

**Time - 3 Hour****MM-70**The question paper contains 3 printed pages.**Instructions**

1. The question paper contains 8 Questions. Candidates are required to answer any **five (5)** questions.
2. All questions carry equal marks.

Q. 1. What is Production and Operations Management ("POM")? Explain the techniques of POM which could be applied for improving organization's efficiency and effectiveness in delivering products and services in a rural development organization. **(14)**

Q. 2. The owner of a NGO is considering a new computer system for accounting and inventory control. A computer company sent the following information about the computer system installation;

	Activity	Description	Immediate Predecessors	Duration (days)
Start	A	Select the computer model	-	6
	B	Design input / output system	A	12
	C	Design monitoring system	A	10
	D	Assemble the computer hardware	B	20
	E	Develop the main programmes	B	11
	F	Develop input/output routines	C	8
	G	Create Database	E	6
	H	Install the system	D,F	3
Finish	I	Test and implement	G,H	6

From the above information, you are required to find;

- (i). Activity on arrow network for the project. **(4)**
 - (ii). Determine the critical path and compute the minimum time for the implementation of the computerized production and inventory management system, and explain why it is necessary to know about the critical path. **(4)**
 - (iii). Find the floats of non-critical activities. **(6)**
- Q. 3.** The operations manager of an agribusiness company has an opportunity to participate in a project that has a sales price of Rs. 90,00,000, but it must be completed within 80 weeks. Since the operations manager, at 8:30 a.m. on Monday (start of the 80 week), has to determine on the profitability of the project on an 80 week basis, so that the project activities could start at 10 a.m. in order to stay within 80 weeks, as demanded by the funding agency, whereas the time/cost is based on 100 week basis. A table of times and cost is given below.

Table of times and cost

Event	Preceding Event	Normal Time (Weeks)	Normal Cost (Rs.)	Crash Time (Weeks)	Crash Cost (Rs.)
4	1	20	8,00,000	10	13,00,000
2	1	20	17,00,000	10	19,00,000
3	1	60	11,00,000	50	13,00,000
4	2	40	6,00,000	30	10,00,000
3	2	20	9,00,000	10	11,00,000
5	2	70	8,50,000	60	12,00,000
5	4	40	10,00,000	30	16,00,000
5	3	30	5,00,000	20	7,00,000

Did the operations manager accept the agribusiness project?

(14)

- Q. 4. A fertilizer retailer experiences demand for a particular fertilizer at an effectively constant rate of 1200 units per year. The cost of placing an order for the fertilizer is estimated to be Rs. 2500 and the cost of holding a unit in store for a year is assessed as 30% of the purchase price. The supplier of the fertilizer offers a price discount on larger orders. For orders less than 250 the price is Rs. 220 per unit, while for orders of 250 or greater the price is Rs. 210 per unit. In what quantities would you recommend ordering?

What would be the recommended order quantity if the following changes occurred? Firstly, the demand for the fertilizer reduces to 120 units per year. Secondly, the cost of placing an order fell to Rs. 1000 per order.

(14)

- Q. 5. (a) Explain the structure of transportation problem as a special class of the linear programming problem.

(4)

(b) A dairy firm has three plants located in the state. The daily milk production at each plant is as follows:

Plant 1: 6 million litres

Plant 2: 1 million litres, and

Plant 3: 10 million litres

Each day, the firm must fulfil the needs of its four distribution centers. Minimum requirement at each center is as follows:

Distribution center 1: 7 million litres

Distribution center 2: 5 million litres

Distribution center 3: 3 million litres, and

Distribution center 4: 2 million litres

Costs in thousand of rupees of shipping one million liter from each plant to each distribution center is given in the following table:-

		Distribution centers			
		D ₁	D ₂	D ₃	D ₄
Plant	P ₁	2	3	11	7
	P ₂	1	0	6	1
	P ₃	5	8	15	9

As an Operations Manager, find the optimal distribution schedule, if the object is to minimize total transportation cost.

(10)



Q. 6. (a) Explain the mathematical structure of the assignment problem. (4)

(b) A university department head has five instructors to be assigned to four different courses. All of the instructors have taught the courses in the past and have been evaluated by the students. The satisfaction rating (from a perfect score of 100) for each instructor for each course is given in the following table. The department head wants to know whom to be selected for teaching each course. The instructor who is not allocated to teach at all mark all the course exams instead.

Instructor	Course			
	A	B	C	D
1	80	75	90	85
2	95	90	90	97
3	85	95	88	91
4	93	91	80	84
5	91	92	93	88

Find the optimal assignment and the corresponding ratings. (10)

Q. 7. The following data corresponds to the annual consumption of items for an agribusiness company which was obtained from store inventory records:

Item No.	Annual Consumption (No. of units)	Price per unit (Rs.)
1	3000	2000
2	60,000	20
3	20	5000
4	200	125
5	350	90
6	6000	250
7	40	10000
8	300	700

Draw an ABC analysis graph after classifying A, B & C class items. (14)

Q. 8. Write short notes on any two of the following: (7 x 2)

- Resource Leveling & Resource Smoothing.
- Queuing and capacity planning.
- 7 QC tools for identifying quality problems and causes.

