P-9: OPERATIONS MANAGEMENT AND STRATEGIC MANAGEMENT

SUGGESTED ANSWERS

SECTION – A

1.

(i) (C)

(ii) (B)

(iii) (C)

(iv) (A)

(v) (D)

(vi) (C)

(vii) (B)

(viii) (C)

(ix) (C)

(x) (C)

(xi) (A)

(xii) (D)

(xiii) (B)

(xiv) (A)

(xv) (A)

SECTION – B

2. (a)

The layout selected in conformity with layout principles should be an ideal one. These principles are aligned as under:

(i) Principle of Minimum Travel:
Men and materials should travel the shortest distance between operations so as to avoid waste of labour and time and minimise the cost of materials handling.

(ii) Principle of Sequence:
Machinery and operations should be arranged in a sequential order. This principle is best achieved in product layout, and efforts should be made to have it adopted in the process layout.

(iii) Principle of Usage:
Every unit of available space should be effectively utilised.

(iv) Principle of Compactness:
There should be a harmonious fusion of all the relevant factors so that the final layout looks well integrated and compact.

(v) Principle of Safety and Satisfaction:
The layout should contain built in provisions for safety for the workmen. It should also be planned on the basis of the comfort and convenience of the workmen so that they feel satisfied.

(vi) Principle of Flexibility:
The layout should permit revisions with the least difficulty and at minimum cost.

(vii) Principle of Minimum Investment:
The layout should result in savings in fixed capital investment, not by avoiding installation of the necessary facilities but by an intensive, use of available facilities.

2. (b)

Define Design Thinking:

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 five phases—Empathize, Define, Ideate, Prototype and Test—it is most useful to tackle problems that are ill-defined or unknown.

Five stages of Design Thinking are discussed as follows:

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 analyze 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're 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, design thinking 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.

3. (a)

Production Planning and Control fulfils its various objectives by focusing on the following points / issues:

(i) Analysing the orders to determine the raw materials and parts that will be required for their completion.

(ii) Answering questions from customers and salesmen concerning the status of their orders.

(iii) Assisting the costing department in making cost estimates of orders.

(iv) Assisting the human resource departments in the manpower planning and assignment of men to particular jobs.

(v) Controlling the stock of finished parts and products.

(vi) Determining the necessary tools required for manufacturing.

(vii) Direction and control of the movement of materials through production process.

(viii) Initiating changer in orders as requested by customers while orders are in process.

(ix) Issuing requisitions for the purchase of necessary materials.

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

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

(xii) Maintaining stocks of materials and parts.

(xiii) Production of work orders to initiate production activities.

(xiv) Notifying sales and accounting of the acceptance of orders in terms of production feasibility.

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

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

(xvii) Receiving orders from customers.

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

3. (b)

(i) Linear Regression of Y on X : Y = a + b X

Average day Temperature (in Centigrade)	**Daily Sale of Ice-Cream (in Thousand ₹)**	**Square of X**	**Product of X and Y**
X	Y	(X^2)	(XY)
20	10	400	200
25	20	625	500
30	30	900	900
35	40	1225	1400
40	50	1600	2000
$\sum X = 150$	$\sum Y = 150$	$\sum X^2 = 4750$	$\sum XY = 5000$

To find the values of a and b, the following equations are to be solved:

$\sum Y = na + b\sum X$	Eqn. (i)
$\sum XY = a\sum X + b\sum X^2$	Eqn. (ii)
By putting the values, we get	
150 = 5 a + 150 b	Eqn. (iii)
5000 = 150 a + 4750 b	Eqn. (iv)
Multiplying eqn. (iii) by 30 and putting it as eqn. (v) we get	
4500 = 150 a + 4500 b	Eqn. (v)
By deducting eqn. (v) from eqn. (iv) we get,	
500 = 250 b, $\therefore \quad b = \frac{500}{250} = 2$	
By putting the value of b eqn. (iii), we get	
150 = 5 a + 2 x 150 = 5 a + 300	
Or, 5a = 150 – 300 or, 5a = – 150, or, a = $a = \frac{-150}{5} = -30$	
Now, by putting the value of a and b the required Regression Equation of Y on X is	
Y = a + bx ; or Y = – 30 + 2 x	
So, Y = 2 x – 30	

(ii) Estimated Trend value of daily Sales (Y) of Ice-Cream for

(a) Average day temperature of 32° C :
Y = 2 x 32 – 30 = 34 i.e. ₹ 34000

(b) Average day temperature of 42° C :
Y = 2 x 42 – 30 = 54 i.e. ₹ 54000

(iii) Estimated Average day Temperature (x) for daily Sales of Ice-Cream of ₹ 60 Thousand is

$Y = 2x - 30$ or $2x = Y + 30 = 60 + 30 = 90$

or, $x = \frac{90}{2} = 45\ ^{\circ}C$

4. (a)

(i) The given problem is a standard minimization problem. Subtracting the minimum element of each raw from all its elements in turn, the given problem reduces to.

