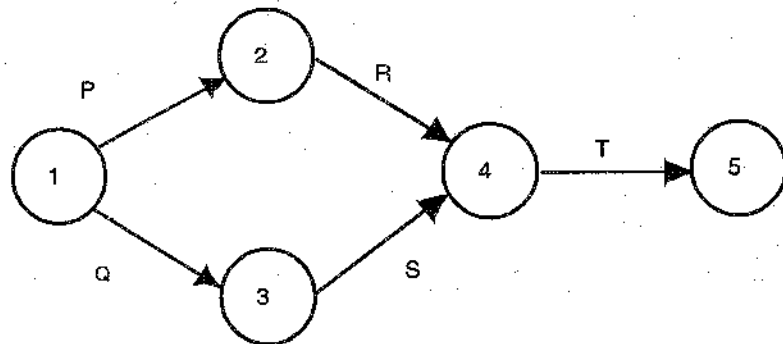
2014 - June [6] (a) A project consists of five activities. Activities P and Q run simultaneously. The relationship among the various activities is as follows:

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:



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. 167

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:

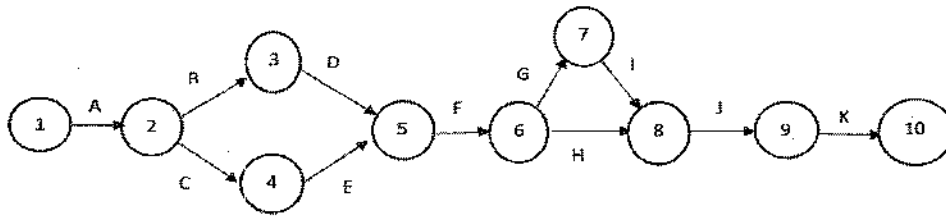
Activity	Preceding Activity
A	-
B	A
C	A
D	B
E	C
F	D, E
G	F
H	F
I	G
J	I, H
K	J

Draw the network diagram.

(6 marks)

Answer:

The Network diagram:



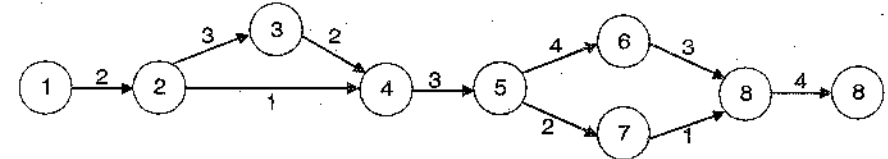
2017 - Dec [5] (b) Draw the network for the following activities and find critical path and total duration of the project.

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:



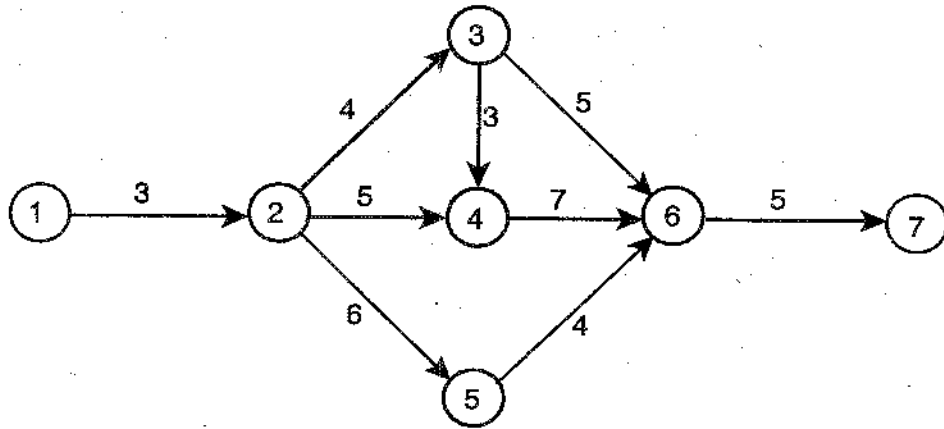
Paths	Duration (months)
1-2-3-4-5-7-8-9	2+3+2+3+4+3+4=21 (Critical path)
1-2-3-4-5-6-8-9	2+3+2+3+2+1+4=17
1-2-4-5-7-8-9	2+1+3+4+3+4=17
1-2-4-5-6-8-9	2+1+3+2+1+4=13

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

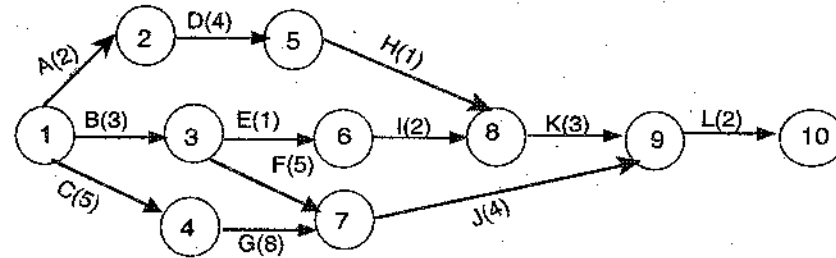
2019 - Dec [5] (a) Draw the network for the following activities and find the Critical Path and Total duration of the project.

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)

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	3
C	2-4	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)**

Answer:

(i)	
(ii)	<p>The Possible Paths :</p> <p>1-2-3-5-6-7-8 = 18 Days</p> <p>1-2-5-6-7-8 = 6 Days</p> <p>1-2-5-6-8 = 18 Days</p> <p>1-2-4-5-6-7-8 = 26 Days</p> <p>1-2-4-5-6-8 = 38 Days</p>
(iii)	<p>Critical Path & Duration :</p> <p>1-2-4-5-6-8 and duration is 38 Days</p>

(iv)	Activity	Total Float (Days)	Free Float (Days)	Independent Float (Days)
	D	20	20	20
	E	8	8	0
	H	12	0	0
	J	12	12	0

2023 - June [5] (b) Prantik (P) Ltd., a publisher, is preparing to produce the second edition of a Project Management Text Book. The activities required and their estimated times are as follows:

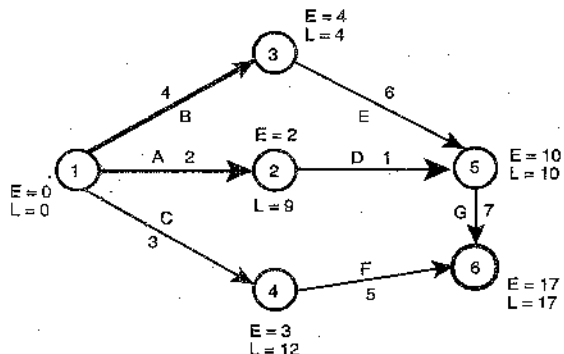
Activity and Identification		Estimated duration in days		
		Optimistic	Most Likely	Pessimistic
A	1-2	1	1	7
B	1-3	1	4	7
C	1-4	2	2	8
D	2-5	1	1	1
E	3-5	2	5	14
F	4-6	2	5	8
G	5-6	3	6	15

Required:

- (i) Draw the project network and identify all the paths through it.
- (ii) Assess the expected duration and variance for each activity and also project length.
- (iii) Identify the critical path and assess the EST, EFT, LST, LFT and total float for each activity. **(3+3+4 marks)**

Answer:

(i) The Network is drawn as shown below:



Identification of Paths are:

- (1) 1-3-5-6
- (2) 1-2-5-6
- (3) 1-4-6
- (ii) & (iii)

Activity and Identification		$T_e =$	$V_t =$	EST	EFT	LST	LFT	Total Float
A	1-2	2	1	0	2	7	9	7
B	1-3	4	1	0	4	0	4	0
C	1-4	3	1	0	3	9	12	9
D	2-5	1	0	2	3	9	10	7
E	3-5	6	4	4	10	4	10	0
F	4-6	5	1	3	8	12	17	9
G	5-6	7	4	10	17	10	17	0

Project Length = 17 Days

Critical Path:

B-E-G (1-3-5-6)

2023 - Dec [5] (b) TINTEX LTD., a construction company has an opportunity to submit a bid for the construction of a new apartment building. From specifications provided by the developer, a PERT Network for the project has been developed and the estimate of optimistic, most likely and pessimistic, completion duration in days (a, m and b respectively) for each activity are shown below:

Activity and Identification		Estimated Time In Days		
		Optimistic (a)	Most likely (m)	Pessimistic (b)
A	1-2	15	20	25
B	1-3	20	25	30
C	2-3	6	10	14
D	2-4	8	12	16
E	3-4	2	6	10
F	4-5	6	10	14

Required:

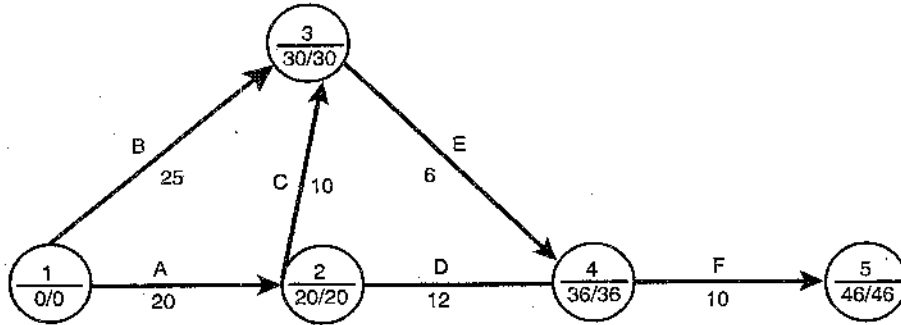
- (i) Assess the expected Time (in days) of the project.
- (ii) Draw the Project Network and identify all paths through it.
- (iii) Identify the Critical Path with its duration and assess the Total Float and Free Float of each activity of the Project. **(7 marks)**

Answer:

(i) **Expected Time (in days).**

Activity and Identification	(a)	(m)	(b)	$t_e = \frac{a + 4m + b}{6}$	
A	1-2	15	20	25	20
B	1-3	20	25	30	25
C	2-3	6	10	14	10
D	2-4	8	12	16	12
E	3-4	2	6	10	6
F	4-5	6	10	14	10

(ii)



(iii) **Critical Path with duration of the project:**
 (A – C – E – F) 1 – 2 – 3 – 4 – 5 and duration 46 days.
 The floats for each Activity are assessed below:

Activity and Identification		Expected Time	EST	EFT	LST	LFT	Total	Flats Free (TF – HS)
A	1 – 2	20	0	20	0	20	0	0
B	1 – 3	25	0	25	5	30	5	5
C	2 – 3	10	20	30	20	30	0	0
D	2 – 4	12	20	32	24	36	4	4
E	3 – 4	6	30	36	30	35	0	0
F	4 – 5	10	36	46	36	46	0	0

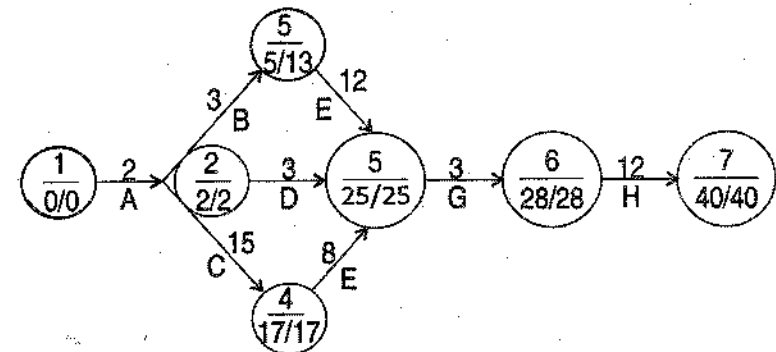
2024 - June [5] (b) ZOTECH Ltd., has recently won a Contract for the installation of a die casting machine at a local factory of a large national firm of electronic Engineers. The following table gives the various activities in this job and normal duration (in days) thereof.

Activity and Identification	Preceding Activities	Duration (days)
A	1 - 2	2
B	2 - 3	3
C	2 - 4	15
D	2 - 5	3
E	3 - 5	12
F	4 - 5	8
G	5 - 6	3
H	6 - 7	12

Required:

- (i) Design the PERT Network diagram and indicate all paths through it.
- (ii) Identify the Critical Path and its duration (in days).
- (iii) Analyze and Assess the Total Float, Free Float and Independent Float of Each activity. (7 marks)

Answer:



NETWORK

Critical Path and duration (in days) 1 - 2 - 4 - 5 - 6 - 7 and 40 days.

Activity and Identification		Duration (Days)	DAYS						
			EST	LST	EFT	LFT	Total Float	Free Float	Independent Float Free- Tail
A	1-2	2	0	0	2	2	0	0	0
B	2-3	3	2	10	5	13	8	0	0
C	2-4	15	2	2	17	17	0	0	0
D	2-5	3	2	22	5	25	20	20	20
E	3-5	12	5	13	17	25	8	8	0
F	4-5	8	17	17	25	25	0	0	0
G	5-6	3	25	25	28	28	0	0	0
H	6-7	12	28	28	40	40	0	0	0

2024 - Dec [5] (b) BITZON Ltd., a Chemical Product Manufacturing Company have split their Schedule of Implementation into the following 6 activities and have estimated Time Duration (in weeks) under 3 Scenarios as under:

(Time in Weeks)

Activity and Identification	Optimistic time estimate	Pessimistic time estimate	Most likely time estimate
A 1 - 2	5	11	8
B 1 - 3	18	26	22
C 2 - 4	15	25	20
D 3 - 4	4	12	8
E 4 - 5	8	12	10
F 3 - 5	14	26	20

Required:

- (i) Assess the expected duration (in weeks) for each activity.
 - (ii) Design the PERT Network Diagram and indicate all paths through it.
 - (iii) Identify the Critical Path and its Duration (in weeks).
 - (iv) Analyze and indicate the Total Float and Free Float available on each activity.
- (7 marks)

Paper 9 Operations Management and Strategic Management		
Feedback	I Need More	Scanner Preparation Key
		
Scan to Share your Experience	Scan for Quick Assistance	Scan & go to "My Books"

Key Concepts in Project Monitoring and Control

- **Monitoring:** Ongoing tracking of project activities to assess performance.
- **Control:** Taking corrective actions when deviations occur.
- **Triple Constraints:** Managing time, cost, and scope to achieve project goals.

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

Legend



Objective



Short Notes



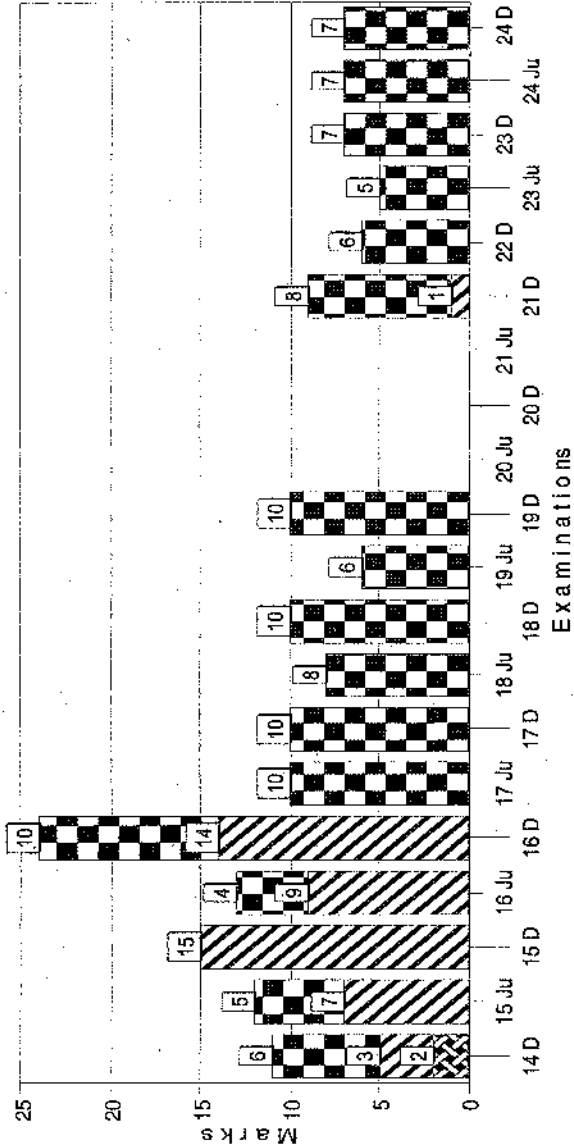
Distinguish



Descriptive



Practical



CHAPTER	Economics of Maintenance and Spares Management
7	

THIS CHAPTER INCLUDES	
1. Break Down Maintenance	3. Routine Maintenance
2. Preventive Maintenance	4. Replacement of Machine
	5. Spare Parts Management

QUICK LOOK	<i>Weightage Analysis</i>
Repeatedly Asked Questions	
2012 - Dec [4] (d), 2015 - June [2] (b) (iii), 2014 - June [2] (b), 2016 - June [III] [2] (a)	

PAST YEAR QUESTIONS AND ANSWERS

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.

