Paper - 9 : Operations Management and Strategic Management

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Full Marks : 100   **Time allowed: 3 hours**

The figures in the margin on the right side indicate full marks.
This question paper has two sections.
Both the sections are to be answered subject to instructions given against each.

Section – I : [Operations Management]

1. **(a) Choose the correct alternatives:**   **1×10=10**

   (i) This process is used when higher volumes of more standardised goods or services are needed. This process is
   (a) Batch process
   (b) Continuous process
   (c) Repetitive process
   (d) Job shop process

   (ii) Which of the following is not a method for solving Assignment problem?
   (a) Complete Enumeration method
   (b) Hungarian method
   (c) Simplex method
   (d) Natural method

   (iii) The objective of application of linear programming in industrial problems is
   (a) to determine a plan for production and procurement in the time period under consideration
   (b) to determine an optimal solution of the problem under the given constraints
   (c) to determine the cost effective solution of the problem under scarce resources
   (d) to determine a plan for time based solution to the problem for increasing productivity

   (iv) Sustainable competitive advantage in the market place can be achieved through
   (a) Line Balancing
   (b) JIT manufacturing
   (c) Cellular manufacturing
   (d) Batch production

   (v) Multiple shift operation enhances
   (a) Firm's Capacity utilisation
   (b) Demand for firm's product
   (c) Firm's labour turnover
   (d) Firm's channel conflict

(vi) In a linear programming model feasible solution is
(a) The basic solution to the general L.P. problem
(b) Any solution that also satisfies the non-negative restrictions of the general L.P. problem
(c) A solution which optimize (maximize or minimize) the objective function of a general L. P. problem
(d) A basic solution to the system of equation if one or more of the basic variables become equal to zero.

(vii) It is the basis for decisions regarding capacity planning, facilities (or plant) layout, equipment and design of work systems. This is
(a) Process Design
(b) Process Planning
(c) Process Strategy
(d) Process Selection

(viii) Which one of the following is not a Sequencing rule for single facility?
(a) SSRO
(b) DSRO
(c) MDD
(d) LFT

(ix) The most obvious reason for product design is
(a) To offer new products to sustain in the market
(b) To offer new products to fulfill changing preferences of customers
(c) To offer new products to remain competitive in the market
(d) To offer new products to cope with changing regulations in the market

(x) Operations management is concerned essentially with the utilization of resources. Utilisation of resources means
(a) Obtaining maximum effect from resources
(b) Minimizing loss of resources,
(c) Minimising under utilization or waste of resources
(d) All the above

(b) Match items in column A with that in column B   1×6=6

Column A	Column B
(a) Degenerate	(i) Process Strategy
(b) Bottleneck	(ii) Job allocation
(c) Repetitive Focus	(iii) Line Balancing
(d) Improved Matrix	(iv) Linear Programming
(e) Cycle time	(v) Manufacturing Resource Planning
(f) MRP II	(vi) Layout

(c) State whether the following statements are True/False.   **1×6=6**
1. The life cycle of a product has many points of similarity with the human life cycle.
2. The Linear Programming problem has two basic parts: the objective function and the constraint set.
3. The most widely used index of productivity is to work out the output per machine-hour.
4. The productivity is a measure of how much input is required to achieve a given output.
5. One of the limitations of Gantt Chart is that it does not clearly indicate the details regarding progress of activities.
6. Preventive maintenance ensures greater safety to workers.

Answer:

1. (a) (i)   (c) Repetitive process
       (ii)   (d) Natural method
       (iii)   (a) to determine a plan for production and procurement in the time period under consideration
       (iv)   (b) JIT manufacturing
       (v)   (a) Firm's Capacity utilization
       (vi)   (b) Any solution that also satisfies the non-negative restrictions of the general L.P. problem
       (vii)   (b) Process Planning
       (viii)   (d) LFT
       (ix)   (c) To offer new products to remain competitive in the market
       (x)   (d) All the above

(b)

Column A	Column B
(a) Degenerate	(iv) Linear Programming
(b) Bottleneck	(vi) Layout
(c) Repetitive Focus	(i) Process Strategy
(d) Improved Matrix	(ii) Job allocation
(e) Cycle time	(iii) Line Balancing
(f) MRP II	(v) Manufacturing Resource Planning

(c)
   1. (T)
   2. (T)
   3. (F)
   4. (T)
   5. (T)

6. (T)

[Answer any three questions from the following]

2. **(a) What do you mean by 'Capacity Planning'? Discuss in brief the types of Capacity Planning.**

    (b) A department works on 8 hours shift, 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	300	4.0
Y	400	6.0
Z	500	3.0

Determine the number of machines required. **8+8=16**

Answer:

2. (a) **Capacity Planning:**
    The effective management of capacity is the most important responsibility of production and operations management. The objective of capacity management i.e., planning and control of capacity, is to match the level of operations to the level of demand.