Again subtracting the minimum element of each column from all its elements in turn

Step 1. Row Subtraction

Contractor \ Job	A	B	C	D
1	2	33	0	13
2	0	7	27	43
3	0	12	33	24
4	0	5	3	7

Step 2. Column Subtraction

Contractor \ Job	A	B	C	D
1	2	28	0	6
2	0	2	27	36
3	0	7	33	17
4	0	0	3	0

Step 3. Draw he Minimum Straight lines to Cover Zeros.

Contractor \ Job	A	B	C	D
1	~~2~~	~~28~~	~~0~~	~~6~~
2	0	2	27	36
3	0	7	33	17
4	~~0~~	~~0~~	~~3~~	~~0~~

Since the number of lines is less than the order of cost matrix, select the smallest element in the cost matrix not covered by the lines, subtract this element from all the uncovered elements and also added to numbers at intersection of two lines.

Step – 4

Contractor \ Job	A	B	C	D
1	~~4~~	~~28~~	~~0~~	~~6~~
2	~~0~~	~~0~~	~~25~~	~~34~~
3	0	5	31	15
4	~~2~~	~~0~~	~~3~~	~~0~~

Step 5: Return to Step 3, cover all zeros. Since the number of lines is 4, the optimality creiteria is satisfied.

Contractor \ Job	A	B	C	D
1	4	28	[0]	6
2	0	[0]	25	34
3	[0]	5	31	15
4	2	0	3	[0]

Step 6 : Assign

Contractor	Job	Amount (₹) in thousand
1	C	37
2	B	27
3	A	25
4	D	50
Total		139

Hence, total minimum cost of the project will be ₹ 139000

4. (b)

(i) From the frequency table let us construct the relative frequency, probability and range of R. N. as follow:

Daily Demand	Relative Frequency	Probability	Cum Problem	Range of R. N.
0	20 / 100	0.20	0.20	00 – 19
1	30 / 100	0.30	0.50	20 – 49
2	20 / 100	0.20	0.70	50 – 69
3	10 / 100	0.10	0.80	70 – 79
4	6 / 100	0.06	0.86	80 – 85
5	4 / 100	0.04	0.90	86 – 89
6	10 / 100	0.10	1.00	90 – 99

Next the result of 10 days simulation is as follows:

Days	Random No.	Generated Demand of Driers
1	03	0
2	23	1
3	36	1
4	93	6
5	69	2
6	43	1
7	87	5
8	51	2
9	11	0
10	08	0
Total	-	18

(ii) Average demand of Drier per day :

$$\frac{18}{10} = 1.8 \text{ Driers}$$

5. (a)

(i) Consider each block of 200 hours as one period, we can calculate the number of replacements due to failure in successive periods, with a policy that only the electronics tubes which fail will be replaced.

Expected life of Electronic tube:
1x0.10+2x0.26+3x0.35+4x0.22+5x0.07 = 2.9 periods.

Expected number of failure in each period:

$$\frac{1000}{2.9} = 344.8276 \text{ i.e., } 345$$

Cost of Individual Replacement = 345 x 600 = ₹ 207000
Group Replacement: Initial Cost = 1000 x 150 = ₹ 150000

(ii) COMPUTATION AVERAGE COST :

No. of Period	Expected No. of Tubes to be replaced by the period end	Cum. No. of Tubes replace Individually by period end	COST		Total Cost (Te)	Average Cost (Te / n)
			Individually	Group		
			(₹)	(₹)	(₹)	(₹)
1.	100	100	60000	150000	210000	210000
2.	270	370	222000	150000	372000	186000
3.	403	773	463800	150000	613800	204600
4.	365	1138	682800	150000	832800	208200
5.	328	1466	879600	150000	1029600	205920

(iii) Since the average Cost (₹ 186000) is lowest in period 2. So, the Company should replace all the electronic tubes at period 2.