DESCRIPTIVE QUESTIONS

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

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.

2014 - June [2] (a) Write down the formula for:
(iii) Breakdown Maintenance Index (as a % age) **(1 mark)**

Answer :

$$\text{Break down Maintenance Index} = \frac{(\text{Cost of breakdown repair})}{(\text{No. of breakdown})} \times 100$$

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".

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.

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:
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.

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:

1. Regulating basic conditions	TPM advocates keeping a well-organized shop floor which should be very clean.
2. Adhering to proper operating procedures	The most significant cause of failure is operators deviating from procedures and introduce errors and variance into the process.
3. 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.
4. Improving weaknesses in design	TPM tries to identify and correct any defects in equipment designs that contribute to break-downs or complicate maintenance.
5. 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.

2016 - June [II] 2. (b) Write down the formula for:

(iii) Frequency of Breakdown

(1 mark)

Answer:

$$\text{Frequency of break downs} = \frac{\text{(Number of break downs per week)}}{\text{(Available machine hours per week)}}$$

2016 - June [II] Answer the question:

3. (c) List the various steps in Maintenance Planning.

(8 marks)

Answer:

Steps in Maintenance Planning:

1. Know the equipment to be maintained, available technique for maintenance and the facilities available to carry out maintenance work.
2. Establish the priorities of maintenance activities by categorising the activities as emergency work, priority work and non priority work.
3. 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.
4. 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.
5. Prepare a list of maintenance materials and spare parts required.
6. Prepare a list of special tools and special facilities such as material handling equipments (such as crane) required.
7. Estimate the time required to do the maintenance work.
8. Provide for necessary safety devices and safety instructions.

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:

- Scheduling maintenance projects;
- Maintenance cost reports by production department, cost category and other classifications;
- Inventory status reports for maintenance part and supplies;
- Parts failure data; and
- Operations analysis studies which may include computer simulation, waiting lines, and other analytical programmes.

2016 - Dec [2] (b) Write down the formula for the following which are used for measuring maintenance effectiveness:

- Down-time index (as a percentage); and
- Maintenance cost index as a percentage. (2 × 2 = 4 marks) [Sec. B]

Answer:

- Down time index (as a percentage):

$$\frac{\text{(Downtime per week)}}{\text{(Available machine hours per week)}} \times 100$$
- Maintenance cost index (as a percentage):

$$\frac{\text{(Annual Maintenance cost)}}{\text{(Cost of Production)}} \times 100$$

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:

- Manpower (maintenance crew) available.
- Pending maintenance work (in terms of man hours backlog).
- Availability of machine or equipment for preventive maintenance service.
- Availability of proper tools, handling equipments, consumables, spare parts etc.

- Availability special maintenance equipments if any, special fixtures and tools, cranes, etc.
- Whether additional manpower is available at outside sources to be hired when needed.
- When to start the maintenance work and when it should be completed,
- Previous maintenance history records or charts.

2021 - Dec [10] What is the underlying principle of preventive maintenance? (1 mark) [Sec. B - SAQ]

Answer:

Prevention is better than cure.

PRACTICAL QUESTIONS

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

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 calcinator.

Or

The expected down-time cost calcinator = (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.

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 (₹)	1,200	1,400	1,800	2,600	3,200	4,100	5,200
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	Cum.	C-S	T(n)	A(n)
	Cost, M _t	Maintenance			
(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.

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	1,100	1,600	2,200	3,000	4,100	4,900	6,100

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 _t ₹	Cum. Main. Cost, Σ M _t ₹	Depreciation (C-S) ₹	Total Cost T(n) ₹	Annual Cost A(n) ₹
(i)	(ii)	(iii)	(iv)	(v) = (iii) + (iv)	(vi) = (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.

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.

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

$$= \frac{(\text{No. of trucks}) (\text{Cost per breakdown})}{(\text{Expected number of months between failures})} = \frac{(50) (\text{₹}3,000)}{(3.0)} = \text{₹} 50,000.$$

Now, let us compute the costs of following different periodicities of preventive maintenance.

1. 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 = $5 \times \text{₹} 3,000$	= ₹ 15,000
Cost of preventive maintenance = $\text{₹} 500 \times 50$	= ₹ 25,000
Total Cost during the PM period	= ₹ 40,000
Hence, cost per month for this policy is = $\text{₹} 40,000 \div 1$	= ₹ 40,000

2. 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 = $(15.5) \times \text{₹} 3,000 = \text{₹} 46,500$
Cost of prev. maintenance = $\text{₹} 500 \times 50 = \text{₹} 25,000$
Total cost during the PM period = ₹ 71,500
Hence, cost per month for this policy:
$\text{₹} 71,500 \div 2 \text{ months} = \text{₹} 35,750$

3. 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 = $31.55 \times \text{₹} 3,000 = \text{₹} 94,650$
Cost of preventive maintenance = $50 \times \text{₹} 500 = \text{₹} 25,000$
Total = ₹ 1,19,650
Hence, cost per month for this policy
$= \text{₹} 1,19,650 \div 3 \text{ months} = \text{₹} 39,883.33$

4. 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 = $(57.855) \times (\text{₹} 3,000) = \text{₹} 1,73,565$
Cost of preventive maintenance = $50 \times \text{₹} 500 = \text{₹} 25,000$
Total = ₹ 1,98,565
Hence, cost per month for this policy is $\text{₹} 1,98,565 \div 4 \text{ months} = \text{₹} 49,641.25$
Comparing the costs per month of different policies, we see that the policy of preventive maintenance every two months is the most economic policy.

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.

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 = $1.834 \times ₹ 2500 = ₹ 4,585$.

Preventive maintenance cost per month:

Average cost of one breakdown/month = ₹ 2,500

Maintenance contract cost/month = ₹ 1,700

Total = ₹ 4,200.

Thus, preventive maintenance policy is suitable for the firm

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)	(B)	(C)	(A × C)
No. of Break down	Freq	Freq (a/b) in month	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

= $2,500 \times 1.69$

= ₹ 4,225

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.

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	1,200	1,700	2,300	3,200	4,300	4,800	6,300

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, M_j (₹)	Cumulative Maintenance Cost, $\sum M_j$ (₹)	$C - S$ (₹)	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 2,500 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) × 25,00 hours = 2,50,000 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 = $(2 \times 2,500) / 2 = 2,500$ 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 $(2,50,000 - 2,500) = 2,47,500$ component hours of testing.

During 365 days a year (four hours a day) for 12,000 components the number of expected failures = $(2 \times 12,000 \times 365 \times 5) / 2,47,500 = 176.97 = 177$ 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.

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 breakdowns; 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 = $1.434 \times 600 = 860.4$

Cost of preventive maintenance program per day = ₹ 250 + 600 = 850

Expected annual savings from the preventive maintenance program

= $(860.4 - 850) \times 300 = 10.4 \times 300 = ₹ 3,120$

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	1,200	1,800	2,500	3,200	4,100	5,000	6,000

- Find out Cost of machine.
Calculate the replacement period of the machine.
- Determine the Optimal Replacement Period.

(4+4 = 8 marks) [Sec. C - Five LAQ]

Answer:

1. Cost of the Machine:

The cost of the machine includes the purchases price and installation charges.

Total cost of the machine:

Cost of machine = Purchase price + Installation charges

Cost of machine = ₹ 12,000 + ₹ 3,500

Cost of machine = ₹ 15,500

2. Calculate the Replacement Period:

Step-by-Step process:

- Calculate the total cost for each year including maintenance costs:
 - For each year, add the cumulative maintenance costs to the cost of the machine and subtract the scrap value.
- Calculate the average cost for each year:
 - The average cost for each year is the total cost up to that year divided by the number of years.

Calculations:

Year	Maintenance Cost (₹)	Cumulative Maintenance Cost (₹)	Total Cost (₹)	Average Cost (₹)
1	250	250	14,250*	14,250.00
2	760	1,010	14,910	7,455.00

3	1,200	2,210	16,110	5,370
4	1,800	4,010	18,010	4,502.50
5	2,500	6,510	20,510	4,102.00
6	3,200	9,710	23,710	3,951.67
7	4,100	13,810	27,810	3,972.86
8	5,000	18,810	32,810	4,101.25
9	6,000	24,810	38,810	4,312.22

Summary:

1. Cost of the machine: ₹ 15,500
2. Replacement period of the machine: 6th year
3. Optimal replacement period. The machine may best be replaced every 6 years, as the lowest average cost is ₹ 3,951.67 in the 6th year.
 $*12,000 + 3,500 - 1,500 + 250 = ₹ 14,250$

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)

Answer:

Cost of Machine (C) = ₹ 13,000 (Purchase Price) + ₹ 3,700 (Installation charges) = ₹ 16,700/-; Scrap Value (S) = ₹ 1,400/-

Year	Maintenance Cost (in ₹)	Cumulative Maintenance Cost (in ₹)	Cost of machine (less) Scrap value (in ₹)	Total Cost (in ₹)	Annual Cost (in ₹)
(i)	(ii)	(iii)	(iv)	(v) = (iii) + (iv)	(vi) = (v)/n
1	300.0	300.0	15,300	15,600	15,600.00
2	850.0	1,150.0	15,300	16,450	8,225.00
3	1,300.0	2,450.0	15,300	17,750	5,916.67
4	1,900.0	4,350.0	15,300	19,650	4,912.50
5	2,600.0	6,950.0	15,300	22,250	4,450.00
6	3,300.0	10,250.0	15,300	25,550	4,258.33
7	4,200.0	14,450.0	15,300	29,750	4,250.00
8	6,000.0	20,450.0	15,300	35,750	4,468.75
9	7,500.0	27,950.0	15,300	43,250	4,805.55

- (i) Lowest average cost is ₹ 4,250/-; which corresponds to n=7 in the above table. Thus machine needs to be replaced every 7th year (on economic considerations).
- (ii) Average cost of replacement will be ₹ 4,250/- in this case.

2023 - June [5] (a) SONTECH Ltd., a Solar manufacturing company has observed the following number of breakdowns in the new Lantern over the past year:

No. of breakdowns	0	1	2	3
No. of months it occurred	3	6	2	1

It costs the company ₹ 2,000 to rectify a lantern. For a cost of ₹ 600 per month, preventive maintenance can be carried out of limit the breakdown to one per month.

Required:

Which policy is suitable for the company? Support your answer with needful calculations and justification. (5 marks)

Answer:

No. of breakdowns (1)	Frequency of breakdowns in months (2)	Probability (3)	Expected value (4) = (1) × (3)
0	3	3/12 = 0.25	0
1	6	6/12 = 0.50	0.50
2	2	2/12 = 0.167	0.334
3	1	1/12 = 0.083	0.249
Total	12	1.00	1.08

Total number of breakdowns per month = 1.08

Cost of breakdown per month = $1.08 \times 2,000 = ₹ 2,160/-$

Cost of preventive maintenance program per month = ₹ 600 + ₹ 2,000 = ₹ 2,600/-

Expected annual savings from preventive maintenance program = $(2,160 - 2,600) \times 12 = -440 \times 12 = ₹ (5,280)$

Comment: Preventive maintenance policy is not suitable for the Company. It is better if the Company rectifies the lantern as and when breakdown occurs.

2023 - Dec [5] (a) The Management of BB HOTEL IN is considering periodic replacement of light bulbs fitted in its rooms. There are 200 rooms in the hotel and each room has 5 bulbs. The Management is conducting a study on the life of the light bulbs. The following mortality rates have been observed for the light bulbs.

Month of USE	1	2	3	4	5
Percent of bulbs failing by that month	10	15	25	30	20

There are 1,000 light bulbs in use and it costs ₹100 to replace an individual bulb which has burnt out. If all bulbs were replaced simultaneously, it would cost ₹ 20 per bulb. It is proposed to replace all bulbs at fixed intervals, whether or not they have burnt out and to continue replacing burnt out bulbs as they fail.

Required:

- Examine the number of light bulbs to be replaced every month.
- Calculate the average monthly cost (₹) of individual replacement.
- Identify at what interval of time the Management of BB Hotel IN should replace all the light bulbs and which policy of replacement would be economical. (7 marks)

Answer:

- No. of light bulbs to be replaced every month = 299 bulbs.
- The average monthly cost of the individual replacement = ₹ 29,900
- Group replacement : Initial Cost = ₹ 20,000

The optimum replacement cycle under Group replacement is given under:

Month	No. of light bulbs to be replaced	Monthly cost of Individual replacement @ ₹100 / bulb (₹)	Cumulative cost of Individual replacement (₹)	Total cost of individual replacement as well as Group replacement (₹)	Average monthly cost (₹)
1.	100	10,000	10,000	30,000	30,000
2.	160	16,000	26,000	46,000	23,000
3.	281	28,100	54,100	74,100	24,700
4.	377	37,700	91,800	1,11,800	27,950
5.	350	35,000	1,26,800	1,46,800	29,360

Since the Average Cost as stated Supra is lowest in 2nd Month the optimal interval i.e. replacement is in 2 months. So the Management of BB Hotel should replace all light bulbs in every two months. Further since the average Cost (₹ 23,000) is less than ₹ 29,900 of individual replacement, the Group Replacement Policy is economical and better.

2024 - June [5] (a) **RONTIX Ltd.**, a fleet owner finds from its past records that the cost per year of running a truck whose purchase price is ₹ 6,00,000 are as given below:

Year	1	2	3	4	5	6	7	8
Running Costs (₹ in Thousand)	100	120	140	180	230	280	340	400
Re-Sales Price (₹ in Thousand)	300	150	75	37.50	20	20	20	20

(Assume that Cost of Money is zero.)

Required:

- Assess the average annual cost of truck for each year.
- Analyze and Infer at what age should the truck be replaced on economic consideration. **(7 marks)**

Answer:

- The average Annual Costs to date for each year are assessed below:

Cost of Owning and Operating Truck (₹ In Thousand)

Year (t)	Running Costs	Cumulative Running Costs	Resale value	Depreciation (Capital Cost)	Total Costs	Average Cost per Year
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	100	100.0	300.0	300.0	400.0	400.00
2.	120	220.0	150.0	450.0	670.0	335.00
3.	140	360.0	75.00	525.0	885.0	295.00
4.	180	540.0	37.50	562.5	1,102.5	275.63
5.	230	770.0	20.00	580.0	1,350	270.00
6.	280	1,050.0	20.00	580.0	1,630	271.67
7.	340	1,390.0	20.00	580.0	1,970	281.43
8.	400	1,790.0	20.00	580.0	2,370	296.25

- After analysis of the parameter stated Supra, we conclude that the truck should be replaced at the end of the Fifth year, of which average annual Cost (₹ 2,70,000) is minimum; otherwise the average annual cost would increase after fifth year.

2024 - Dec [5] (a) A computer of **ROPAM Ltd.**, has 1000 nos. of Electronic Tubes.

They are subject to Mortality as given below:

Period	Age at Failure (Hrs.)	Probability of Failure
1	0 - 200	0.10
2	201 - 400	0.26
3	401 - 600	0.35
4	601 - 800	0.22
5	801 - 1000	0.07

If the tubes are group replaced, the cost of replacement is ₹ 150 per Electronic tube.

Group replacement can be done at fixed intervals in the night shift when the computer is not normally used. Replacement of individual Electronic tubes which fail in Service Cost ₹ 600 per Electronic tube.