    Capacity planning is concerned with finding answers to the basic questions regarding capacity such as:
    (i) What kind of capacity is needed?
    (ii) How much capacity is needed?
    (iii) When this capacity is needed?

    Capacity planning is to be carried out keeping in mind future growth and expansion plans, market trends, sales forecasting, etc. Capacity is the rate of productive capability of a facility. Capacity is usually expressed as volume of output per period of time.

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

    Capacity planning is mainly of two types:

(i) **Long-term capacity plans** which are concerned with investments in new facilities and equipments. These plans cover a time horizon of more than two years.

(ii) **Short-term capacity plans** which takes into account work-force size, overtime budgets, inventories etc.

Capacity refers to the maximum load an operating unit can handle. The operating unit might be a plant, a department, a machine, a store or a worker. Capacity of a plant is the maximum rate of output (goods or services) the plant can produce.

(b) **Step 1:** Calculate the processing time needed in hours to produce product x, y and z in the quantities demanded using the standard time data.

Product	Annual demand (units)	Standard processing time per unit (Hrs.)	Processing time needed (Hrs.)
X	300	4.0	300 x 4 = 1200 Hrs.
Y	400	6.0	400 x 6 = 2400 Hrs.
Z	500	3.0	500 x 3 = 1500 Hrs.
			Total = 5100 Hrs

Step 2 : Annual production capacity of one machine in standard hours = 8 × 250 = 2000 hours per year

Step 3 : Number of machines required = $\dfrac{\text{Work load per year}}{\text{Production capacity per machine}} = \dfrac{5100}{2000} =$

2.55 machines = 3 machines.

3. **(a) State in brief about Process Design & Selection.**

(b) The Taj service station has a central store where service mechanics arrive to take spare parts for the jobs they work upon. The mechanics wait in queue if necessary and are served on a first come first served basis. They store is manned by one attendant who can attend 10 mechanics in an hour on an average. The arrival rate of the mechanics averages 6 per hour. Assuming that the pattern of mechanics' arrivals is Poisson distribution and the servicing time is exponentially distributed, determine W_s, W_q & L_q, where the symbols vary their usual meaning. **6+10=16**

Answer:

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

used, (c) the quantities to be produced and (d) the existing physical layout of the plant.

The process design is concerned with the following:

(i) Characteristics of the product or service offered to the customers.

(ii) Expected volume of output.

(iii) Kinds of equipments and machines available in the firm.

(iv) Whether equipments and machines should be of special purpose or general purpose.

(v) Cost of equipments and machines needed.

(vi) Kind of labour skills available, amount of labour available and their wage rates.

(vii) Expenditure to be incurred for manufacturing processes.

(viii) Whether the process should be capital-intensive or labour-intensive.

(ix) Make or buy decision.

(x) Method of handling materials economically.

(b) The average arrival time λ = 6, and the service time = μ = 10

So $= \dfrac{\lambda}{\mu} = \dfrac{5}{20} = 0.6$

So $W_s = W_q + \dfrac{1}{\mu} = \dfrac{Ls}{\lambda} = \dfrac{1}{\mu - \lambda} = \dfrac{1}{10 - 6} = 0.25$ hour

$W_q = \dfrac{L_q}{\lambda} = \dfrac{\lambda}{\mu(\mu - \lambda)} = \dfrac{6}{10(10 - 6)} = 0.15$ hour

$L_q = \dfrac{\lambda^2}{\mu(\mu - \lambda)} = \dfrac{36}{10(10 - 6)} = 0.90$

4. **(a) A captain of a cricket team has to allot five middle batting positions to five batsmen. The average runs scored by each batsman at these positions are as follows:**

		Batting Position				
		III	IV	V	VI	VII
	A	40	40	35	25	50
	B	42	30	16	25	27
Batsmen	C	50	48	40	60	50
	D	20	19	20	18	25
	E	58	60	59	55	53

Make the assignment so that the expected total average runs scored by these batsmen are maximum.