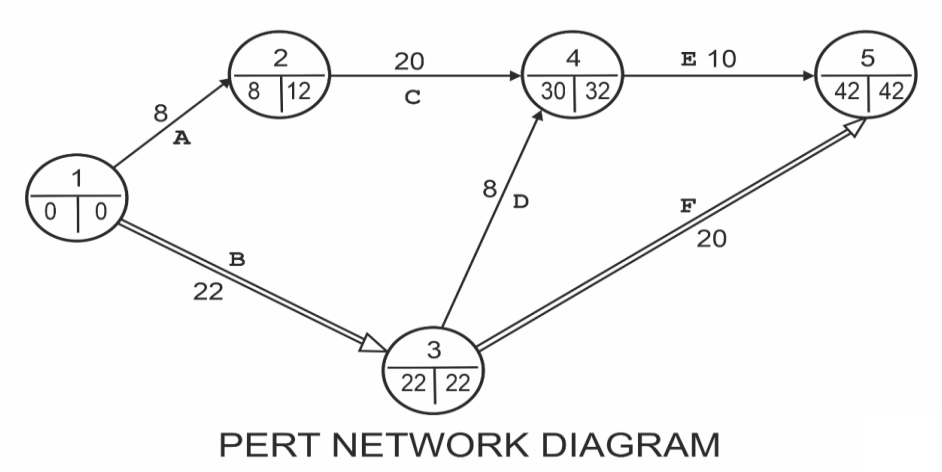
The Minimum Average Cost for group replacement is ₹ 186000, which is less than ₹ 207000 of individual replacement, for an interval of 200 hours / period 2. This is the optimal policy, and will be economical to the Company.

5 (b)

(i) **(Time in Weeks)**

Activity and Identification		Optimistic Time	Most Likely Time	Pessimistic Time	Expected Time
A	1 – 2	5	8	11	8
B	1 – 3	18	22	26	22
C	2 – 4	15	20	25	20
D	3 – 4	4	8	12	8
E	4 – 5	8	10	12	10
F	3 – 5	14	20	26	20

(ii)



PERT NETWORK DIAGRAM

(iii) Critical Path : 1 – 3 – 5, Duration : 42 Weeks

(iv) **(Time in Weeks)**

Activity and Identification		Duration	EST	EFT	LST	LFT	Total Float (LFT-EFT) Or (LST-EST)	Free Float (TF – Head Slack)
A	1 – 2	8	0	8	4	12	4	0
B	1 – 3	22	0	22	0	22	0	0
C	2 – 4	20	8	28	12	32	4	2
D	3 – 4	8	22	30	24	32	2	0
E	4 – 5	10	30	40	32	42	2	2
F	3 – 5	20	22	42	22	42	0	0

6. (a)

Objectives should possess Certain desirable characteristics in order to be effective. They are as follows:

(i) Specific:

The first step towards setting objectives is to specify what the company wants to achieve.

This involves answer to five specific set of questions namely, what the organisation wants to achieve? Why the company wants to achieve? Who are being involved in the process? Where it wants to achieve and which are the resources and constraints that needs to be identified? Specific objectives are more likely to lead and motivate the managers.

(ii) Understandable:

The objectives should be such that they are understandable to those who are expected to achieve them. Clarity in objectives helps to avoid ambiguity which in turn helps to achieve the desired results.

(iii) Measurable:

Objectives should be precise and measurable. There has to be a standard against which they can judge their performance. It is often considered to be a good practice to quantify objectives rather than to state them in qualitative terms. It helps to measure and control the achievement of the objectives with respect to comparable companies in a particular industry and in general.

(iv) Attainable:

Objectives must be challenging but realistic or attainable. They give all employees an incentive to look for ways of improving the operations of an organisation. If an objective is unrealistic in the challenges it poses, employees may give up; an objective that is too easy may fail to motivate managers and other employees.

(v) Relevant:

Objectives must be linked to the overall vision and mission of the organisation. There should not be any conflict between the objectives that the management has set with the goals of the organisation. This is a very important task as misalignment between the two can lead to failure in achieving the corporate vision.

(vi) Time Bound:

Objectives should specify a time period. Time constraints tell employees that success requires an objective to be attained by a given date, not after that date. Deadlines can inject a sense of urgency into objective attainment and act as a motivator. However, not all objectives require time constraints.

6. (b)

There are three types of Big Data, namely structured, unstructured and semi-structured.

Structured:

A structured data is any data that can be stored, accessed and process in the form of fixed format.

Un-Structured:

An un-structured data is one with unknown form or structure.

Semi-Structured:

A Semi-structured data can contain both the forms of data.

The Characteristics of Big Data are explained as under:

Volume:

Size of data plays a very crucial role in determining value out of data. Also, whether a particular data can actually be considered as a Big Data or not, is dependent upon the volume of data. The name Big Data itself is related to a size which is enormous. Hence, 'Volume' is one characteristic which needs to be considered while dealing with Big Data solutions.

Variety:

Variety refers to heterogeneous sources and the nature of data, both structured, unstructured and semi structured. During earlier days, spreadsheets and databases were the only sources of data considered by most of the applications however, in recent period data can be in the form of emails, photos, videos, monitoring devices, PDFs, audio, etc. These data also need to be analysed.

Velocity:

The term ‘velocity’ refers to the speed of generation of data and processing of data to be responsive to the needs of the customers. Big Data velocity deals with the speed at which data flows in from sources like business processes, application logs, networks, and social media sites, sensors, mobile devices, etc. The flow of data is massive and continuous.