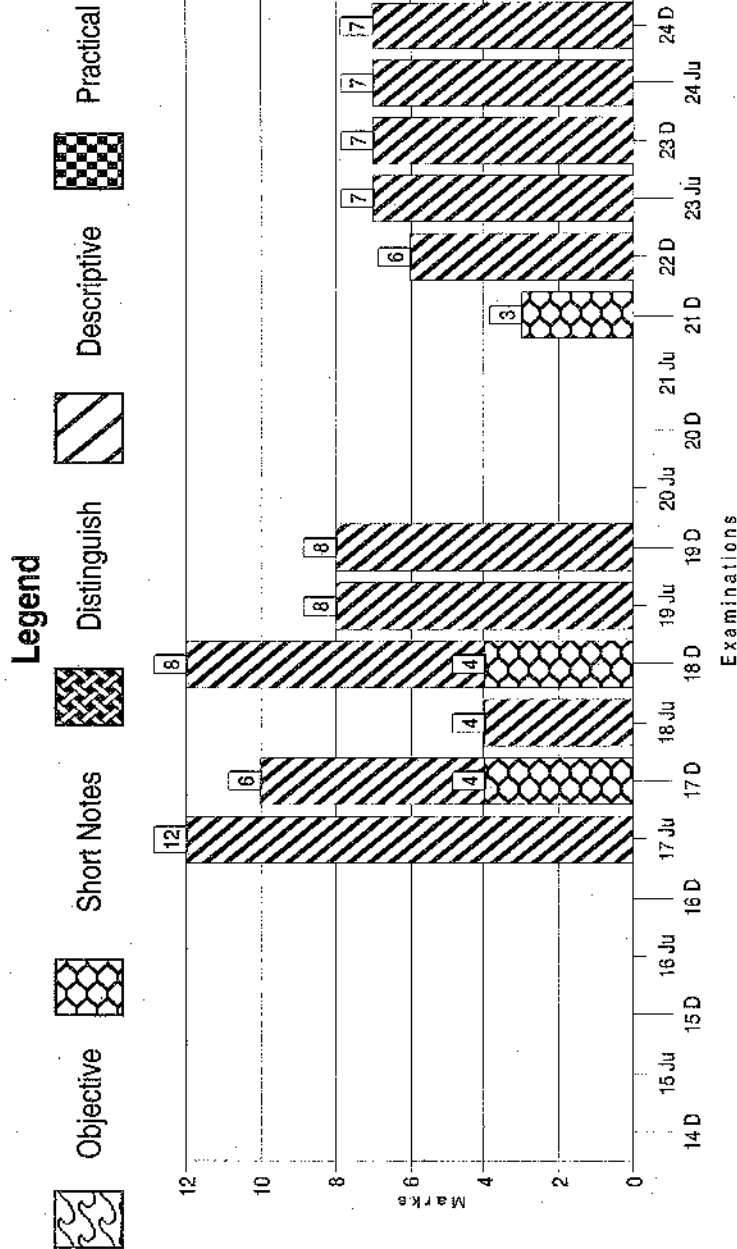
Assume that:

- Electronic Tubes that fail during a period are replaced just before the end of the period.
- The actual percentage of failure during a period for a sub-population of the Tubes with the same age is the same as the expected percentage of failure during the period for that sub-population.

Required:

- Analyze the number of Electronic Tubes to be replaced every period.
- Assess the failure costs (₹) on average of individual replacement of electronic tubes.
- Identify at what interval of time the Company should replace all the electronic Tubes.
- Advice which policy of replacement will be economical to the Company. **(7 marks)**

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



CHAPTER	Strategic Management- Introduction	
8		
THIS CHAPTER INCLUDES		
1. Introduction to Strategy and Strategic Management	5. Alignment with Individual Level Objective and Organisational Objective	
2. Alignment of Strategy with Vision, Mission and Culture	6. Balanced Score Card	
3. Objectives of Strategic Management	7. EVA – Driven Responsibility Accounting	
4. Organisational Genomics		

PAST YEAR QUESTIONS AND ANSWERS

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.

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.

2021 - Dec [2] Write short notes on Importance of Strategic Management.

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

Answer:

Importance of Strategic Management:

- Discover organization strengths and weaknesses
- Identify the available opportunities and possible threats
- Discover the objectives and goals in line with organizations strengths and available opportunities
- Implement changes to overcome weaknesses and manage the threats.
- Provide vision/mission or direction to future of organizations
- Build a dynamic and strong organization.

DESCRIPTIVE QUESTIONS

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:

1. External constraints	Choice of strategy is governed by the extent and degree of the firm's dependence on owners, customers, suppliers, and the government.
2. Intra-Organisational Forces	Decisions are influenced by the power play among different interest groups and by the degree of uncertainty.
3. 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.
4. 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.
5. 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.

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:

1. 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.
2. 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.
3. 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:

- To set-up realistic objectives,
- To develop plans and policies for achieving the set objectives,
- 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.

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:

- What the firm is?
- What it seeks to accomplish?
- 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.

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.

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.

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.

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.

1. Corporate Level
2. Business Level
3. Functional Level
 1. **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.

2. **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.
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 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.

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.

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:

- (a) Strategy is likely to be concerned with long-term direction of an organisation.
- (b) Strategic decisions are normally about trying to achieve some advantage for the organisation over competition.
- (c) Strategy is likely to be concerned with the scope of the organisation's activities.
- (d) Strategy can be seen as matching the resources and activities to the environment in which it operates.
- (e) Strategy can be seen as stretching an organisation's resources and competences to create new opportunities or to capitalise on them.
- (f) Strategies sometimes require major resource changes for an organisation.
- (g) Strategic decisions are likely to affect operational decisions.
- (h) 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.

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)

Answer:

The need for an explicit mission arises for varied reasons:

1. Unanimity of purpose,
2. Motivating the use of the organization's purpose,
3. Develop a basis for use of the organization's resources,
4. Facilitate the translation of objectives into a work structure.
5. Cost, time, and performance parameters can be controlled.
6. Specify organizational purpose and assign tasks.

A strategic vision portrays a company's aspirations for its future destination.

A company's mission describes its purpose and its present business.

A company's mission describes its purpose and its present business (who we are, what we do, and why we are here). It announces what the company is providing to society; either a service or a product. The mission contains few specific directives, only broadly outlined or implied objectives and strategies. Characteristically, it is a statement of attitude, outlook, and orientation rather than of details and measurable targets.

2023 - June [7] (a) (i) Define the term 'Strategy'.

(ii) Explain the three types of strategy usually considered by a typical business firm. (1 + 6 = 7 marks)

Answer:

(i) 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.

(ii) Three types of Strategy:

• **Corporate Strategy:**

- (a) Concerned with overall purpose and scope of an organization
- (b) How value will be added to the different parts / business units and product lines of an organization?
- (c) Three main categories: stability, growth & retrenchment

(d) Decisions include: investments in diversification, vertical integration, acquisitions, new ventures, allocation of resources between different businesses of the firm and divestments.

• **Business Strategy:**

- (a) It is about - How to compete successfully in particular markets?
- (b) It emphasizes improvement of the competitive position of organisation's products or services in the specified industry or market segment served by that business unit.
- (c) Two main categories: competitive and cooperative strategies

• **Functional or Operational level Strategy:**

- (a) How the component parts of an organisation deliver effectively the corporate and business level strategies in terms of resources, processes and people?
- (b) Concerned with developing and nurturing competence to provide a business unit with a competitive advantage.
- (c) Directed towards maximizing resource productivity

2023 - Dec [6] (a) Explain in brief the various important issues that need to be kept in mind while setting up objectives of an organization. (7 marks)

Answer:

1. **Specificity:** Specificity is related to the organisational level for which a set of objectives have been stated. Objectives may be stated at different levels of specificity. At one extreme they might be very broadly stated goals and on the other extreme it may be translated in to performance targets. This issue of specificity may be resolved by stating specificity at different levels of the organisation and prefixing terms such as corporate, general and particular so that they serve the needs of performance and its evaluation.
2. **Multiplicity:** The issue of multiplicity arise from the fact that it is rare for an organisation to work on a single objective or a few objectives. Since objectives deal with a large number of functional areas, a large number of them have to be formulated to cover the diverse aspects of the organisation's functioning. It may be mentioned that neither too few nor too many objectives are considered realistic. The issue of multiplicity takes into account the number and types of objectives that are being set.

3. **Periodicity:** Objectives may be set for different time frame. It is possible to set long term, medium term and short term objectives. Normally organisations determine objectives for the long term and the short term. These different time frame of objectives need to be integrated with each other in order to achieve the desired result. Long term objectives tend to be general in nature as the outcomes tend to be less certain. On the other hand short term objectives tend to be more specific and comprehensive given the certainty involved in it.
4. **Verifiability:** The issue of verifiability revolves around the question of deciding whether an objective has been met or not. Moreover, linked to verifiability is the concept of quantification. A definite way to measure an objective is to quantify it. In cases where objectives cannot be quantified, qualitative objectives may be set. Qualitative objectives may require some value judgements of experts from within and outside the organisation.
5. **Reality:** It is often found that organisations have two set of objectives namely, official and operative. While the official objectives are those which the organisation professes to attain, the operative objectives are those which they seek to attain in reality. **For example** developing human resource is the official objective of most of the organisations. However, to determine whether it is the operative objective will depend on the amount of resource allocation that has been made towards the development of human resource.
6. **Quality:** The capability of an objective to provide a specific direction and a tangible basis for evaluating performance determines the quality of an objective. **For example** stating that "to increase revenue" is considered to be a bad objective as it lacks the element of measurability. If the same objective is rephrased as "to increase the revenue by 30% in the next 6 months and thereafter increase it by 40%, maintainable for the next two years" can be considered to be a good objective.

2024 - June [6] (a) "Strategic Management involves a greater Scope than that of any one area of operational Management." - In this Context align the objectives of Strategic Management. **(7 marks)**

Answer:

The objectives of Strategic Management are as follows:

- (a) To identify opportunities and adapt resources to exploit the opportunities created.
- (b) To create opportunities by stretching the resources and competences of the organization and capitalize them.
- (c) To help managers to understand the key relationships among actions, context and performance by providing the conceptual frameworks.
- (d) To help an organization enjoy competitive advantage.
- (e) To sustain and improve the competitive position by the deployment and acquisition of appropriate resources and by monitoring and responding to environmental changes.
- (f) To monitor and remain responsive to the demands of key stakeholders.
- (g) To identify the critical success factors and meet the needs and wants of the customers.
- (h) To avoid failure by focusing on the building blocks of competitive advantage (superior efficiency, superior quality, superior innovation and superior responsiveness to customers), instituting continuous improvement and learning, tracking the best industrial practices and using benchmarking.
- (i) To overcome inertia and accept the changes in the ever-changing environment to remain competitive and at times to survive.
- (j) To develop a creative and innovative attitude and to think strategically.

2024 - Dec [6] (a) "Objectives should possess certain desirable characteristics in order to be effective". In this context, identify and explain those characteristics of Effective Objectives. **(7 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.

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:
 - (a) Managerial perceptions of external dependence.
 - (b) Values, preference and managerial attitude towards risk.
 - (c) Managerial awareness of past strategies.
 - (d) Managerial power relationship and organization structure.
 - (e) Influence of lower-level managers.
 - (f) 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: <ol style="list-style-type: none"> (a) Can the management team achieve sufficient commitment to make a choice to change direction? (b) Can the team maintain sufficient enthusiasm to enable its employees to implement the choices?

(c) 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.

Paper 9 Operations Management and Strategic Management		
Feedback	I Need More	Scanner Preparation Key
		
Scan to Share your Experience	Scan for Quick Assistance	Scan & go to "My Books"

- Key Concepts in Strategic Management**
- **Vision and Mission:**
 - **Vision:** What the organization aims to become.
 - **Mission:** The organization's purpose and its reason for existence.
 - **SWOT Analysis:** Identifying Strengths, Weaknesses, Opportunities, and Threats.
 - **Levels of Strategy:**
 - **Corporate Strategy:** Decisions about the entire organization.
 - **Business Strategy:** How a business competes in a specific market.
 - **Functional Strategy:** Specific actions in areas like marketing, operations, and finance.
 - **Strategic Planning Process:** Setting objectives, analyzing the environment, formulating strategies, implementing plans, and evaluating results.

Checklists for Strategic Management

- **Understand the Organization:**
Define the vision, mission, and core values.
Analyze internal capabilities and external environment.
- **Develop Strategies:**
Use tools like SWOT, PESTEL, and Porter's Five Forces.
Align strategies with organizational goals.
- **Implementation:**
Allocate resources effectively.
Communicate strategies across all levels.
- **Evaluation:**
Monitor key performance indicators (KPIs).
Identify and correct deviations from the plan.

Fun Flows for Strategic Management

- **Strategic Management Process:**
Vision - Analyze - Plan - Implement - Monitor - Adapt.
- **SWOT Analysis Flow:**
Strengths and Weaknesses (Internal) - Opportunities and Threats (External) - Formulate Strategies.
- **Strategy Pyramid:**
Corporate Level (Top) - Business Level (Middle) - Functional Level (Bottom).

Challenges in Strategic Management

- **Dynamic Environments:**
Rapid changes in technology or market conditions.
- **Resource Constraints:**
Limited budgets, time, or manpower.
- **Resistance to Change:**
Employees resisting new strategies or processes.
- **Unclear Objectives:**
Lack of clarity in vision and goals.
- **Globalization:**
Managing international operations and diverse markets.

Motivational Quotes

- "Strategy is about making choices, trade-offs; it's about deliberately choosing to be different." – Michael Porter
- "However beautiful the strategy, you should occasionally look at the results." – Winston Churchill
- "Vision without action is a daydream. Action without vision is a nightmare." – Japanese Proverb

Smart Study Tips

- **Use Frameworks:**
Memorize key strategic tools like SWOT, PESTEL, and Porter's Five Forces.

Study Real-Life Examples:

Analyze strategies of companies like Tesla, Amazon, or McDonald's.

- **Visual Learning:**
Draw flowcharts, matrices, and pyramids to remember strategic processes.
- **Link Concepts:**
Relate strategic management to practical situations or personal experiences.
- **Practice Application:**
Solve case studies to understand how theories work in real scenarios.

Keywords to Focus On

- Vision and Mission.
- Strategic objectives.
- SWOT analysis.
- PESTEL framework.
- Core competencies.
- Competitive advantage.
- Resource allocation.
- Key Performance Indicators (KPIs).

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

Legend



Objective



Short Notes



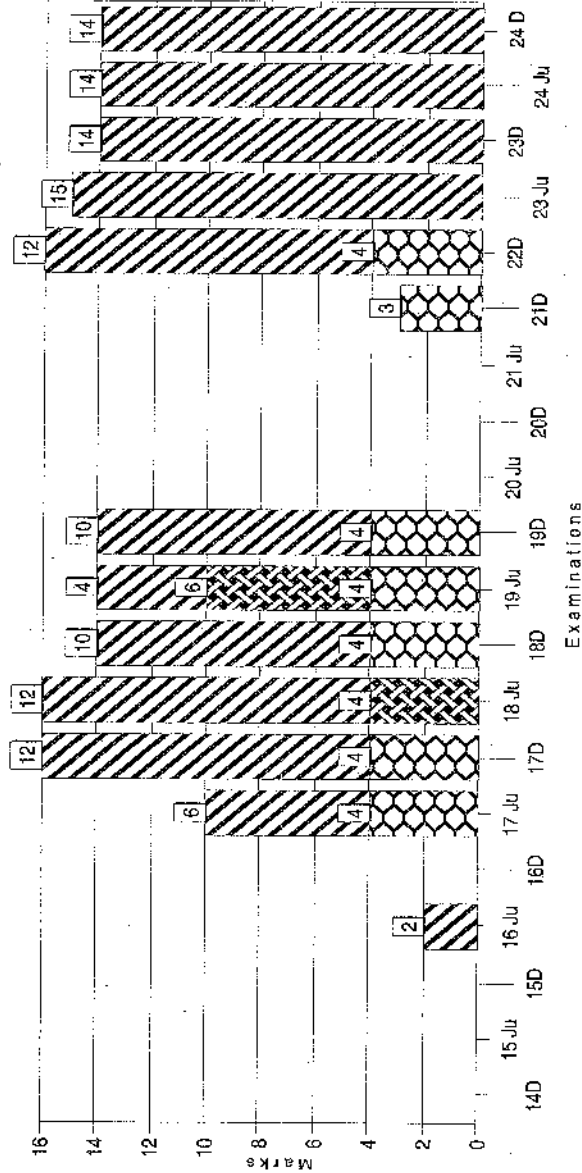
Distinguish



Descriptive



Practical



233

CHAPTER	Strategic Analysis and Strategic Planning	
9		
THIS CHAPTER INCLUDES		
1. Analysis of Business Environment	4. Portfolio Analysis and BCG Matrix	
2. PESTEL, Value Chain and Porter's 5 Framework	5. Stages in Strategic Planning	
3. SWOTC Analysis (Industry Sector and Company)	6. Alternative in Strategic Planning	

QUICK LOOK	<i>Weightage Analysis</i>
Repeatedly Asked Questions	
2018 - June [9] (d), 2019 - June [8] (a)	

PAST YEAR QUESTIONS AND ANSWERS

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.

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.

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.

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:

- (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.

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:

1. A top-down approach, in which managers are given targets to achieve which they pass on down the line.
2. 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.
3. 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.

2021 - Dec [4] Write short notes on Stages in Strategic Planning. **(3 marks) [Sec. C - Six LAQ]**

Answer:

Please refer 2019 - June [9] (d) on page no. 236

2022 - Dec [9] Write short note on the following question:

(d) Enumerate the approaches that can be adopted to strategic planning. **(4 marks)**

Answer:

Please refer 2019 - Dec [9] (d) on page no. 236

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.

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. 237

DESCRIPTIVE QUESTIONS

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.

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).

- (a) **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.
- (b) **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.

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.

- Explain the four aspects that are embedded in the definition of strategic planning.
- Points out reasons why organizations may embark on the concept of strategic planning.
- State some shortcomings of strategic planning.