(b) Wanda'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 eight per hour, with arrivals tending to follow a Poisson distribution. Find

    (i) The average number of cars in line.

    (ii) The average time cars spend in line and service.   **10+6=16**

Answer:

4. (a) This is a problem of Maximisation. To solve it using Assignment technique it has to be converted to a Minimisation problem by forming a Relative Loss Matrix.

Batsman	Batting Position				
	III	IV	V	VI	VII
A	40	40	35	25	50
B	42	30	16	25	27
C	50	48	40	60	50
D	20	19	20	18	25
E	58	60	59	55	53

Relative Loss Matrix*

Batsman	Batting Position				
	III	IV	V	VI	VII
A	20	20	25	35	10
B	18	30	44	35	33
C	10	12	20	0	10
D	40	41	40	42	35
E	2	0	1	5	7

* This matrix is formed by subtracting all the elements of the given matrix from the highest element (60) of it.

Row Operation Matrix

Batsman	Batting Position				
	III	IV	V	VI	VII

A	10	10	15	25	0
B	0	12	26	17	15
C	10	12	20	0	10
D	5	6	5	7	0
E	2	0	1	5	7

Column Operation Matrix

Batsman \ Batting Position	III	IV	V	VI	VII
A	10	10	14	25	[0]
B	[0]	12	25	17	15
C	10	12	19	[0]	10
D	5	[6]	4	7	0
E	2	0	0	5	7

Minimum no. of horizontal and vertical straight lines to cover all the zeros = 4 ≠ Order of the matrix(5). So the solution is non optimal.

Improved Matrix

Batsman	III	IV	V	VI	VII
A	10	6	10	25	[0]
B	[0]	8	21	17	15
C	10	8	15	[0]	10
D	5	2	[0]	7	X
E	6	[0]	X	9	11

Here minimum no. of horizontal and vertical straight lines to cover all the zeros = 5 = Order of the matrix.
So the solution is optimal.

Optimal Assignment

Batsman	Batting Position	Average runs scored
A	VII	50

B	III	42
C	VI	60
D	V	20
E	IV	60
	Total =	232

Expected maximum total runs = 232

(b) Arrive Rate = λ = 8 cars per hour

Service Rate = μ = 1 per 5 minutes, or 12 per hour

Av. No. of cars waiting in line = $L_q = \dfrac{\lambda^2}{2\mu(\mu-\lambda)} = \dfrac{8^2}{2(12)(12-8)} = 0.667$ car

Av. time cars spend in line and service = $W_s = \dfrac{L_q}{\lambda} = \dfrac{1}{\mu} = \dfrac{0.667}{8} = \dfrac{1}{12} = 0.167$ hours, or 10 minutes.

5. **(a) State the differences between PERT & CPM.**

(b) A Public transport system is experiencing the following number of breakdowns for months over the past 2 years in their new fleet of vehicles:

Number of breakdowns	0	1	2	3	4
Number of months this occurred	2	8	10	3	1

Each break down costs the firm an average of ₹ 2,800. For a cost of ₹ 1,500 per month, preventive maintenance can be carried out to limit the breakdowns to an average of one per month. Which policy is suitable for the firm? **6+10=16**

Answer:

5. (a)

PERT	CPM
1. It is a technique for planning scheduling & controlling of projects whose activities are subject to uncertainty in the performance time. Hence it is a probabilistic model.	1. It is a technique for planning scheduling & controlling of projects whose activities not subjected to any uncertainty and the performance times are fixed. Hence it is a deterministic model.
2. It is an Event oriented system	2. It is an Activity oriented system
3. Basically does not differentiate critical and non-critical activities.	3. Differentiates clearly the critical activities from the other activities.

4. Used in projects where resources (men, materials, money) are always available when required.	4. Used in projects where overall costs is of primarily important. Therefore better utilized resources.
5. Suitable for Research and Development projects where times cannot be predicted.	5. Suitable for civil constructions.