Variability:

This refers to the inconsistency which can be shown by the data at times, thus hampering the process of being able to handle and manage the data effectively.

7. (a)

Five Steps involved in Strategic Planning Process are enumerated below:

(i) Select the corporate mission and major corporate goals

The first component of the strategic planning process is crafting the organisation’s mission statement, which provides the framework or context within which strategies are formulated. A mission statement has four main components: a statement of its reason for existence (i.e. a mission); a statement of some desired future state, usually referred to as the vision; a statement of the key values that the organisation is committed to; and a statement of major goals.

(ii) Analyse the organisation's external competitive environment to identify opportunities and threats :

The second component of the strategic planning process is an analysis of the organisation's external operating environment. The essential purpose of the external analysis is to identify strategic opportunities and threats within the 9rganization's operating environment that will affect how it pursues its mission. Three interrelated environments should be examined: the industry environment in which the company operates, the country or national environment and the wider socioeconomic or macro environment.

(iii) Analyse the Organization's internal operating environment to identify the Organization's strengths and weaknesses :

Internal analysis, the third component of the strategic planning process, focuses on reviewing the resources, capabilities, and competencies of a Company. The goal is to identify the strengths and weaknesses of the company. The next component of strategic thinking requires the generation of a series of strategic alternatives, or choices of future strategies to pursue, given the company's internal strengths and weaknesses and its external opportunities and threats.

(iv) Select Strategies :

Managers select strategies that build on the organisation's strengths and correct its weaknesses in order to take advantage of external opportunities and counter external threats. In order to select the right strategies managers compare and contrast the various alternative possible strategies against each other and then identify the set of strategies that will create and sustain a competitive advantage. It is very important for the strategic managers to keep in mind that the strategies selected should be consistent with the mission and major goals of the organisation.

(v) Implement the strategies :

In order to achieve a competitive advantage and increase profitability managers must put those strategies selected into action. Strategy implementation involves taking actions at the functional, business, and corporate levels to execute a strategic plan.

7. (b)

Business environment exhibits many characteristics. Some of the important characteristics are as follows:

- **Environment is complex:**

  The business environment happens to be very complex as it comprises of a number of factors namely, events, conditions and influences arising from different sources interacting with each other to create entirely new sets of influences. It is indeed difficult to instantly say what factors constitute a given environment. Environment is a complex phenomenon and it is easier to understand it in segments or compartments rather than grasp in totality.

- **Environment is dynamic:**

  The changing nature of environment is a constant. The dynamism of the environment is largely due to large number of factors that continuously influences its character and shape.

- **Environment is Multi-faceted:**

  The perception of the observer is very important to determine the shape and character of three environment. Changes in the environment may be perceived differently by different individual. The changes and developments may be considered to be an opportunity to one and a threat to others.

- **Environment has a. far reaching impact:**

  The impact of environment on an organisation is huge. It critically underpins the growth and profitability of an organisation. Any changes in the environment affect the organization in more ways than one. The very survival and existence of an organisation is critically dependent on its environment.

8. (a)

The Transnational has the following detailed Characteristics:

(i) Each national unit operates independently, but is a source of ideas and capabilities for the whole Corporation. For example, in Unilever, the centre for innovation in hair-care products worldwide is in France.

(ii) National units achieve greater scale economies through specialisation on behalf of the Whole Corporation, or at least large regions. Unilever in Europe has replaced its web of small national food manufacturing units with a few specialised larger factories that export its products to other European countries.

(iii) The corporate centre manages this global network by first establishing the role of each business unit, then sustaining the systems, relationships and culture to make the network of business units operate effectively. The success of a transnational corporation is dependent on the ability simultaneously to achieve global competences, local responsiveness and organisation wide innovation and learning.

(iv) Global business managers have the overriding responsibility to further the company's global competitiveness, which will cross both national and functional boundaries.

(v) Country or area managers have potentially a dual responsibility to other parts of the transnational. First, they must act as a sensor of local needs and feed these back to those responsible internationally for new products or services. Second, they should seek to build unique competences: that is, becomes a centre of excellence which allows them to be a contributor to the company as a whole, in manufacturing or research and development, for instance.

(vi) Functional managers such as finance or IT have a major responsibility for ensuring worldwide innovation and learning across the various parts of the organisation.

(vii) Corporate (head office) managers integrate these other roles and responsibilities. Not only are they the leaders, but they are also the talent spotters among business, country and functional managers, facilitating the interplay between them. For example, they must foster the processes of innovation and knowledge creation.

8. (b)

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

(i) 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.

(ii) 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.

(iii) 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.

(iv) Incentives :

In order to increase the likelihood of employees working to acHfeve 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.

(v) 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.