(5 + 5 + 5 = 15 marks) [CMAFG - III]

Answer:

- 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".
-------------------------------------	--

<p>2. What is your "Strategic Vision"?</p>	<p>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.</p>
<p>3. Critical Success Factors</p>	<p>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?</p>
<p>4. Operational Goals:</p>	<p>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)</p>

	<p>(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.</p>
<p>5. Next Steps and Key Decisions</p>	<p>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.</p>

- (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:

1. Non-availability of correct and accurate data.
2. Doing strategic planning only to satisfy accreditation or regulatory requirements.
3. Failing to communicate the plan to the people who execute the plan.
4. Top management making intuitive decisions that conflict with formal plan.
5. Failing to use plans as a standard for measuring performance.
6. Delegating tasks to a few persons rather than involving all managers.
7. Failing to involve key employees in all phases of planning.
8. Failing to create an environment conducive of change.
9. Lack of flexibility and creativity.
10. Strategic planning usually restricted to hard business concerns, leaving without proper attention for soft issues like customer, quality, labour productivity, social concerns etc.
11. Strategy planning sometimes becomes a routine exercise, without having proper attention to strategic issues.
12. The planning process is isolated from the external groups that critically affect the company like labour unions, consumer advocates, social service organizations etc.

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 in fact 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."

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:

1. The markets for the product operate in such a way that price-based competition is an important factor.
2. The product is standardized and its consumption takes place in such a manner that differentiation is not required.
3. The bargaining power of buyer to negotiate a price reduction is high from the supplying firm.
4. 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:

- (a) The firm knows who are its competitors and knows all the marketing-mix.
- (b) The market is too large and a few firms offering a standardized product.
- (c) The customers' needs and preferences are too diversified.
- (d) It is possible for the firm to charge a premium price for differentiation that is valued by the customers.
- (e) 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:

1. Product design;
2. Quality of product;
3. Technology development;
4. Distribution system;
5. Customer services etc.

(c) The risks involved in focus business strategy are as follows:

1. Target segment may disappear for some reason.
2. It is difficult to identify which segments the firms should choose.

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:

1. Intensive promotion by means of	<ul style="list-style-type: none"> ❖ Brand-stressing advertising, ❖ Attractive design and functional packaging, ❖ Effective after-sales services, ❖ Given importance in customer loyalty.
2. Trading down through	<ul style="list-style-type: none"> ❖ Introduction of low-priced models of existing products or services, ❖ Price-cutting of entire product line.
3. Trading up through	<ul style="list-style-type: none"> ❖ Improvement of quality and appearances etc. ❖ Use of prestigious packages, ❖ Price increase to cream market levels.
4. Proliferation, exclusive or radical by	<ul style="list-style-type: none"> ❖ More design or varieties, ❖ More exclusive and innovative features, ❖ Creating radical and distinct package designs, ❖ More options.
5. Increase of product availability and point-of-sale service through	<ul style="list-style-type: none"> ❖ More distribution outlets, ❖ More dealers, ❖ More service centers.

2016 - June [I] Answer the question:

(b) State the disadvantages of 'Vertical Integration'.

(2 marks)

Answer:

Disadvantages of vertical integration are:

- Not attractive for low volumes.
- High capital investment and operating costs.
- Less ability to react more quickly to changes in customer demands, competitive actions and new techniques.

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:

- What business activities the company should be in?
- How performance of the different business SBUs should be evaluated?
- 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.

(c) 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:

- The link between market share and profitability is questionable since increasing market share can be very expensive.
- The approach may over emphasize high growth, since it ignores the potential of declining markets.
- The model considers market growth rate to be a given. In practice the firm may be able to grow the market.

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:
- Capacity balancing issues.
 - Potentially higher costs due to low efficiencies resulting from lack of supplier competition.
 - Decreased flexibility due to previous upstream or downstream investments.
 - Decreased ability to increase producer variety if significant in-house development is required.
 - Development new core competencies may compromise existing competencies.
 - Increased bureaucratic costs.

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:

- 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.

- 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.
- 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.
- 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.

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).

- 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.

2. 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.
3. Relative market share amongst competitors is not necessarily an indication of their competitive strengths at any particular time. After all, market leaders are vulnerable.
4. 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.
5. It does not suggest any response to declining markets other than withdrawal: many firms can make money in 'sunset industries'.
6. It ignores the extent to which a firm which serves a number of markets can exploit production synergies.
7. It ignores the threat of substitute products.

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.

- (a) 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.
- (b) 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:

1. It will make the future through their proactive planning and advanced preparation.
2. It will introduce original action by removing present difficulties.
3. It enables to anticipate future problems.
4. It will change the goals to suit internal and external changes.
5. It experiments with creative ideas and take initiative.
6. It will attempt to shape the future and create a more desirable environment.
7. It permits quick response to change,
8. It prevents panic in crisis situations.
9. It makes managers more adaptable to unforeseen changes.

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:

- (a) **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.
- (b) **Product position and Product - market mix.**
- (c) **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.
- (d) **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.
- (e) **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.

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:

- (a) Major opportunities and threats;
- (b) Major objectives;
- (c) Strategies to achieve the objectives;
- (d) Specific data on sales/profits/market share sought;
- (e) 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.

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

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.

2019 - June [7] (b) Briefly describe the limitations of the BCG model.

(4 marks)

Answer:

Please refer 2017 - June [7] (b) on page no. 250

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:

- (a) investment in the research and development of additional products;
- (b) acquisition of rights to produce someone else's product;

- (c) buying-in the product and 'badging' it;
 (d) 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:

1. customer information that allows accurate targeting;
2. established distribution channels;
3. a brand which can be credibly applied to the new product.

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)**

Answer:

1. Portfolio analysis is a term used in describing methods of analyzing a product -market portfolio with the following aims.
 - (i) To identify the current strengths and weaknesses of an organization'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.
2. Several matrices have been developed over the years to analyse market share, market growth and market position.
3. Value system: A factor very much complimentary to the mission that influences the portfolio strategy is the value system of the promoters or major stock holders. After the Murugappa group took over the EID Parry, the liquor business of the EID Parry group was sold off as the Murugappa group management felt that it was unethical to be in the liquor business.

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)**

Answer:

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. 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.

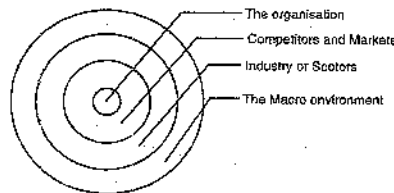
2023 - June [7] (b) With reference to Business Environment, examine in detail.

- (i) Various layers and
- (ii) Characteristics.

(4 + 4 = 8 marks)

Answer:

(i) **Layers of Business Environment:**



1. The macro environment is the outermost and the highest level layer. This consists of broad environmental factors that impact to a greater or lesser extent on almost all organizations. Here the PESTEL framework can be used to identify how future trends in the political, economic, social, technological, environmental and legal environments might impinge on organizations.
2. Industry, or sector, forms the next layer with this broad general environment. This is made up of organizations producing the same products or services. Here, the Porter's 5 forces framework is particularly useful in understanding the attractiveness of particular industries or sectors and potential threats from outside the present set of competitors.
3. Competitors and markets are the most immediate layer surrounding the organizations. Within most industries or sectors, there will be many different organizations with different characteristics and competing on different bases, some closer to a particular organization, some more remote.

(ii) **Characteristics of Business Environment:**

1. **Environment is complex:** It comprises of a number of factors namely, events, conditions and influences arising from different sources interacting with each other to create entirely new set of influences. It is easier to understand environment in segments or compartments rather than grasp in totality.
2. **Environment is dynamic:** The changing nature of environment is constant. The dynamism of the environment is largely due to large number of factors that continuously influence it's character and shape.
3. **Environment is multi-faceted:** Changes in the environment may be perceived differently by different people. It may be considered as an opportunity to one and threat to other.
4. **Environment has a far reaching impact:** It critically underpins the growth & profitability of the organization. Any change in environment affects the organization in more than one way.

2023 - June [8] (a) (i) After assuming an organization of your own choice, apply the concept of Portfolio Analysis on it. Now derive.

- (1) Various objectives of Portfolio Analysis and (3 marks)
- (2) Advantages of Portfolio Analysis. (4 marks)

Answer:

Objectives of Portfolio Analysis:

- To analyse the current mix of business and take investment decisions
- To develop strategies for adding new businesses in the portfolio thereby inducing growth
- To decide the business to be retained and the one to be excluded from the portfolio

Advantages of Portfolio Analysis:

- It encourages top management to evaluate each of the corporation's business individually and to set objectives and allocate resources for each.
- It stimulates the use of externally oriented data to supplement management's judgement.

- It raises the issue of cash flow availability for use in expansion and growth
- It's graphic depiction facilitates communication.

2023 - Dec [7] (a) Examine Various Mechanisms that may be employed for identifying Strategic alternatives in the medium and large organizations.

(7 marks)

Answer:

In medium and large organizations, the following mechanisms may be employed for identifying strategic alternatives:

1. Brainstorming Sessions:

In most organizations, strategic alternatives are identified during brainstorming sessions of top management and key executives. In such meetings, participants generate a number of alternatives. At this stage, no importance is given to the relative merits and demerits of the options. In the next stage, each alternative is reviewed and subjected to close scrutiny. The alternatives which are considered fairly appealing are further examined and analyzed for final selection.

2. Special Meetings:

Some large organizations may hold special meetings of top executives away from their work, in a hotel or a holiday resort. This is to ensure that the process of thinking is not disturbed by interruptions during the course of deliberations. The participants present different alternative scenarios along with their recommended courses of action. Depending on the assumptions and future trends, each course of action is discussed and attempts are made to finalize the best options for further analysis.

3. Outside Consultants:

Some organizations may engage the services of an outside consultant to handle the process of generating alternative strategies. The premise is that an outsider can observe the phenomenon objectively and dispassionately, and bring in his own expertise into the process. The outside viewpoint is expected to be new and fresh, and thus can show up many new opportunities to the organization.

4. Joint Meetings:

Another useful way of generating alternatives is to hire the services of a consultant and also associate some internal members in the process. This method has the advantage of blending the new ideas contributed by the outside consultants with workable solutions from within the organization. (Rao. et al. 2008).

2023 - Dec [7] (b) "The value chain describe the categories of activities within and around an organization which create a product or service". In this context, demonstrate the activities involved in value chain of an organization.

(7 marks)

Answer:

Primary activities are directly concerned with the creation or delivery of a product or service. **For example**, for a manufacturing business the primary activists are as follows:

- Inbound logistics are activities concerned with receiving; storing and distributing inputs to the product or service including materials handling, stock control, transport, etc.
- Operations transform these inputs into the final product or service. Operations include machining, packaging, assembly, testing, etc.
- Outbound logistics collect, store and distribute the product to customers, for example warehousing, materials handling, distribution, etc.
- Marketing and sales provide the means whereby consumers/users are made aware of the product or service and are able to purchase it. This includes sales administration, advertising and selling.
- Service includes those activities that enhance or maintain the value of product or service, such as installation, repair, training and spares.

Support activities help to improve the effectiveness or efficiency of primary activities. **The following are the support or secondary activities:**

- 1. Procurement:** It refers to the processes that occur in many parts of the organisation for acquiring the various resource inputs to the primary activities.
- 2. Technology development:** All value activities have a 'technology', even if it is just know-how. Technologies may be concerned directly with a product or with processes or with a particular resource.

3. **Human resource management:** This transcends all primary activities. It is concerned with those activities involved in recruiting, managing, training, developing and rewarding people within the organisation.
4. **Infrastructure:** The formal systems of planning, finance, quality control, information management, and the structures and routines that are part of an organisation's culture.

2024 - June [7] (a) "Identifying key drives for change helps managers to focus on the PESTEL factors that are most important and which must be addressed as the highest priority" - Justify the statement with the help of PESTEL Framework. (7 marks)

Answer:

PESTEL framework covers six main types of environmental influences, namely, Political, Economic, Social, Technological, Environmental and Legal. All these influences create both opportunities as well as threats depending upon the situation.

Political instability poses threats to business organizations whereas, Political stability and a favourable government creates opportune business environment.

Economic growth leads to an increase in customer expenditures which in turn gives companies the opportunity to expand operations and earn higher profits. On the contrary Recession increases competitive pressures and decreases customer expenditures causing a threat to the companies.

Social influences include changing cultures and demographics. Demographic forces are outcomes of changes in the characteristics of a population, such as age, gender, ethnic origin, race, sexual orientation and social class.

Like the other forces in the general environment, demographic forces present managers with opportunities and threats and can have major implications for organizations.

Technological influences refer to innovations such as artificial intelligence, internet, nano-technology, or the rise of new composite materials.

Environmental stands specifically for 'green' issues, such as pollution and waste. The environmental factors have now become extremely important for

organizations as countries across the globe are increasingly concerned with the environmental changes and are striving towards clean, green and renewable sources of energy.

Legal embraces Legislative constraints or changes such as health and safety Legislation or restriction on Company mergers and acquisitions.

2024 - June [7] (b) Analyze the Techniques that can help to improve Strategic decision Making. (7 marks)

Answer:

The Techniques for improving strategic decision making are enumerated below:

Devil's advocacy:

It requires the generation of a plan, and a critical analysis of that plan. One member of the decision-making group acts as the devil's advocate, emphasizing all the reasons that might make the proposal unacceptable. In this way, decision makers can become aware of the possible perils of recommended courses of action.

Dialectic inquiry:

It is more complex because it requires the generation of a plan (a thesis) and a counter-plan (an antithesis) that reflect plausible but conflicting courses of action. Strategic managers listen to a debate between advocates of the plan and counter-plan and then decide which plan will lead to higher performance. The purpose of the debate is to reveal the problems with the definitions, recommended courses of action, and assumptions of both plans.

The outside view:

It requires planners to identify a reference class of analogous past strategic initiatives, determine whether those initiatives succeeded or failed, and evaluate the project at hand against those prior initiatives.

Group Think:

1. Concept was given by psychologist Irvin Janis.
2. It occurs when a group of decision makers embarks upon a course of action without questioning underlying assumptions.
3. Typically, a group coalesces (unites) around a person or policy.

4. It ignores or filter out information that can be used to question the policy and develops after the fact rationalizations for its decision.
5. Commitment to the mission or goals becomes based on an emotional rather than an objective assessment of the correct course of action.
6. The consequences can be poor decisions.

2024 - Dec [7] (a) Identify and analyze the five main steps involved in the Formal Strategic Planning Process. **(7 marks)**

2024 - Dec [7] (b) "Business Environment exhibits many characteristics". In this event, demonstrate in brief the said important characteristics of Business Environment. **(7 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 24x7 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 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.

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 Starbucks 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:

- (a) Keep the engaging commitment.
- (b) Set Long-term Strategic Objectives for improved performance of the organization,
- (c) Keep on generating Strategic Options
- (d) Keep evaluating and decide on strategies
- (e) There is a need to track monitoring implementation of the strategies against the long-term objectives.

(iii) Key Components of Strategic Planning Process are :

- (a) The Strategic intent/objective to improve the long-term performance of the Starbucks Coffee: A Tata Alliance.
- (b) The Strategic issues distilled from the analysis of key factors relevant to the overall situation of the organization in its environment and
- (c) 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.

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 Angeles, 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.

Paper 9 Operations Management and Strategic Management		
Feedback	I Need More	Scanner Preparation Key
		
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Key Concepts in Strategic Analysis and Planning

- **Strategic Analysis:**
Examining internal and external factors that impact the organization.
 - **Tools:** SWOT, PESTEL, Porter's Five Forces, Value Chain Analysis.
- **Strategic Planning:**
Creating a roadmap to achieve the organization's mission and vision.
 - **Steps:** Goal setting, strategy formulation, implementation, and evaluation.
- **Key Elements:**
 - **Vision and Mission:** Define the organization's purpose and future direction.
 - **Goals and Objectives:** Specific targets to achieve the vision.
 - **Resource Allocation:** Assigning resources effectively.

Checklists for Strategic Analysis

- **Internal Analysis:**
Identify strengths and weaknesses.
Assess resources, capabilities, and core competencies.
Use tools like Value Chain Analysis and VRIO framework.
- **External Analysis:**
Examine opportunities and threats.
Analyze industry trends using PESTEL and Porter's Five Forces.
- **Environmental Scanning:**
Regularly update data on competitors, market trends, and customer behavior.

Checklists for Strategic Planning

- **Define Vision and Mission:**
Ensure alignment with organizational values.
- **Set SMART Goals:**
Specific, Measurable, Achievable, Relevant, Time-bound.

- **Formulate Strategies:**
Use frameworks like BCG Matrix, Ansoff Matrix, and Balanced Scorecard.
- **Implementation Plan:**
Develop action steps, timelines, and allocate resources.
- **Evaluate and Control:**
Monitor KPIs and adapt strategies based on performance.