(b) Converting the frequencies to a probability distribution and determining the expected cost/month of breakdowns we get:

No. of breakdowns (x)	Frequency in months (f)	Probability $p = f / \sum f$	Expected no. of breakdowns (px)
0	2	0.083	0.000
1	8	0.333	0.333
2	10	0.417	0.834
3	3	0.125	0.375
4	1	0.042	0.168
			Total 1.710

Expected Breakdown cost per month; Expected cost = 1.710 × ₹ 2,800 = ₹ 4,788.

Preventive maintenance cost per month: -

Average cost of one breakdown/month	=	₹ 2, 800
Maintenance contract cost/month	=	₹ 1,500
Total	=	₹ 4,300

Thus, preventive maintenance policy is suitable for the firm.

Section – II : (Strategic Management)

6. Choose the correct answer from the given alternatives: 1×6=6

   (i) 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, skill, steering power, styles and shared values.
   (d) Structure, strategy, staff, skills, systems, shared values, super ordinate goal.
   (e) None of the above.

   (ii) A strategic business unit (SBU) is defined as a division of an organization:
   (a) That help in the marketing operation
   (b) That enable managers to have better control over the resources
   (c) That help in the choice of technology

(d) That help in the allocation of scarce resources

(e) That help in identifying talents and potentials of people

(iii) Intensity of competition is _____ in low return industries.

    (a) Law

    (b) Non - existent

    (c) High

    (d) Not important

    (e) Dependant on industry nature

(iv) Ansoff proposed that for filling the corporate planning gap, one follows four strategies namely.

    (a) Market penetration, product differentiation, market identification and diversification

    (b) Market penetration, product development, market identification and diversification

    (c) Market penetration, product development, market development and diversification

    (d) Market identification, product development, positioning and diversification

    (e) Differentiation, product innovation, market opportunity and diversification

(v) For an actress in Bollywood, her pretty face would a/an

    (a) Asset

    (b) Strategic asset

    (c) Core competency

    (d) Capability

    (e) All of the above

(vi) Corporation vision' is the same as

    (a) Corporate dream

    (b) Corporate mission

    (c) Corporate goal

    (d) Corporate strategy

Answer:

6.   (i)   (d) Structure, strategy, staff, skills, systems, shared values, super ordinate goal.

        (ii)   (b) That enable managers to have better control over the resources

        (iii)   (c) High

        (iv)   (c) Market penetration, product development, market development and diversification

        (v)   (b) Strategic asset

        (vi)   (a) Corporate dream

[Answer any two questions from the following]

7. (a) State the relationship between 'Strategy' & 'Competitive Advantage'.

    (b) What do you mean by 'Strategic Management'? Why Strategic Management is important? **6+6=12**

Answer:

7. (a) A company achieves competitive advantage when it provides buyers with superior value compared to rival sellers or offers the same value at a lower cost to the firm. The advantage is sustainable if it persists despite the best efforts of competitors to match or surpass this advantage. A company's strategy is its action plan for outperforming its competitors and achieving superior profitability. In effect, it represents a managerial commitment to an integrated array of considered choices about how to compete. These include choices about:
    (i) How to attract and please customers?
    (ii) How to compete against rivals?
    (iii) How to position the company in the market place?
    (iv) How best to respond to changing economic and market conditions?
    (v) How to capitalize on attractive opportunities to grow the business?
    (vi) How to achieve the company's performance targets?

    (b) **Strategic Management:**

    Strategic management according to Alfred D. Chandler is "determination of the basic long-term goals and objectives of an enterprise and adoption of course of action and allocation of resources necessary to carry out these goals."

    Strategic Management include understanding the strategic position of an organisation, strategic choices for the future and turning strategy into action. The strategic position is concerned with the impact on strategy of the external environment, internal resources and competences, and the expectations and influence of stakeholders.

    Strategic management is a continuous process that appraises the business and industries in which the organization is involved; appraises it's competitors; and fixes goals to meet all- the present and future competitor's and then reassesses each strategy.

    Importance of Strategic Management:
    (i) Discover organisation strengths and weaknesses
    (ii) Identify the available opportunities and possible threats
    (iii) Discover the objectives and goals in line with organisations strengths and available opportunities
    (iv) Implement changes to overcome weaknesses and manage the threats.

