



- Notes :
1. All questions are compulsory and carry equal marks.
  2. Draw neat labelled diagram and use supporting data wherever necessary.
  3. Avoid vague answer and write specific answer related to question.

1. Either
- a) Explain nature and features of OR in detail. **8**
  - b) Explain classification of problems in OR. **8**
- OR**
- c) Explain applications of operation Research. **8**
  - d) What are phases of operation Research? Explain. **8**
2. Either
- a) Obtain all the basic solutions to the following system of linear equation. **8**  

$$x_1 + 2x_2 + x_3 = 4$$

$$2x_1 + x_2 + 5x_3 = 5$$
  - b) What is Big-M method? Write down step/algorithm to solve the problem. **8**
- OR**
- c) Food x contains 6 units of vitamin A per gram and 7 units of vitamin B per gram and costs 12 paise per gram. Food y contains 8 units of vitamin A per gram and 12 units of vitamin B per gram and costs 20 paise per gram. The daily minimum requirement of vitamin A and vitamin B are 100 units and 120 units resp. find the minimum cost of product cost. **8**
  - d) Explain the applications of duality. **8**
3. Either
- a) Explain Maximin-Minimax principle in detail. **8**
  - b) Solve the following game. **8**
- |          |     |          |    |     |    |
|----------|-----|----------|----|-----|----|
|          |     | Player B |    |     |    |
|          |     | I        | II | III | IV |
| Player A | I   | 3        | 2  | 4   | 0  |
|          | II  | 3        | 4  | 2   | 4  |
|          | III | 4        | 2  | 4   | 0  |
|          | IV  | 0        | 4  | 0   | 8  |
- OR**
- c) Explain Dominance property in detail. **8**
  - d) A and B play game in which each has three coins a 5P., 10P. and a 20P. Each selects a coin without the knowledge of the other's choice if the sum of the coins is an odd amount, A wins B's coin, if the sum is even, B win's A's coin. Find the best strategy for each player and the value of the game. **8**

4. Either

- a) A company has 4 machines on which to do 3 jobs. Each job can be assigned to one and only one machine. The cost of each Job on each machine is given in the following table. 8

Job	Machine			
	A	B	C	D
1	18	24	28	32
2	8	13	17	19
3	10	15	19	22

Determine the optimum solution.

- b) Explain least - cost method. Also explain Vogel's approximation method (VAM). 8

**OR**

- c) What is an Assignment problem? Explain. 8

- d) Solve the following transportation problems. 8

From	To			Available
	A	B	C	
I	50	30	220	1
II	90	45	170	3
III	250	200	50	4
Requirement	4	2	2	

5. Solve all the questions.

- a) Explain concept linear programming model. 4
- b) Explain two-phase method. 4
- c) Explain various terminologies of game theory. 4
- d) Explain Branch and Bound techniques for Assignment problem. 4

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