Fun Flows for Strategic Analysis and Planning

- **Strategic Analysis Flow:**
Analyze Internal Factors - Analyze External Factors - Identify Gaps - Recommend Strategies.
- **Strategic Planning Flow:**
Vision - Goals - Strategy - Action Plan - Monitoring.
- **Environmental Analysis Flow:**
Political - Economic - Social - Technological - Environmental - Legal (PESTEL).

Challenges in Strategic Analysis and Planning

- **Inaccurate Data:**
Decisions based on outdated or incomplete data.
- **Resource Limitations:**
Balancing available resources with strategic priorities.
- **Dynamic Environments:**
Rapid changes in technology and market conditions.
- **Stakeholder Alignment:**
Conflicting interests among stakeholders.
- **Implementation Gaps:**
Poor communication or execution of plans.

Motivational Quotes

- "Strategy is not the consequence of planning but the starting point."
– Michael Porter
- "Failing to plan is planning to fail." – Alan Lakein
- "In preparing for battle, I have always found that plans are useless, but planning is indispensable." – Dwight D. Eisenhower

Smart Study Tips






- **Understand Frameworks:**
Master key strategic tools like SWOT, PESTEL, and Porter's Five Forces.
- **Use Case Studies:**
Analyze how organizations develop and execute strategies.
- **Visual Learning:**
Draw diagrams for analysis flows, strategy matrices, and implementation plans.
- **Practice Application:**
Solve hypothetical scenarios to apply strategic tools effectively.
- **Break Down Topics:**
Study analysis and planning processes step by step.

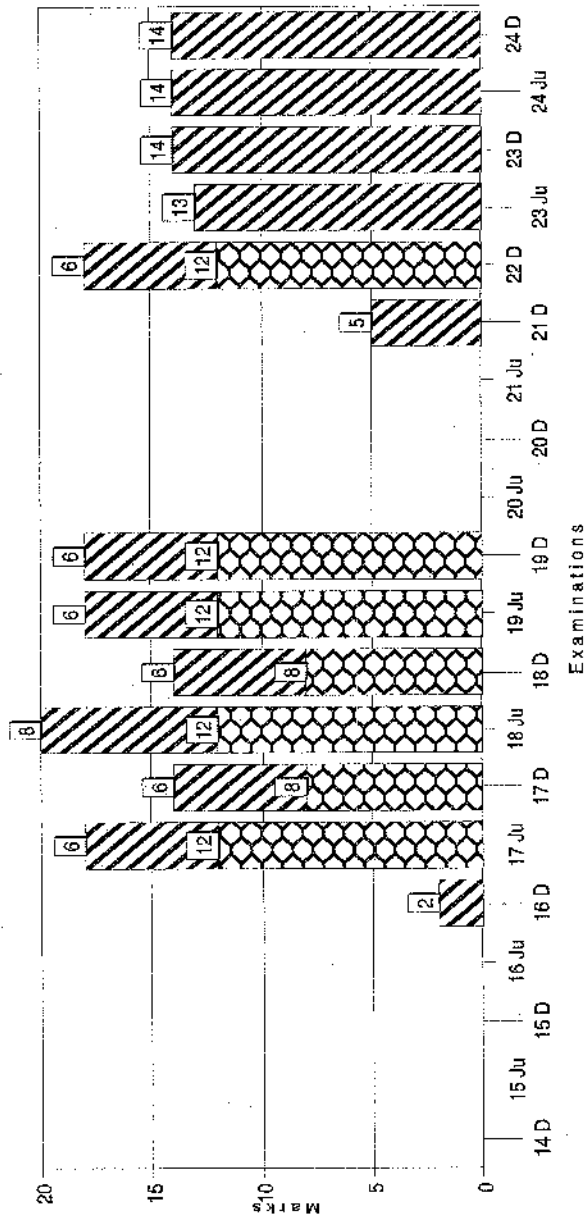
Keywords to Focus On

- Vision and Mission.
- SWOT Analysis.
- PESTEL Analysis.
- Competitive advantage.
- Resource allocation.
- Key Performance Indicators (KPIs).
- Strategic alignment.
- Implementation roadmap

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

Legend

-  Objective
-  Short Notes
-  Distinguish
-  Descriptive
-  Practical



CHAPTER	Formulation and Implementation of Strategy	
10		
THIS CHAPTER INCLUDES		
<ol style="list-style-type: none"> 1. Strategy Formulation - Production Strategy, Supply Chain Strategy, Marketing Strategy, Human Resource Strategy 2. Structuring of Organisation for Implementation of Strategy 	<ol style="list-style-type: none"> 3. Strategic Business Unit 4. Business Process Re-engineering 5. Management Control, Operational Control and Task Control 7. Goal Congruence 	

PAST YEAR QUESTIONS AND ANSWERS

SHORT NOTES

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 it 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 is 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.

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.

2018 - June [9] Write short notes on the following:

- Marketing Plan and Strategy.
- Geographic and Matrix structure for implementation of organisational strategy.
- Types of firms/organisations for which BPR can be applied.

(4 x 3 = 12 marks)

Answer:

(a) Marketing Plan and Strategy: Marketing Plan is a written document that specifies in detail the firm's 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 peak seasons
- Poor performance of middle level managers
- Inappropriate distribution of resources and jobs in order to achieve maximum performance, etc.

2018 - Dec [9] Write short notes on the following:

- Definition of the terms 'Re-engineering' and 'Process' in Business Process Re-engineering
- 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.

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:

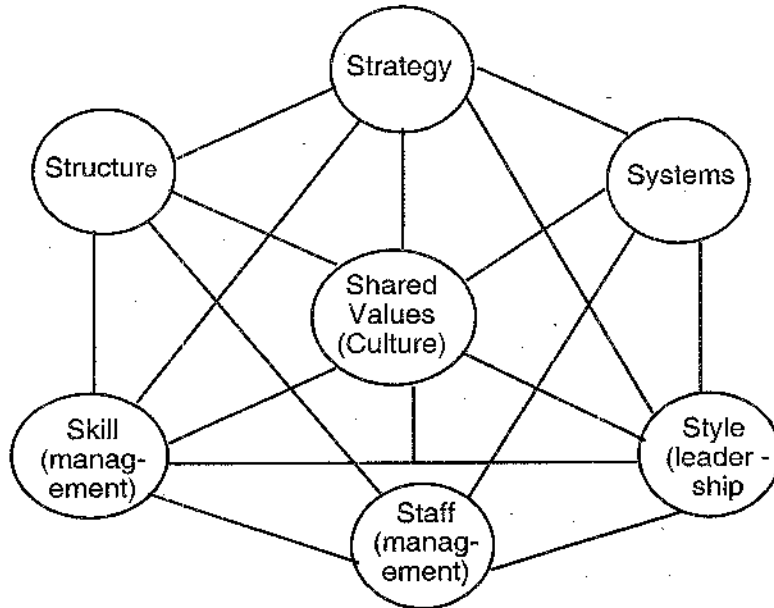
The more important features which human resource strategy may bring to bear on the organisation are as follows:

1. **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.
2. **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.

3. **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.
4. **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.
5. **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.
6. **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.
7. **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.

2019 - Dec [9] Write short notes on of the following:

- Name the steps involved in the formulation of production strategy.
- Write a brief note on 'Behaviour Control' aspect of Strategic Control System.
- 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:**

1. Study the overall corporate plan and define the objectives.
2. Analyse the present production operations and the present and future environment.
3. Review sales - forecast and marketing.
4. 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)

Answer:

- (a) • Core competences are activities or processes that critically underpin an organization's competitive advantage.
 - The core competences have the following characteristics
 - (i) Provide distinctive advantage for the firm
 - (ii) Difficult for the competitors to imitate
 - Competence is rare
 - Competence is concerned with managing complex activities or processes
 - Competitors are not clear which resource or competences have caused the success of the firm. This is known as causal ambiguity
 - The competence is embedded in the culture
 - (iii) They make a significant contribution to customer value and the end products offered by the firm
 - (iv) They provide access to a wide variety of markets
 - In order to understand this let us take the case of Honda. Honda's core competence lies in design and manufacture of engine and its end products includes motorcycles, cars, generators, lawn-mowers, etc. Similarly the core competences of Canon are optics, imagery and microprocessors and its end products includes cameras, fax machine, image-scanners, etc.
- (b) • **The following steps are involved in the formulation of production strategy**
 1. **Study the overall corporate plan and define the objectives:**
As in other operating areas, production planning begins with corporate objectives and planning premises. Examination of overall corporate planning not only provides overall directions for manufacturing but also answers questions about overall economic, industrial, market and company factors which will limit and otherwise affect the production planning.

2. **Analyse the present production operations and the present and future environment:** The production manager should analyse the current manufacturing operations and the present and future environmental trends to determine the company's manufacturing strengths and weaknesses and to isolate environmental factors such as the manpower supply and new process and equipment developments, which significantly affect manufacturing operations.
3. **Review sales-forecast and marketing:** Since planning in other areas affects manufacturing plans, the planner should examine the plans in these areas. Sales goals are the basis upon which specific operating plans for manufacturing are built. Hopefully, the manufacturing manager will have participated in the development of these goals so that the sales goals can be reconciled with operations limitations. Once settled manufacturing plans can be developed to meet sales goals.
4. **Make strategic decisions for production:** Keeping in mind the overall corporate business mix, present production operations, environmental forces, sales forecast and marketing mix, the production manager has to decide about the extent of manufacturing activity, choice of manufacturing process, capacity machines and equipment to be used, and physical facilities.

(c) **The 3-Rs of Re-engineering:**

The 3 Rs of Re-engineering are enumerated as shown in below Table:

Redesign	Retool	Reorchestrate
<ul style="list-style-type: none"> • Simplify • Standardize • Empowering • Employee ship • Groupware • Measurements 	<ul style="list-style-type: none"> • Networks • Intranets • Extranets • Work Flow 	<ul style="list-style-type: none"> • Synchronize • Process • IT • Human Resources

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, Prahalad and Hamel prescribe three tests:

1. it should be able to provide potential access to a wide variety of market;
2. it should make a significant contribution to the perceived customers of the end product; and
3. 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.

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.

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:

1. **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.
2. **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.
3. **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.
4. **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.
5. **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.

6. **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.
7. **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.

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.

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.

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:

- (a) Useful for some specific industries like Information Technology, Healthcare etc.
- (b) Employee can see visible results of their efforts
- (c) Remove barrier to communications
- (d) Managing projects are easy
- (e) Effective structures when environment is very dynamic

Disadvantages:

1. Complex structure as this contains both vertical and horizontal flow of information
2. High cost approach due to more management positions
3. Dual lines of authority
4. Conflicts arises in the allocation of resources

2019 - June [8] (b) State the various advantages and disadvantages of SBU structure.

(6 marks)

Answer:

Various advantages and disadvantages of SBU structure:

Advantages:

1. Promotes accountability since units' heads are responsible for individual SBU profitability
2. Career development opportunities are further higher in this structure
3. Allow better control of categories of products manufacturing, marketing and distributions
4. Helps to expand in different related and unrelated businesses.

Disadvantages:

- (a) May provide inconsistent approach to tackle customers, etc., because each unit may work in it's own way to handle situations
- (b) High cost approach.

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.

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.

2021 - Dec [2] What are the disadvantages of Matrix Organization Structure?
(4 marks) [Sec. C - Four LAQ]

Answer:

Disadvantages of Matrix Organization Structure:

- (a) Complex structure as this contains both vertical and horizontal flow of information
- (b) High-cost approach due to more management positions
- (c) Dual lines of authority
- (d) Conflicts arises in the allocation of resources

2022 - Dec [8] (b) Explain with examples, why do we need the Strategic Business Unit.
(6 marks)

Answer:

A Strategic Business Unit is a relatively autonomous division of a large company that operates as an independent enterprise with responsibility for a particular range of products or activities. These strategic business units are responsible for their own profit or loss but are answerable to the top management.

SBU or a Strategic Business unit mostly targets a particular market segment and it provides expertise in product management and operations which help the parent company manage and track the different products that are produced in the company. The SBU is given the authority to make its own strategic decisions within corporate guidelines as long as it meets corporate objectives. A big organization like Unilever etc. has many SBUs for their different categories of products like Cosmetics, Food products, Beverages, etc., and each is managed through a separate unit head. It promotes accountability.

Since units' heads are responsible for individual SBU profitability. Career development opportunities are further higher in this structure.

It allows better control of categories of products manufacturing, marketing, and distribution.

2023 - June [8] (b) Visualise as if you are heading a Project-based firm. Justify the formation of 'Project-based structure' in your firm. Evaluate the advantages and limitation of Project-based structures. **(2+4+2 = 8 marks)**

Answer:**Justify the formation of Project-based structure in your firm:**

The project-based structure is one where teams are created, undertake the work and are then dissolved. This can be particularly appropriate for your organization if it deliver large and expensive goods or services (civil, engg., information systems, films) or those delivering time-limited events (Conference, sporting events, or consulting engagements). The organisation structure is a constantly changing collection of project teams created, steered and glued together loosely by a small corporate group. Many organisations use such teams in a more adhoc way to complement the main' structure. For ex. Task forces are set up to make progress on new elements of strategy or to provide momentum where the regular structure of the organisation is not effective.

Advantages of Project based structures:

- The project based structure can be highly flexible, with projects being set up and dissolved as required.
- Accountability and control are good because project teams should have clear tasks to achieve within a definite life.
- Projects can be effective at knowledge exchange as project team members will typically be drawn from different departments within the firm.
- Projects can also draw members internationally and because project life spans are typically short, project teams may be more willing to work temporarily around the world.

Disadvantages of Project based structures:

- Without strong programme management providing overarching strategic control, organizations are prone to proliferate projects in an ill coordinated fashion.
- The constant breaking up of project teams can also hinder the accumulation of knowledge over time or within specialism.

2023 - June [9] (a) What do you understand by Business Process Re-engineering? What are the important reasons that lead an organization to undertake re-engineering? **(2 + 3 = 5 marks)**

Answer:

Hammer and Champy (1993) defined BPR as "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".

Business Process Re-engineering may be considered to be radical redesign of the business processes often used by companies to cut costs and return to profitability. It is fundamental re-thinking and radical re-design of business processes to achieve dramatic improvements in critical contemporary measures of performances such as cost, quality, service and speed.

There are 3 important reasons that lead an organization to undertake re-engineering:

- An organization needs dramatic improvements to sustain itself and is already in deep trouble. High failure rate of products and repetitive customer complaints can be one of the reasons that can cause huge disruption in the functioning of the organization.
- The need for re-engineering can be felt by the management keeping in mind the imminent problems that the organization is expected to face in the future due to some dramatic changes in the environment, both internal and external.
- There can be situations when re-engineering can help organizations to be in better position than they are currently in.

2023 - Dec [8] (a) "While designing a Control System, top management should remember that controls should following strategy". In this context enumerate the recommended guidelines for proper control. **(7 marks)**

Answer:**Guidelines for Proper Control:**

In designing a control system, top management should remember that controls should follow strategy. Unless controls ensure the use of the proper strategy to achieve objectives, there is a strong likelihood that dysfunctional side effects will completely undermine the implementation of the objectives.

The following guidelines are recommended:

- Control should involve only the minimum amount of information needed to give a reliable picture of events: Too many controls create confusion. Focus on the strategic factors by following Pareto's 80/20 rule: Monitor those 20% of the factors determines 80% of the results.
- Control must be reasonable. Frequent reporting and rapid reporting may frustrate control.
- Controls do not work unless they are acceptable to those who apply them.
- Controls should monitor only meaningful activities and results, regardless of measurement difficulty: If cooperation between divisions is important to corporate performance, some form of qualitative or quantitative measure should be established to monitor cooperation.
- Controls must be flexible to take care of changing circumstances.
- Controls should be timely so that corrective action can be taken before it is too late: Steering controls, controls that monitor or measure the factors influencing performance, should be stressed so that advance notice of problems is given.
- Long-term and short-term controls should be used: If only short-term measures are emphasized, a short-term managerial orientation is likely.
- Controls should aim at pinpointing exceptions: Only activities or results that fall outside a predetermined tolerance range should call for action.
- Emphasize the reward of meeting or exceeding standards rather than punishment for failing to meet standards: Heavy punishment of failure typically results in goal displacement. Managers will fudge reports and lobby for lower standard.

2023 - Dec [8] (b) Demonstrate in brief some of the areas that have the ability to create goal congruence. (7 marks)

Answer:

Aspects of Goal Congruence:

The following are some of the areas that have the ability to create goal congruence:

(a) **Communication and Understanding:**

Channels of communication and how goals are perceived are important to achieve goal congruence. Operational managers have a responsibility

of being aware as to what actions are desirable and what goals are to be achieved. It should be understood that the communication of different goals can occur through informal channels, which involves meetings and face to face interactions, or through formal channels including budgets or other financial documents. There is an inherent risk that even if the communication is well executed, it might be perceived in different ways. Organisations, therefore, should internalise the goals in a good manner to avoid that employees feel inability to achieve them.