(v) Provide vision/mission or direction to future of organisations

(vi) Build a dynamic and strong organisation

(vii) Help to achieve growing and stable organisation.

8. (a) What do you mean by 'A strategic vision'?

(b) State the benefits of having a Vision?   **6+6=12**

Answer:

8. (a) **A strategic vision:**

A strategic vision describes management's aspirations for the future and delineates the company's strategic course and long term direction. Well conceived visions are Distinctive and specific to a particular organisation; they avoid generic, feel-good statements.

A number of organisations have summed up their visions in a brief phrase for e.g.

- Nike: 'To bring innovation and inspiration to ever athlete in the world.'
- Scotland Yard: 'to make London the safest major city in the world

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 provide 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.

(b) The benefits of having a Vision:

According to Parikh and Neubauer (1993), a well construed vision can provide the following benefits:

- Good visions are inspiring and exhilarating.
- Vision represents a discontinuity, a step function and a jump ahead so that the company knows what it is to be.
- Good vision helps in the creation of a common identity and a shared sense of purpose.
- Good visions are competitive, original and unique. The make sense in the market place as they are practical.
- Good visions foster risk taking and experimentation.
- Good visions foster long term thinking

- Good visions represent integrity: they are truly genuine and can be used to the benefit of the people.

9. **Write short notes on any three of the following:**   **4x3=12**
   (a) Environmental Analysis
   (b) Boston Matrix
   (c) Market Penetration Strategy
   (d) Business Process Re-engineering

Answer:

9. (a) Environmental factors - both internal environment and external environment - are analysed to:
   (i)   identify changes in the environment,
   (ii) identify present and future threats and opportunities, and
   (iii) assess critically it's own strengths and weaknesses.
   Organisational environment encompasses all factors both inside and outside the organisation that can influence the organisation positively and negatively. Environmental factors may help in building a sustainable competitive advantage.

   (b) The Boston Consulting Group (BCG)'s matrix analyses 'products and businesses by market share and market growth.'

   This growth/share matrix for the classification of products into cash cows, dogs, rising stars and question marks is known as the Boston classification for product-market strategy.
   (i)   Stars are products with a high share of a high growth market. In the short term, these require capital expenditure, in excess of the cash they generate, in order to maintain their market position, but promise high returns in the future.
   (ii) In due course, however, stars will become cash cows, with a high share of a low-growth market. Cash cows need very little capital expenditure and generate high levels of cash income. The important strategic feature of cash cows is that they are already generating high cash returns, which can be used to finance the stars.
   (iii) Question marks are products in a high-growth market, but where they have a low market share. A decision needs to be taken about whether the products justify considerable capital expenditure in the hope of increasing their market share, or whether they should be allowed to 'die' quietly as they are squeezed out of the

expanding market by rival products. Because considerable expenditure would be needed to turn a question mark into a star by building up market share, question marks will usually be poor cash generators and show a negative cash flow.

(iv) Dogs are products with a low share of a low growth market. They may be ex-cash cows that have now fallen on hard times. Dogs should be allowed to die, or should be killed off. Although they will show only a modest net cash outflow, or even a modest net cash inflow, they are 'cash traps' which tie up funds and provide a poor return, on investment, and not enough to achieve the organisation's target rate of return.

(c)

Firm increases its sales in its present line of business. This can be accomplished by:
(i) price reductions;
(ii) increases in promotional and distribution support:
(iii) acquisition of a rival in the same market;
(iv) modest product refinements.

These strategies involve increasing the firm's investment in a product/market and so are generally only used in markets which are growing, and hence the investment may be recouped. In this respect the strategy is similar to invest to build and holding strategy as described by the Boston Consulting Group.

(d) Business Process Re-engineering:

Business Process Re-engineering/(BPR) is a business management strategy, originally pioneered in the early 1990s, focusing on the analysis and design of workflows and processes within an organization. BPR aimed to help organizations fundamentally rethink how they do their work in order to dramatically improve customer service, cut operational costs, and become world-class competitors. In the mid-1990s, as many as 60% of the Fortune 500 companies claimed to either have initiated reengineering efforts, or to have plans to do so.

BPR is achieving dramatic performance improvements through radical change in organizational processes, re-architecting of business and management processes. Redesign, retooling 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.