

Set A

Unique Code: 32377907

Name of the course: **B.SeB.Sc. (H) Statistics, DSE – 1**

Name of the paper: **Operations Research**

Semester V

Formatted: Left

Time: 3 Hours

Maximum Marks: 75

Attempt any four questions. All questions carry equal marks.

1. Use duality to solve the following L.P.P.:

$$\text{Maximize } Z = 2x_1 + x_2$$

Subject to the constraints:

$$x_1 + 2x_2 \leq 10$$

$$x_1 + x_2 \leq 6$$

$$x_1 - x_2 \leq 2$$

$$x_1 - 2x_2 \leq 1$$

$$x_1, x_2 \geq 0$$

2. A company has four factories situated in four different locations in the country and four sales agencies located in four other locations in the country. The shipping costs (Rs. Per unit), cost of production (Rs. Per unit), the sales price, capacities and monthly requirements are given below:

Factory	Sales Agency				Monthly Capacity	Cost of Production
A	7	5	6	4	10	10
B	3	5	4	2	15	15
C	4	6	4	5	20	16
D	8	7	6	5	15	15
Monthly Requirement (units)	8	12	18	22		
Sales Price	20	22	25	18		

Find the monthly production and distribution schedule that will maximize profit.

Set A

- 3 The effectiveness of advertisement in different media by two competitive firms A and B is given by the ~~pay-off~~ payoff matrix (in Rs. 000) below:

	Form B		
Firm A	Radio	Television	Press
Radio	3	-2	4
Television	-1	4	2
Press	2	2	6

Test whether there is a saddle point and a pure strategy for optimum returns. Give reasons. Use dominance property to evaluate the mixed strategies of A and B and the value of the game. Test the results from both A's as well as B's point of view.

- 4 A company has four sales representatives who are to be assigned to four different sales territories. The monthly sales increase estimated for each sales representative for different sales territories (in lakh rupees) are given in the table below:

	I	II	III	IV
A	200	150	170	220
B	160	120	150	140
C	190	195	190	200
D	180	175	160	190

Suggest an optimum assignment and total maximum sales increase per month. If for certain reasons, sales representative B cannot be assigned to sales territory III, will the optimum assignment schedule be different? If so, find that schedule and the effect on total sales.

Set A

- 5 The network below gives the permissible routes and their lengths in miles between city 1 (node 1) and six other cities (node 2-7). Draw the network diagram. Find the minimal spanning tree for this network. Also determine the shortest route and hence the shortest distance from city 1 to node 7 (city 7).

Nodes	1	2	3	4	5	6	7
1		12	16	19			
2				20	17		
3				13		14	
4					17	18	
5							16
6							20

- 6 Find the most economic batch quantity of a product on a machine if the production rate of that item on the machine is 200 pieces per day and the demand is uniform at the rate of 100 pieces per day. The set-up cost is Rs. 200 per batch and the cost of holding one item in inventory is Re. 0.81 per day. How will the batch quantity vary if the machine production rate is infinite?