(b) **Create direction:**

One of the reasons for lack of goal congruence is the absence of direction related to employees' behaviour. Performance management and goals facilitate efficient communication about what managers want their subordinates to focus on. It needs no mention that providing clear information and direction, employees can better understand what is expected from them, how to perform adequately, and how to contribute effectively to the achievement of the organisational goals. There is a need to increase the employees understanding of the strategic objectives as well as the organisation's value drivers.

(c) **Motivation:**

The problem of motivation can exist even though employees have knowledge about how to perform adequately because employees can act in their own self interest instead of in the organisation's best interest. The employees can make their own performance report better by allocating resources without befitting the organisation as a whole. One of the strongest reasons for demotivation among employees and managers is dislike for the work allocated. The reason for motivation varies among employees. While some employees feel motivated for some recognition and appraisals others may feel motivated because of commitment and responsibility without any required pay off. The more motivated the employees of the organisation the better will be the goal congruence.

(d) **Incentives:**

In order to increase the likelihood of employees working to achieve their individual goals, organisation's aim to influence motivation by providing incentives. Research suggests that individuals tend to perform better

when they are rewarded. Rewards and compensations should create goal congruence between individual goals and organisational goals by stimulating individuals to perform by providing incentives, as rewards are related to increased effort.

(e) **Connection:**

It is very important to create a connection between goals, performance measures and incentives. In order to align the employees' self interest and overall organisational objectives it is necessary to relate incentives with performance. By linking incentives to certain goals, individuals tend to pay more attention to what is important.

2024 - June [8] (a) "Michael Goold and Andrew Campbell provide Nine design tests against which to check specific tailor - made structural Solutions" - In this Context, Analyze any seven of these nine test.

(7 marks)

Answer:

The design tests are analyzed as follows:

1. **The Market-Advantage Test:**

This test of fit with market strategy is fundamental, following Alfred Chandler's classic principle that 'structure follows strategy'. For example, if coordination between two steps in a production process is important to market advantage, then they should probably be placed in the same structural unit.

2. **The Parenting Advantage Test:**

The structural design should fit the 'parenting' role of the corporate centre.

3. **The People Test:**

The structural design must fit the people available. It is dangerous to switch completely from a functional structure to a multidivisional structure if, as is likely, the organization lacks managers with competence in running decentralized business units.

4. **The Feasibility Test:**

This is a catch-all category, indicating that the structure must fit legal, stakeholder, trade union or similar constraints.

5. **The Specialised Cultures Test:**

This test reflects the value of bringing together specialists so that they can develop their expertise in close collaboration with each other. A structure fails if it breaks up important specialist cultures.

6. **The Difficult Links Test:**

This test asks whether a proposed structure will set up links between parts of the organizations that are important but bound to be strained.

7. **The Redundant Hierarchy Test:**

Any structural design should be checked in case it has too many layers of management, causing undue blockages and expense. Delaying in response to redundant hierarchies has been an important structural trend in recent years.

8. **The Accountability Test:**

This test stresses the importance of clear lines of accountability, ensuring the control and commitment of managers throughout the structure.

9. **The Flexibility Test:**

In a fast-moving world, an important test is the extent to which a design will allow for change in the future. For instance, divisional domains should be specified broadly enough to allow divisional managers to follow new opportunities as they emerge.

2024 - June [8] (b) "Hammer and Champy (1993) point to the existence of a set of 'commonalities, recurring themes or characteristics' that can guide Business Process Re-engineering (BPR)". - In accordance with this, align the said Commonalities or characteristics that guide BPR. (7 marks)

Answer:

The commonalities or characteristics that guide BPR are given below:

1. Combining several jobs into one.
2. Allowing workers to make decisions.
3. Performing the steps of a process in a natural order.
4. Recognition that processes have multiple versions and designing processes to take account of different situations.

5. Reducing checks and controls to the point where they make economic sense.
6. Minimizing reconciliation.
7. Appointing a case manager to provide a single point of contact at the interface between processes.
8. Performing processes where it makes the most sense, e.g., if the accounting department needs pencils, it is probably cheaper for such a small order to be purchased directly from the office equipment store along the block than to be ordered via the firm's purchasing department.
9. Reconciling centralization with decentralization in process design e.g. a shared database, decentralized decisions can be made while permitting overall coordination simply through information sharing.

2024 - Dec [8] (a) "The Transnational Structure seeks to obtain the best form of the two extreme International Strategies, the Multi-Domestic Strategy and the Global Strategy". In this context, identify and discuss the characteristics of Transnational Structure. **(7 marks)**

2024 - Dec [8] (b) "The achievement of goal congruence is essential in order to increase the profitability of the organization and to achieve its goals". With reference to this statement, demonstrate some of the areas that have the ability to create goal congruence. **(7 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:

- (a) Provide access to a wide variety of markets.
- (b) Contribute significantly to the end-product benefits.
- (c) Be difficult for competitors to imitate; and
- (d) It should be valuable.

Yes, It fits for VIT.

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:

1. Strategic decisions are likely to affect the long-term direction of an organisation.
2. Strategic decisions are normally about trying to achieve some advantage for the organisation.
3. Strategic decisions are likely to be concerned with the scope of an organization's activities: Does (and should) the organisation concentrate 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.
4. Strategy is to do with the matching of the activities of an organisation to the environment in which it operates.
5. 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.
6. 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.

7. Strategic decisions are therefore likely to affect operational decisions.
8. 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 at least 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.


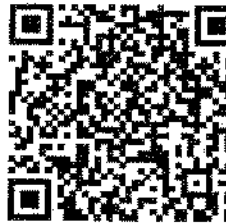
Managers, therefore, have to cross functional and operational boundaries to deal with strategic problems and come to agreements with other managers who, inevitably, have different interests and perhaps different priorities. This problem of integration exists in all management tasks but is particularly 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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Key Concepts in Strategy Formulation and Implementation

- **Strategy Formulation:**
The process of defining organizational goals and devising strategies to achieve them.
 - **Tools:** SWOT Analysis, PESTEL, Porter's Five Forces, and BCG Matrix.
- **Strategy Implementation:**
Translating formulated strategies into operational actions.
 - **Focus:** Allocating resources, managing change, and monitoring performance.
- **Levels of Strategy:**
 - **Corporate-Level Strategy:** Overall direction for the organization.
 - **Business-Level Strategy:** Competing within specific markets.
 - **Functional-Level Strategy:** Implementation at departmental levels.

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

Legend



Objective



Short Notes



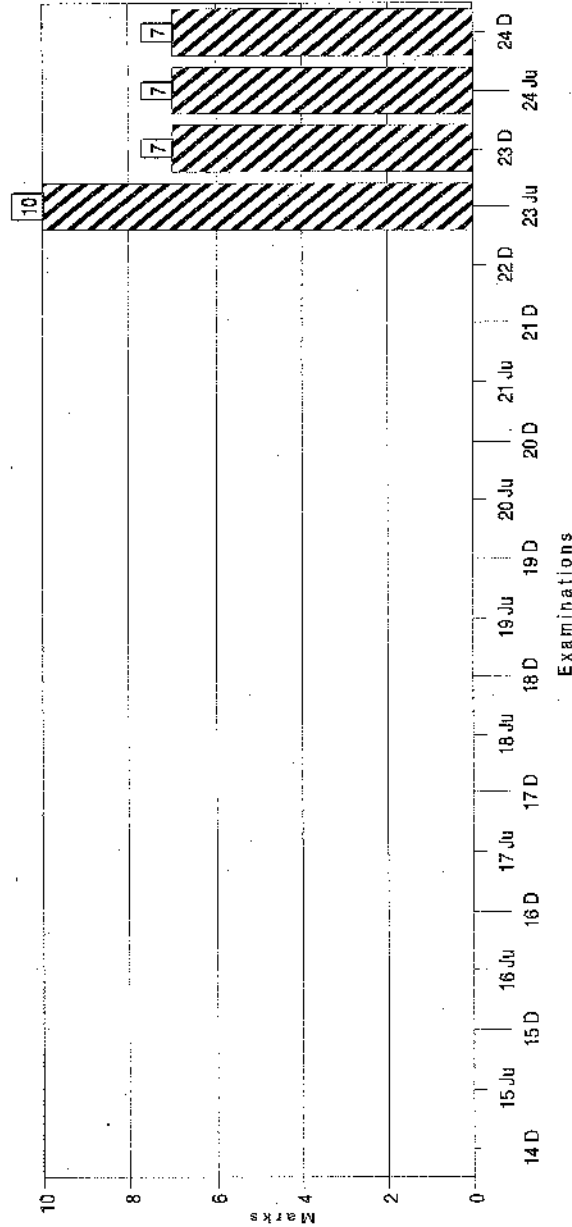
Distinguish



Descriptive



Practical



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CHAPTER	<h1>Digital Strategy</h1>	
11		
THIS CHAPTER INCLUDES		
1. Introduction	2. Digital Transformation for Competitive Advantages	3. Innovations and Disruptive Business Models
		4. Emerging Trends in Digital and Social Marketing Strategies

PAST YEAR QUESTIONS AND ANSWERS

DESCRIPTIVE QUESTIONS

- 2023 - June [9]** (b) (i) Compare and contrast the two terms: Digitization and Digitalization.
 (ii) Examine various application areas of Internet of Things (IoT). (any six)
(4 + 6 = 10 marks)

Answer:

- (i) **Digitization:** All analogue data needs to be converted and generated by operating machinery and legacy systems, devices, physical documents etc. into digital data and records. Taking steps to ensure that all data to be used in the process of business transformation are relevant, generated from first hand sources and trustworthy is important.
- Digitalization:** The need to use digital technologies befitting the needs for changing business, operating and revenue models with the objective to generate more turnover and achieving maximization of value creation as well as minimization of value destruction needs to be implemented. For example, brick and mortar business models is added with and / or replaced by virtual marketplace for E-Commerce

(ii) **Application areas of Internet of Things (IoT):**

- Increasingly, organisations in a variety of industries are using IoT to operate more efficiently, better understand customers to deliver enhanced customer service, improve decision-making and increase the value of the business.
- **Access to low-cost, low-power sensor technology:**
Affordable and reliable sensors are making IoT technology possible for more manufacturers.
- **Connectivity:**
A host of network protocols for the internet has made it easy to connect sensors to the cloud and to other things for efficient data transfer.
- **Machine learning and analytics:**
With advances in machine learning and analytics, along with access to varied and vast amounts of data stored in the cloud, businesses can gather insights faster and more easily. The emergence of these allied technologies continues to push the boundaries of IoT and the data produced by IoT also feeds these technologies.
- **Conversational artificial intelligence (AOI):**
Advances in neural networks have brought natural-language processing (NLP) to IoT devices (such as digital personal assistants Alexa, Cortana, and Siri) and made them appealing, affordable and viable for home use.
- **Smart Lighting:**
This is another one of the Internet of Things examples that have gradually been coming into common usage. Bulbs and battens connected to Wifi can be turned on and off remotely. Schedule for usage can be set for these devices along with their brightnesses controlled and their power consumption monitored. Using other IoT devices, smart lighting devices can also be turned on and off by voice alone. The power consumption of these devices can also be easily monitored using IoT.

• **Smart Parking:**

It is hard to regulate the occupancy and parking coverage in large multi-story car parking facilities. Among the many Internet of Things examples is the use of IoT in such facilities for counting the number of cars that have driven into the facility and the number that have driven out. Specific devices can also give you the exact location where you have parked your car so you are not lost.

• **Medical Fridges:**

Medical fridges are a grand entry to the Internet of Things examples list and can be used for regulatory compliance and safety purposes. Vials of vaccines and medicines can often be spoiled if they are not kept at the correct temperatures. Medical refrigerators cannot be monitored throughout the day, especially in person. Having IoT sensors inside medical fridges can enable them to be monitored remotely, and their temperature changed as per requirement.

2023 - Dec [6] (b) "In spite of the fact that Cloud computing has huge benefits yet, it has its own causes of Concern". In this context, examine the Demerits of Cloud computing. (Any seven). **(7 marks)**

Answer:

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:

1. **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.
2. **Costs 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.
3. **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.

4. **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.
 5. **Compliance with industry laws:** When transferring data from on-premises local storage into cloud storage, it can be difficult to manage compliance in the industry regulations through a third party.
 6. **Management of multiple clouds:** Every cloud is different, so multi-cloud deployments can dis-join efforts to address more general cloud computing challenges.
 7. **Cloud performance:** Network and providers outages can interfere with productivity and disrupt business processes if organisations are not prepared with contingency plans.
 8. **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.
 9. **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.
3. **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.
 4. **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 as (i) The Awareness Stage (ii) The Consideration stage and (iii) The Decision Stage.
 5. **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.
 6. **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.
 7. **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.
 8. **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.

2024 - June [6] (b) Demonstrate the different types of Digital Marketing Strategies. (Any seven) (7 marks)

Answer:

The different types of Digital Marketing strategies are discussed below:

1. Social Media Marketing Platforms:



Today's 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.

2. 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.

2024 - Dec [6] (b) "Big data is a collection of data that is huge in volume and growing exponentially with time". In this Context Identify the different types of big data and briefly explain the main characteristics of big data.

(7 marks)

Paper 9 Operations Management and Strategic Management		
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Key Concepts in Digital Strategy

- **Digital Transformation:**
Integrating digital technologies into all areas of business to improve processes, customer experience, and value delivery.
- **Components of Digital Strategy:**
 - **Vision:** Define the role of digital in achieving business goals.
 - **Technology:** Choose platforms, software, and tools.
 - **Processes:** Optimize workflows using digital solutions.
 - **People:** Train teams and adapt organizational culture.
- **Core Pillars:**
 - Data and Analytics.
 - Customer-Centricity.
 - Agility and Innovation.
 - Integration of Emerging Technologies (AI, IoT, Blockchain).

Checklists for Digital Strategy

- **Planning Phase:**
Define digital goals aligned with business objectives.
Conduct a SWOT analysis for digital capabilities.
Identify key technologies and trends.
- **Execution Phase:**
Develop a roadmap with timelines and milestones.
Allocate resources for technology, training, and tools.
Foster cross-functional collaboration.
- **Monitoring Phase:**
Track KPIs like customer engagement, digital adoption, and ROI.
Regularly review and update the strategy to align with market trends.

Fun Flows for Digital Strategy

- **Digital Strategy Development Flow:**
Vision - Assessment - Technology Selection - Implementation - Monitoring.
- **Digital Transformation Cycle:**
Define Goals - Design Digital Solutions - Execute - Evaluate - Optimize.
- **Customer-Centric Digital Flow:**
Customer Needs - Digital Tools - Enhanced Experience - Feedback Loop.

Motivational Quotes

- "Digital transformation is not about technology; it's about strategy." – Unknown
- "Adapt or perish, now as ever, is nature's inexorable imperative." – H.G. Wells
- "Innovation distinguishes between a leader and a follower." – Steve Jobs

CHAPTER	
12	Objective Questions

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SCANNER CMA Inter Gr-II Paper-9 Section-B

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

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 = $\frac{7.0 + 9.0 + 10.0 + 10.0}{4} = 9.0$ Minutes

Normal time = $9.0 \times 0.9 = 8.1$ minutes.

Standard Time = $\frac{8.1}{(1 - 0.15)} = 9.53$ minutes

(e) (ii) Change in quantity = $(10,000 - 7,000) = 3,000$ Units
 Change in profit = ₹ $[20,000 - (-40,000)] = ₹ 60,000$
 Unit Contribution = $\frac{\text{Change in Profit}}{\text{Change in Output}} = \frac{60,000}{3,000} = ₹ 20$

So, when output = 10,000 units

Total contribution = $(₹ 20 \times 10,000) = ₹ 2,00,000$

Contribution = Fixed Cost + Profit

2,00,000 = Fixed Cost + 20,000

or, $2,00,000 - 20,000 = \text{Fixed Cost}$

or, Fixed cost = ₹ 1,80,000

(f) (ii) Production Mix

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.

2014 - June [5] (c) Expand the following:

(i) TPM

(1 mark)

Answer:

TPM stands for Total Productive Maintenance.

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.

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.'

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.

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".

- 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.

- 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.

- 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

- 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

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

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.
- 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)

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

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)

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) Preventive 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

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

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

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 [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?
- Method Study
 - Work Study
 - Time Study
 - Motion Study
- (v) Generally the size of the order for production in Job production is
- small
 - large
 - medium
 - very large
- (vi) Which one of the following statements is NOT correct?
- LFT is calculated from the LFT of the head event.
 - Slack can be calculated by adding EFT and LFT of any job.
 - EFT is the sum of the EST and the time of duration for any event.
 - 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?
- Better product quality
 - Greater safety to workers
 - Increased breakdowns and downtime
 - Fewer large-scale repairs
- (viii) Which one of the following establishes time sequence of operations?
- Routing
 - Sequencing
 - Scheduling
 - Dispatching
- (ix) MRP stands for
- Material Requirement Planning
 - Material Reordering Planning
 - Material Requisition Procedure
 - Material Recording Procedure
- (x) With reference to Aggregate Planning, identify which of the following statements is NOT correct?

