CBCS SCHEME

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18ME56

Fifth Semester B.E. Degree Examination, June/July 2024
Operations Management

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define Operations Management. Sketch and explain the schematic model for operations/production system. **(06 Marks)**

b. Define productivity. List the factors affecting productivity. **(06 Marks)**

c. A glass factory specializing in crystal is experiencing a substantial backlog, and the firm's management is considering three courses of action:

A – Arrange for subcontracting
B – Begin overtime production
C – Construct new facilities

The correct choice depends largely upon future demand, which may be low, medium or high. By consensus, management ranks the respective probabilities as 0.10, 0.50 and 0.40. A cost analysis reveals the effect upon profits that is shown in Table.Q1(c). [Profits are in thousands rupees]

	Profit (Rs. 000) if demand is		
	Low (P = 0.10)	Medium (P = 0.50)	High (P = 0.40)
A – Arrange subcontracting	10	50	50
B – Begin overtime	–20	60	100
C – Construct facilities	–150	20	200

Table.Q1(c)

(i) State which course of action would be taken under a criterion of (1) maximax (2) maximin (3) maximum expected value.

(ii) Depict the problem in the form of a decision tree. **(08 Marks)**

OR

2 a. Explain the characteristics, advantages and limitations of (i) Batch production (ii) Mass production. **(10 Marks)**

b. Solve the following problem using graphical linear programming:

Maximize Z = 6A + 3B (revenue)
Subject to
Material $20A + 6B \leq 600$ kg
Machinery $25A + 20B \leq 1000$ hr
Labour $20A + 30B \leq 1200$ hr
$A, B \geq 0$ **(10 Marks)**

Module-2

3 a. What are forecasts? List and explain the steps in the forecasting process. **(07 Marks)**

b. Briefly explain the forecasting methods based on judgment and opinion. **(05 Marks)**

c. Explain exponential smoothing. Given the following data as shown in Table.Q3(c).

Period	1	2	3	4	5
Number of complaints	60	65	55	58	64

Table.Q3(c)

Prepare a forecast using each of these approaches:
(i) The appropriate Naïve approach.
(ii) A three-period moving average.
(iii) A weighted average using weights of 0.50 (most recent), 0.30 and 0.20. **(08 Marks)**

OR

4 a. What is a time series? Explain the components of a time series. **(06 Marks)**

b. Explain simple linear regression. The general manager of a building materials production plant feels that the demand for plasterboard shipments may be related to the number of construction permits issued in the country during the previous quarter. The manager has collected the data as shown in Table.Q4(b).

Construction permits (X)	15	9	40	20	25	25	15	35
Plaster board shipments (Y)	6	4	16	6	13	9	10	16

(i) Find the regression equation.
(ii) Determine a point estimate for plasterboard shipments when the number of construction permits is 30. **(14 Marks)**

Module-3

5 a. Explain design capacity and system capacity. An automobile component manufacturer has the plan of buying a moulding machine which can manufacture 1,70,000 good parts per year. The moulding machine is a part of a product line. The system efficiency of the product line is 85%.
(i) What is the required systems capacity?
(ii) Assume that it takes 100 seconds to mould each part and the plant operates 2000 hours per year. If the moulding machines are used only 60% of the time and are 90% efficient, what is the actual output of the moulding machine per hour?
(iii) How many moulding machines would be required? **(10 Marks)**

b. Explain the strategic importance of location decisions. Also list the steps involved in making a facility location decision. **(10 Marks)**

OR

6 a. Explain the factors that determine effective capacity. **(10 Marks)**

b. Explain the concept of cost-volume analysis. The owner of Old-Fashioned Berry Pies is contemplating adding a new line of pies, which will require leasing new equipment for a monthly payment of Rs.6000. Variable costs would be Rs.2 per pie and pies would retail for Rs.7 each.
(i) How many pies must be sold in order to breakeven?
(ii) What would the profit (loss) be if 1000 pies are made and sold in a month?
(iii) How many pies must be sold to realize a profit of Rs.4000? **(10 Marks)**

Module-4

7 a. Explain aggregate planning and master scheduling with an example. Also list the decision variables used in aggregate planning and their associated costs. **(10 Marks)**

b. Given the accompanying supply, demand, cost and inventory data [Tables.Q7(b)(i) and Q7(b)(ii)] for a firm that has a constant workforce and wishes to meet all demand (with no backorders), allocate production capacity to satisfy demand at minimum cost.

Tables.Q7(b)(i) Supply capacity (units)

Period	Regular time (Rs.100/unit)	Overtime (Rs.125/unit)	Subcontract (Rs.130/unit)
1	60	18	1000
2	50	15	1000
3	60	18	1000
4	65	20	1000

Unused capacity in regular time costs at Rs.50 per unit.

Table.Q7(b)(ii) Demand and Inventory

Demand:				
Period	1	2	3	4
Units	100	50	70	80
Inventory:				
Initial = 20, Final = 25, carrying cost = Rs.2/unit – period				

(10 Marks)

OR

8 a. With reference to Master Production Schedule (MPS), explain the following:
(i) Major inputs to MPS
(ii) Demand time fence and planning time fence
(iii) Available to promise inventory and its determination **(09 Marks)**

b. A shoe company schedules running shoe production in lot sizes of 40 units (each of which consists of a carton of pairs). They have a beginning inventory of 45 units and have developed a forecast of demand as shown in Table.Q8(b). The company has received orders for 22 units in week 1, 9 units in week 2, 4 units in week 3, 15 units in week 4, and 5 units in week 5. Set up a master production schedule, and find the Available-To-Promise inventory values for weeks 1 through 8.

Planning Time Fence								
Period	1	2	3	4	5	6	7	8
Forecast	20	20	30	20	20	13	15	20

Table.Q8(b)

(11 Marks)

Module-5

9 a. Explain MRP and CRP. What are the essential inputs and outputs in an MRP system? **(10 Marks)**

b. The product structure tree for X is as shown in Fig.Q9(b), with the number of units required shown in brackets. What quantities of E, J and K are required to complete 500 units of X?

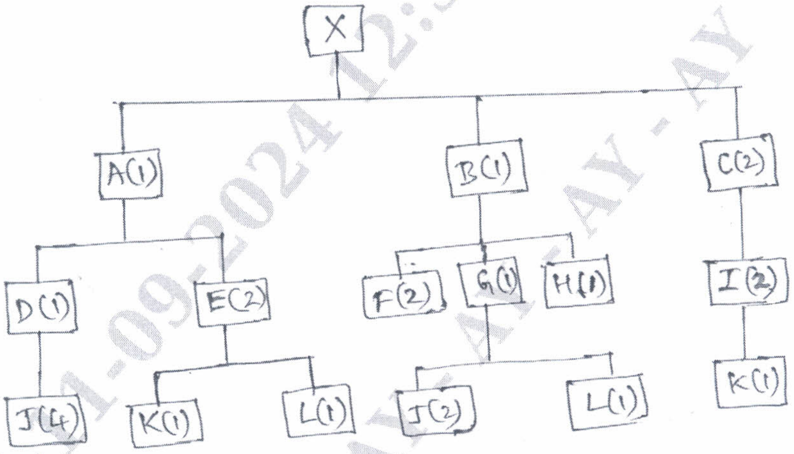

Fig.Q9(b) **(10 Marks)**

OR

10 a. What is a supply chain? Draw a typical manufacturing supply chain and explain. **(05 Marks)**

b. Define supply chain management. List the benefits of effective supply chain management. **(05 Marks)**

c. With a neat block diagram, explain the steps in the procurement process. **(10 Marks)**

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