- It is an Intermediate-term planning.
- It is made operational through a master schedule, that gives the manufacturing schedule.
- Facility planning and scheduling are closely related with the aggregate planning.
- It deals with the strategic decisions, such as purchase of facilities, introduction of new products, processes, etc. **(1×10 =10 marks)**

Answer:

- (b) Re-engineering
- (d) Market Research
- (d) Continuous Process
- (b) Work Study
- (a) Small
- (b) Slack can be calculated by adding EFT and LFT of any job.
- (c) Increased breakdowns and downtime
- (c) Scheduling
- (a) Material Requirement Planning
- (d) It deals with the strategic decisions, such as purchase of facilities, introduction of new products, processes, etc.

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

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 [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) $(\text{Total station time/cycle time} \times \text{Number of work stations}) \times 100$ 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

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.

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

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 is 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 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. **(1 mark) [Sec. A - MCQ]**

Answer:

- (3) Productivity of capital is to be increased through effective materials management

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 [2] Routing and Scheduling becomes relatively complicated in:

- (1) Flow production
- (2) Batch production
- (3) Mass production
- (4) Job production **(1 mark) [Sec. A - MCQ]**

Answer:

- (2) Batch production

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

(1 mark) [Sec. A - MCQ]

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

(1 mark) [Sec. A - MCQ]

2021 - Dec [4] "Desired states or outcomes are objectives". Is this correct?

(1 mark) [Sec. B SAQ]

Answer:

Yes

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

(1 mark) [Sec. A - MCQ]

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

(1 mark) [Sec. A - MCQ]

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

(1 mark) [Sec. A - MCQ]

Answer:

- (4) Just in time production

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

(1 mark) [Sec. A - MCQ]

Answer:

- (4) Passive assessment of plant performance

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

(1 mark) [Sec. A - MCQ]

Answer:

- (4) Purpose for which forecast is made

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 [10] The starting point of Production cycle is

- (1) Market research
 (2) Routing
 (3) Product design
 (4) Production Planning

(1 mark) [Sec. A - MCQ]

Answer:

- (1) Market research

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 (1 mark) [Sec. A - MCQ]

Answer:

- (3) Short term forecasting is used

2021 - Dec [12] Most suitable layout for Job production is:

- (1) Process layout
 (2) Line layout
 (3) Matrix layout
 (4) Product layout (1 mark) [Sec. A - MCQ]

Answer:

- (1) Process layout

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 (1 mark) [Sec. A - MCQ]

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. (1 mark) [Sec. A - MCQ]

Answer:

- (4) He gets increased use value in the product.

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 [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 (1 mark) [Sec. A - MCQ]

Answer:

- (3) Estimate of the amount of unit sales for a specified future period

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? (1 mark) [Sec. A - MCQ]

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 (1 mark) [Sec. A - MCQ]

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

(1 mark) [Sec. A - MCQ]

2021 - Dec [19] For production planning:

- (1) Short term forecasting is useful
- (2) Medium term forecasting is useful
- (3) Forecasting is not useful
- (4) Long term forecasting is useful

Answer:

- (1) Short term forecasting is useful

(1 mark) [Sec. A - MCQ]

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 mark) [Sec. A - MCQ]

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?

Answer:

No.

(1 mark) [Sec. B SAQ]

2021 - Dec [3] The systematic method of probing the future is called.....

(1 mark) [Sec. B - SAQ]

Answer:

Forecasting

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.

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

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

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

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.

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.

2021 - Dec [18] KAIZEN is concerned with the continuous improvement. Is this statement correct?

(1 mark) [Sec. B - SAQ]

Answer:

Yes.

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)

Answer:

- (i) (c) Transport
- (ii) (d) Proper record keeping of maintenance
- (iii) (d) to achieve desired product quality
- (iv) (b) Load Control
- (v) (c) Capital Productivity
- (vi) (a) Slack
- (vii) (d) Less standby or reserve equipment or spares required
- (viii) (c) 75%
- (ix) (b) ISO 14000
- (x) (d) Continuous

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)

Answer:

Column-I	Column-II
(A) OLAP	(3) Analysis of Information from a data warehouse
(B) KAIZEN	(1) Change for the better
(C) Ranking Method	(5) Job Evaluation
(D) Gantt Chart	(6) Visual aid to plan and monitor individual activities
(E) Brainstorming	(2) Value Analysis
(F) Path Slack	(4) Difference in time length of any path and the critical path

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)

Answer:

- (i) True
- (ii) False
- (iii) False

- (iv) False
- (v) True
- (vi) False

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)**

Answer:

- (i) (b) a stream of decisions and actions which leads to the development of an effective strategy or strategies to help achieve objectives.
- (ii) (d) Political, economical, social and technological
- (iii) (d) low quality offered to customers.
- (iv) (c) Road map to Company's future
- (v) (a) Price cutting war
- (vi) (c) Synergy

2023 - June [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) With reference to the aspects of customer service under Operations Management, if Primary consideration focuses on "Movement of a given, requested or acceptable specification", it's corresponding Principal function will be:
 - (a) Manufacture
 - (b) Transport
 - (c) Supply
 - (d) Service **(1 mark)**
- (ii) Which one of the following forecasting is more useful in production planning?
 - (a) Short-term
 - (b) Medium-term

- (c) Long-term
(d) None of the above (1 mark)
- (iii) In which one of the following layouts, similar type of machines and services (i.e. facilities) are located together?
(a) Product or Line layout
(b) Process layout
(c) Group layout
(d) Fixed layout (1 mark)
- (iv) Point-rating method is closely associated with:
(a) Transportation
(b) Simulation
(c) Queuing system
(d) Job Evaluation (1 mark)
- (v) The ratio of Actual Production to the Standard Production is referred to as:
(a) Standardization
(b) Simplification
(c) Productivity
(d) Actual Yield (1 mark)
- (vi) Which one of the following is the project management software program?
(a) MS Power Point
(b) MS Excel
(c) MS Project
(d) MS Access (1 mark)
- (vii) The type of spare parts which although acknowledged to have a long life or a small chance of failure, would cause a long shutdown of equipment because it would take a long time to get a replacement for them, are known as:
(a) Insurance spares
(b) Rotable spares
(c) Regular spares
(d) Capital spares (1 mark)

- (viii) Which of the following is not the method used for Operations Research problems?
(a) Analytical method
(b) Simulation method
(c) Trail and error method
(d) None of the above (1 mark)

Answer:

- (i) (b)
(ii) (a)
(iii) (b)
(iv) (d)
(v) (c)
(vi) (c)
(vii) (d)
(viii) (d)

2023 - June [1] {C} (b) State whether the following statements are 'true' or 'false' (You may write only the Roman numeral and whether 'True' or 'False' without copying the statements into the answer books):

- (i) The term Operations Management is more used for a system where tangible goods are produced. (1 mark)
- (ii) Aggregate planning is an Intermediate term planning decision. (1 mark)
- (iii) The first and foremost stage of Design Thinking is Prototype. (1 mark)
- (iv) The ISO Standards are reviewed every 10 years and revised if needed. (1 mark)

Answer:

- (i) False
(ii) True
(iii) False
(iv) False

2023 - June [1] {C} (c) Fill in the blanks: (You may write only the Roman numeral and the content filling the blank)

- (i) Operations management is concerned essentially with the utilization of _____. **(1mark)**
- (ii) A _____ can be considered as a means of graphically depicting all the operations involved in a Project. **(1mark)**
- (iii) The two types of maintenance costs need to be balanced: Cost of premature replacement and Cost of _____. **(1mark)**

Answer:

- (i) Resources
- (ii) Network
- (iii) Breakdown

2023 - June [6] (a) Choose the correct answer from the given four alternatives (You may write only the Roman numeral and Alphabet chosen for your answer)

- (i) Which one of the following provides the standards for performance appraisal? **(1mark)**
 - (a) Mission
 - (b) Vision
 - (c) Objectives
 - (d) Values
- (ii) Which one of the following provides the broad 'data' from which to identify key drivers of change? **(1mark)**
 - (a) BCG matrix
 - (b) PESTEL analysis
 - (c) SWOT analysis
 - (d) Critical Success Factors
- (iii) Any metric that measures whether an organization is meeting certain objectives and goals that are set to help the organization succeed is called:
 - (a) Key Result Areas
 - (b) Key Performance Areas

(c) Task Control

(d) Key Performance Indicators **(1mark)**

- (iv) A shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network is referred to as:

(a) Artificial Intelligence

(b) Virtual Machine

(c) Machine Language

(d) Blockchain **(1mark)**

Answer:

- (i) (c)
- (ii) (b)
- (iii) (d)
- (iv) (d)

2023 - June [6] (b) State whether the following statements are 'True' or 'False'. (You may write only the roman numeral and whether 'True' or 'False' without copying the statements into the answer books):

- (i) Organizational behaviour is about how people may be motivated to work together in more effective ways. **(1mark)**
- (ii) The term threats can also be seen as challenges. **(1mark)**
- (iii) The advantages of JIT system is that it enables a company to maintain buffer stock of Inventory. **(1mark)**

Answer:

- (i) True
- (ii) True
- (iii) False

2023 - June [6] (c) Fill in the blanks (You may write only the Roman numeral and the content filling the blanks):

- (i) While under Red Ocean Strategy, focus is on current customers, in _____ Strategy, focus is on non-customers. **(1mark)**
- (ii) _____ exists when consumers have a preference for the products of established companies. **(1mark)**

- (iii) _____ is a collection of data that is huge in volume and is growing exponentially with time. **(1 mark)**

Answer:

- (i) Blue ocean
- (ii) Brand loyalty
- (iii) Big data

2023 - Dec [1] [C] Choose the correct answer from the given alternatives. (You may write only the Roman numeral and the Alphabet chosen for your answer):

- (i) With reference to the operations of a manufacturing company, one of the important decisions "How to reach the products to the customers?" is related to which one?
 - (a) Quality Management
 - (b) Inventory Management
 - (c) Maintenance Management
 - (d) Distribution
- (ii) Which one of the following is associated with the question "How much space and capacity does each economic activity centre need?"
 - (a) Facility location
 - (b) Facility layout
 - (c) Capacity Planning
 - (d) MRP
- (iii) The non-linear iterative process that seeks to understand users needs challenge assumptions, redefine problems and create innovative solutions to prototype and test, is called:
 - (a) Product design
 - (b) Product Mix
 - (c) Design thinking
 - (d) Product Life Cycle
- (iv) Any solution that also satisfies the non-negative restrictions of the general linear programming problem is called a:

- (a) Basic Solution
 - (b) Feasible Solution
 - (c) Basic Feasible solution
 - (d) Optimal feasible solution
- (v) ISO Standards are reviewed every:
- (a) Year
 - (b) 2 Years
 - (c) 5 Years
 - (d) 10 Years
- (vi) ABS Ltd., a manufacturing Company has a production line consisting of five work centers in series with individual capacity in units per shift as are given. The actual output of line is 270 units per shift.
- | Work Centre | P | Q | R | S | T |
|----------------|-----|-----|-----|-----|-----|
| Capacity/Shift | 350 | 320 | 360 | 325 | 300 |
- Identify the bottle neck centre
- (a) Work Centre P
 - (b) Work Centre R
 - (c) Work Centre T
 - (d) Work Centre S
- (vii) Under Maintenance management, two types of costs and need to be balanced-one is cost of premature replacement, other is cost of:
- (a) Purchase of Raw Materials
 - (b) Breakdown
 - (c) Purchase of finished goods
 - (d) None of the above
- (viii) The technique which involves developing a model of real phenomenon and then performing experiments on the model evolved, is referred to as:
- (a) Transportation
 - (b) Assignment
 - (c) Simulation
 - (d) Queuing

- (ix) Which one of the following refers to the job-specific goals of each individual employee?
 (a) Performance Objectives
 (b) Personal Objectives
 (c) Professional Objectives
 (d) Organization Genomics
- (x) Which one of the following is related to a situation when consumers have a preference for the products of established companies?
 (a) Economics of Scale
 (b) Brand Loyalty
 (c) Customer switching costs
 (d) Absolute cost advantages
- (xi) 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 is called:
 (a) Transformation
 (b) Reprocessing
 (c) Total Quality Management
 (d) Business Process Re-engineering (BPR)
- (xii) A collection of data that is huge in volume and is growing exponentially with time is called:
 (a) Big data
 (b) Huge data
 (c) Block Chain
 (d) Cloud data
- (xiii) The expected time for an activity of project B is 7 days. If the optimistic and pessimistic time are 3 days and 15 days respectively, what will be the most likely time of the activity?
 (a) 10 days
 (b) 6 days
 (c) 12 days
 (d) None of these

- (xiv) In SWOTC Analysis, the Letter 'C' denotes:
 (a) Champions
 (b) Characteristics
 (c) Challenges
 (d) Core Values
- (xv) While developing KRAs (Key Result Areas) following can be the hurdle(s):
 (a) Lack of clarity
 (b) Distractions
 (c) Top-Down Imposition Areas
 (d) All of the above

(2 x 15 = 30 marks)**Answer:**

- (i) (d) Distribution
 (ii) (b) Facility layout
 (iii) (c) Design thinking
 (iv) (b) Feasible Solution
 (v) (c) 5 Years
 (vi) (c) Work Centre T
 (vii) (b) Breakdown
 (viii) (c) Simulation
 (ix) (b) Personal Objectives
 (x) (b) Brand Loyalty
 (xi) (d) Business Process Re-engineering (BPR)
 (xii) (a) Big data
 (xiii) (b) 6 days
 (xiv) (c) Challenges
 (xv) (d) All of the above

2024 - June [1] {C} Choose the correct answer from the given alternatives (You may write only the Roman numeral and the Alphabet chosen for your answer):

- (i) Let's consider an example of a product manufacturing company, who is aware that it needs to produce the products. One of the important aspects involved in the operational planning which is related to the question. "How much to produce?" is known as:

- (a) Process Selection & Layout
 (b) Aggregate Planning
 (c) Demand Forecasting
 (d) Quality Management
- (ii) _____ of a plant is the maximum rate of output (goods or services) the plant can produce.
 (a) Production
 (b) Potential
 (c) Demand
 (d) Capacity
- (iii) Which one of the following basic process types is used when a very highly standardized product is desired in high volumes?
 (a) Batch Process
 (b) Continuous Process
 (c) Job Shop Process
 (d) Project Process
- (iv) Which one of the following production controls is typically found whenever a particular bottleneck machine exists in the process of Manufacturing?
 (a) Load Control
 (b) Batch Control
 (c) Block Control
 (d) Flow Control
- (v) Which one of the following ISO Standards evaluates the Management of the entire manufacturing process, from purchasing to design, to training?
 (a) ISO 9004
 (b) ISO 9003
 (c) ISO 9000
 (d) ISO 9001
- (vi) A Zinc Plant of ZOS Ltd., manufactures product Z of 30 units per shift of 8 hours. If the Standard time per unit is 12 minutes, what is the productivity per shift of 8 hours?
- (a) 60%
 (b) 75%
 (c) 80%
 (d) 90%
- (vii) Which one of the following design Tests asks whether a proposed Structure will set up links between parts of the organizations that are important but bound to be strained?
 (a) The People Test
 (b) The Feasibility Test
 (c) The difficult Links Test
 (d) The Flexibility Test
- (viii) RON Ltd., a manufacturer of ball bearings provides the following items that is being managed using a fixed order Quantity Model with Safety Stock:
- | | | |
|---------------------|---|--------------|
| Annual Demand (D) | : | 24,000 Units |
| Order Quantity (QO) | : | 3,600 Units |
| Safety Stock (S) | : | 400 Units |
- What is the average Inventory Level?
 (a) 2,500 units
 (b) 2,400 units
 (c) 2,200 units
 (d) None of (a), (b) and (c)
- (ix) The Slack Time of the Tail event and Slack time of Head event of an activity M are 15 days and 2 days respectively. If the total Float of Activity M is 16 days, Free Float will be:
 (a) 13 days
 (b) 14 days
 (c) 15 days
 (d) 18 days
- (x) Which one of the following Digital Marketing Strategies is a form of paid Advertising that allows Marketing Teams to essentially purchase traffic to their website?
 (a) Email Marketing
 (b) Mobile Marketing

- (c) Pay-per Click(PPC)
 (d) Affiliate Marketing
- (xi) Which of the following is/are true for a Blue Ocean Strategy?
 (a) Create and Capture new demand
 (b) Beat the Competition
 (c) Exploit existing demand
 (d) Compete in existing Markets
- (xii) Which one of the following Sorts of Business defined by the Market growth/market share axes of BCG Matrix, is a business unit with high market share in a matured market?
 (a) Cash Cow
 (b) Dog
 (c) Star
 (d) Question Mark (or problem Child)
- (xiii) _____ is the science of using mathematical calculations and logic to generate time effective sequence of task considering any resource and cost constraints.
 (a) Scheduling
 (b) Plan
 (c) Milestone
 (d) Work-in-Progress
- (xiv) Which one of the following announces what the Company is providing to Society; either a Service or a Product?
 (a) Mission
 (b) Vision
 (c) Values
 (d) Objectives
- (xv) Which one of the following types of Cloud Computing, is a distribution model that delivers software applications over the Internet, these applications are often called web services?
 (a) Infrastructure as a Service (IaaS)
 (b) Platform as a Service (PaaS)
 (c) Software as a Service (SaaS)
 (d) Amazon Web Services (AWS)

(2 x15 = 30 marks)

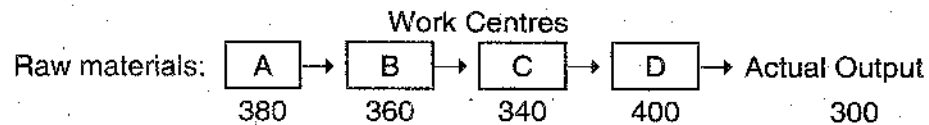
Answer:

- (i) (c)
 (ii) (d)
 (iii) (b)
 (iv) (a)
 (v) (c)
 (vi) (b)
 (vii) (c)
 (viii) (c)
 (ix) (b)
 (x) (c)
 (xi) (a)
 (xii) (a)
 (xiii) (a)
 (xiv) (a)
 (xv) (c)

2024 - Dec [1] {C} Choose the correct answer from the given four alternatives (You may write only the Roman Numeral and the Alphabet chosen for your answer):

- (i) The ability to adapt quickly to changes in volume of demand, in the product mix demanded, and in product design or in delivery schedules, is sometimes referred to as
 (a) Re-Engineering
 (b) Business Process Restructuring
 (c) Agile Manufacturing
 (d) Right Sizing
- (ii) Which one of the following is associated with the configuration of departments, work centres and equipment and machinery, with focus on the flow of materials or work through the production system?
 (a) Facility Location
 (b) Facility Layout

- (c) Capacity Planning
(d) Process Design
- (iii) In which one of the following phases of the product life cycle, organisations get engaged in aggressive promotional and pricing program?
(a) Introduction
(b) Growth
(c) Maturity
(d) Decline
- (iv) The Annual Carrying Cost of Material ZB is ₹ 3.60 per unit and its Total Carrying Cost is ₹ 9,000 per annum. If there is no Safety Stock of Material ZB, what will be the Economic Order Quantity (EOQ) for Material ZB?
(a) 5000 units
(b) 6000 units
(c) 6500 units
(d) 4000 units
- (v) ZOOS Ltd., a manufacturing firm, has four Work Centres A, B, C & D in series with individual capacities in units per day shown in the figure below:





- What is the System Efficiency?
(a) 75.25%
(b) 80.33%
(c) 99%
(d) 88.23%
- (vi) A cement factory of SITON (C) Ltd., in Madhya Pradesh works 7 days a week in 3 shifts per day having maintenance in the first shift of around 2 hours. It has roughly 100 workers which produces only pozzolanic properties cement better known as PPC. The output per month is around 2500 tonnes of PPC. What will be productivity per worker?

- (a) 20 tonnes
(b) 30 tonnes
(c) 25 tonnes
(d) 15 tonnes
- (vii) For Quality Assurance in Design, Production, Installation and Servicing the _____ Model is used.
(a) ISO 9002
(b) ISO 9001
(c) ISO 9003
(d) None of the above options
- (viii) This _____ provides the broad "DATA", from which to identify key drivers of change.
(a) SWOT Analysis
(b) BCG Matrix
(c) PESTEL Analysis
(d) Critical Success Factors
- (ix) Which one of the following cannot be closely associated with the "Red Ocean Strategy"?
(a) Beat the Competition
(b) Make the Value Cost trade-off
(c) Make the Competition irrelevant
(d) Exploit Existing Demand
- (x) The process of _____ requires co-ordination across the entire organization and involves business culture changes.
(a) Digital Strategy
(b) Digitization
(c) Digital Transformation
(d) Data Aggregation
- (xi) Forecasting the weather is an example of _____.
(a) Narrow AI
(b) General AI/Human-Level
(c) Super AI
(d) Deep-Learning

- (xii) Which type of Production Control is most prominently applied in the industries like textiles, and book & magazine printing industries?
 - (a) Batch Control
 - (b) Load Control
 - (c) Order Control
 - (d) Block Control
- (xiii) The Work Breakdown Structure is typically developed in which one of the following phases of the project management life cycle?
 - (a) Project Initiation Phase
 - (b) Project Planning Phase
 - (c) Project Quality Management Phase
 - (d) Execution Phase
- (xiv) Strategy Formulation is characterized by—
 - (a) The focus is on effectiveness.
 - (b) It requires motivation and leadership skills.
 - (c) It involves managing forces during action.
 - (d) It is primarily an operational process.
- (xv) Which one of the following activities involves receiving, storing and distributing inputs to the production process?
 - (a) Inbound Logistics
 - (b) Operations
 - (c) Marketing & Sales
 - (d) Outbound Logistics

(2 × 15 = 30 marks)

Paper 9 Operations Management and Strategic Management		
Feedback	I Need More	Scanner Preparation Key
		
Scan to Share your Experience	Scan for Quick Assistance	Scan & go to "My Books"

Key Concepts in Objective Questions

- **Types of Objective Questions:**
 - **Multiple Choice Questions (MCQs):** Select the correct option.
 - **True/False:** Determine the accuracy of a statement.
 - **Fill-in-the-Blanks:** Complete sentences with the correct word/phrase.
 - **Match-the-Following:** Link related concepts.
- **Skills Required:**
 - Concept clarity.
 - Time management.
 - Logical reasoning and elimination techniques.
- **Scoring Methodology:**
 - Understand negative marking (if applicable).
 - Attempt high-confidence questions first.

Checklists for Solving Objective Questions

- **Preparation Checklist:**
 - Revise key concepts and formulas thoroughly.
 - Focus on keywords, mnemonics, and frameworks.
 - Practice past papers and sample questions.
- **Exam Checklist:**
 - Read all instructions carefully.
 - Eliminate incorrect options systematically.
 - Manage time efficiently; avoid spending too much time on a single question.

Fun Flows for Objective Questions

- **Answer Flow:**
 - Read Question - Identify Keywords - Recall Concept - Eliminate Options - Choose Correct Answer.
- **Elimination Flow:**
 - Mark Incorrect Answers - Compare Remaining Choices - Cross-Check - Confirm Final Answer.
- **Time Management Flow:**
 - High-Confidence Questions - Medium Confidence - Low Confidence.

Challenges in Solving Objective Questions

- **Time Pressure:**
Balancing speed with accuracy during exams.
- **Tricky Options:**
Confusion between closely related choices.
- **Negative Marking:**
Risk of losing marks due to guessing.
- **Overthinking:**
Doubting initial answers and making unnecessary changes.

Motivational Quotes

- "The secret of getting ahead is getting started." – Mark Twain
- "You are stronger than you think and smarter than you know." – Unknown
- "Success is the sum of small efforts, repeated day in and day out." – Robert Collier

Smart Study Tips

- **Flashcards:**
Create flashcards for formulas, definitions, and important keywords.
- **Topic Prioritization:**
Focus on high-weightage topics first.
- **Mock Tests:**
Simulate exam conditions to improve speed and accuracy.
- **Mnemonic Techniques:**
Use mnemonics to remember complex concepts.
- **Review Mistakes:**
Analyze incorrect answers to avoid repeating errors.

Keywords to Focus On

- Core definitions.
- Key formulas.

- Commonly confused terms.
- Important frameworks (e.g., SWOT, PESTEL).
- Acronyms and abbreviations.

How to Perform Well in Exams

- **Understand the Question:**
Focus on what is being asked; avoid assumptions.
- **Use Elimination Techniques:**
Rule out obviously incorrect options first.
- **Prioritize High-Scoring Questions:**
Solve easy questions first to build confidence.
- **Manage Time:**
Allocate specific time slots to sections.
- **Avoid Overthinking:**
Stick to your first instinct unless you're certain of an error.

Mnemonics for Key Topics

- **MCQ Strategy**
 - **Mnemonic: READ**
Read the question carefully.
Evaluate all options.
Apply elimination.
Decide the best answer.
Formula Memorization
 - **Mnemonic: FIND**
Focus on key variables.
Identify patterns in formulas.
Note common mistakes.
Drill practice regularly.
Exam Techniques
 - **Mnemonic: FAST**
Focus on known topics.
Avoid overthinking.
Skip tough questions initially.
Time your answers.

Dec - 2024

**CMA Inter Gr. II Paper - 9 (2022 Syllabus)
Operations Management and Strategic Management**

**Section - A
(Compulsory)**

This section contain Question No. 1. All parts of this question are compulsory.

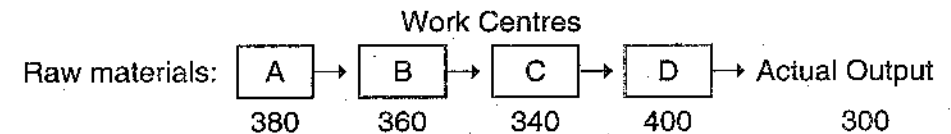
1. Choose the correct answer from the given four alternatives (You may write only the Roman Numeral and the Alphabet chosen for your answer):
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 - Re-Engineering
 - Business Process Restructuring
 - Agile Manufacturing
 - Right Sizing
 - Which one of the following is associated with the configuration of departments, work centres and equipment and machinery, with focus on the flow of materials or work through the production system?
 - Facility Location
 - Facility Layout
 - Capacity Planning
 - Process Design
 - In which one of the following phases of the product life cycle, organisations get engaged in aggressive promotional and pricing program?
 - Introduction
 - Growth
 - Maturity
 - Decline

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SCANIT CMA Inter Gr-II Paper-9 Section-B

- The Annual Carrying Cost of Material ZB is ₹ 3.60 per unit and its Total Carrying Cost is ₹ 9,000 per annum. If there is no Safety Stock of Material ZB, what will be the Economic Order Quantity (EOQ) for Material ZB?
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- What is the System Efficiency?
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 - 30 tonnes
 - 25 tonnes
 - 15 tonnes
 - For Quality Assurance in Design, Production, Installation and Servicing the _____ Model is used.
 - ISO 9002
 - ISO 9001

- (c) ISO 9003
(d) None of the above options
- (viii) This _____ provides the broad "DATA", from which to identify key drivers of change.
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(d) Block Control
- (xiii) The Work Breakdown Structure is typically developed in which one of the following phases of the project management life cycle?

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(b) Project Planning Phase
(c) Project Quality Management Phase
(d) Execution Phase
- (xiv) Strategy Formulation is characterized by—
(a) The focus is on effectiveness.
(b) It requires motivation and leadership skills.
(c) It involves managing forces during action.
(d) It is primarily an operational process.
- (xv) Which one of the following activities involves receiving, storing and distributing inputs to the production process?
(a) Inbound Logistics
(b) Operations
(c) Marketing & Sales
(d) Outbound Logistics

(2 × 15 = 30 marks)

Section - BAnswer any **Five** questions from Question No. 2 to Question No. 8.Each question carries **14** marks.

2. (a) "The Plant Layout selected in conformity with Layout Principles should be an ideal one" — In this context, align those Plant Layout Principles. (7 marks)
(b) What is Design Thinking? Briefly discuss the five stages of Design Thinking. (7 marks)
3. (a) "Production Planning and Control fulfils its various objectives by focusing on the several important points/issues." With reference to this statement, append those said important points/issues. (Any Ten) (7 marks)
(b) METRO-WALLS ICE CREAM PARLOUR observed that during summer months the daily sales of its ice cream depends on the average day temperature as shown in the following Table:

Average Day Temperature in Centigrade (X)	20	25	30	35	40
Daily Sale of Ice Cream (in Thousand ₹) (Y)	10	20	30	40	50

Required:

- Fit a linear regression of Y on X.
 - Estimate the trend values of daily sales of ice cream for average day temperature of 32 and 42 centigrade.
 - Estimate the Average Day Temperature (in Centigrade) for the daily sale of ice cream of ₹ 60 thousands. (7 marks)
4. (a) A project of GREEN IP Ltd., consists of four major jobs, for which four contractors have submitted tenders. The tender amounts, in thousands of rupees, are given below:

Contractors	JOBS			
	A	B	C	D
1	39	70	37	50
2	20	27	47	63
3	25	37	58	49
4	43	48	46	50

(Each Contractor has to be assigned only one Job)

Required:

- Analyze and assign the Jobs to appropriate Contractors so as to minimize the Total Cost of the Project.
 - Assess the Total Costs of the Project. (7 marks)
- (b) Home Town Interior Decoration Ltd., uses a costly drier while painting the fire protection doors. The drier is highly volatile. It cannot be stored. In order to meet the requirement of drier, the exact quantity is purchased every day and consumed. The Management of the Company wants to Simulate the demand of the drier. For this the Management of the Company collected data for past 100 days for the application of the drier on the number of doors and the same data are shown in the table below:

Daily Demand (No. of Driers)	Number of Days
0	20
1	30
2	20
3	10
4	6
5	4
6	10

Consider the following Table of two Digit Random Numbers:

Random Numbers	03	23	36	93	69	43	87	51	11	08
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Required:

- Using the following generated random numbers in Sequence, generate the demand of driers for next ten days.
 - Assess the average demand of drier per day. (7 marks)
5. (a) A computer of ROPAM Ltd., has 1000 nos. of Electronic Tubes. They are subject to Mortality as given below:

Period	Age at Failure (Hrs.)	Probability of Failure
1	0 - 200	0.10
2	201 - 400	0.26
3	401 - 600	0.35
4	601 - 800	0.22
5	801 - 1000	0.07

If the tubes are group replaced, the cost of replacement is ₹ 150 per Electronic tube.

Group replacement can be done at fixed intervals in the night shift when the computer is not normally used. Replacement of individual Electronic tubes which fail in Service Cost ₹ 600 per Electronic tube.

Assume that:

- (1) Electronic Tubes that fail during a period are replaced just before the end of the period.
- (2) The actual percentage of failure during a period for a sub-population of the Tubes with the same age is the same as the expected percentage of failure during the period for that sub-population.

Required:

- (i) Analyze the number of Electronic Tubes to be replaced every period.
 - (ii) Assess the failure costs (₹) on average of individual replacement of electronic tubes.
 - (iii) Identify at what interval of time the Company should replace all the electronic Tubes.
 - (iv) Advice which policy of replacement will be economical to the Company. (7 marks)
5. (b) BITZON Ltd., a Chemical Product Manufacturing Company have split their Schedule of Implementation into the following 6 activities and have estimated Time Duration (in weeks) under 3 Scenarios as under:

(Time in Weeks)

Activity and Identification	Optimistic time estimate	Pessimistic time estimate	Most likely time estimate
A 1 - 2	5	11	8
B 1 - 3	18	26	22
C 2 - 4	15	25	20
D 3 - 4	4	12	8
E 4 - 5	8	12	10
F 3 - 5	14	26	20

Required:

- (i) Assess the expected duration (in weeks) for each activity.
 - (ii) Design the PERT Network Diagram and indicate all paths through it.
 - (iii) Identify the Critical Path and its Duration (in weeks).
 - (iv) Analyze and indicate the Total Float and Free Float available on each activity. (7 marks)
6. (a) "Objectives should possess certain desirable characteristics in order to be effective". In this context, identify and explain those characteristics of Effective Objectives. (7 marks)
- (b) "Big data is a collection of data that is huge in volume and growing exponentially with time". In this Context Identify the different types of big data and briefly explain the main characteristics of big data. (7 marks)
7. (a) Identify and analyze the five main steps involved in the Formal Strategic Planning Process. (7 marks)
- (b) "Business Environment exhibits many characteristics". In this event, demonstrate in brief the said important characteristics of Business Environment. (7 marks)
8. (a) "The Transnational Structure seeks to obtain the best form of the two extreme International Strategies, the Multi-Domestic Strategy and the Global Strategy". In this context, identify and discuss the characteristics of Transnational Structure. (7 marks)
- (b) "The achievement of goal congruence is essential in order to increase the profitability of the organization and to achieve its goals". With reference to this statement, demonstrate some of the areas that have the ability to create goal congruence. (7 marks)

