

18/05/2019

Roll No. ....

Total Pages : 04

BT-8/M-19

38052

OPERATIONS RESEARCH

ME-406-E

Time : Three Hours]

[Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting *one* question from each Unit.

**Unit I**

1. A paper mill produces paper for books as well as for magazines. Each kg. of paper for book requires 2 kg. of material A and 3 kg. of material B. For magazines the paper is 2 kg. of A and 2 kg. of B for each kg. of paper. The mill needs 15000 kg. of paper for books and 60000 kg. for magazines. Materials A and B are available as 3 lakh kg. and 5 lakh kg. respectively. Requirement for books is twice that of magazines. Selling price of book paper is rupees 7 and of magazines paper is Rs. 5. Cost of material A is Rs. 2 and that of material B is Rs. 2.50. Objective is to find the product manufacturing plan and the optimum annual profit. Formulate the problem as linear programming problem. 20

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P.T.O.

2. Compute all the basic feasible solutions to the LP problem : 20

$$\text{Maximize : } Z = 2x_1 + 3x_2 + 4x_3 + 7x_4$$

Subject to the constraints :

$$2x_1 + 3x_2 - x_3 + 4x_4 = 8$$

$$x_1 - 2x_2 - 6x_3 + 7x_4 = -3$$

$$x_1, x_2, x_3, x_4 \geq 0$$

and choose that one which maximizes Z.

### Unit II

3. Find the basic feasible solution of the following Transportation problem and also find the optimal Transportation plan : 20

	1	2	3	4	5	Available
A	4	3	1	2	6	80
B	5	2	3	4	5	60
C	3	5	6	3	2	40
D	2	4	4	5	3	20
Required	60	60	30	40	10	200

4. A construction project is broken down in 10 activities : 20

Activity	1	2	3	4	5	6	7	8	9	10
Immediate predecessor	--	1	1	1	2,3	3	4	5	6,7	8,9
Time (days)	4	2	4	3	5	6	2	3	5	7

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Draw the network and find the critical path. If activities 1 and 10 cannot be shortened but activities 2 and 9 can be shortened to a minimum of 1 week at a cost of Rs. 5000/week, which activity would you shorten to cut the project by 4 weeks ?

### Unit III

5. (a) Describe a method for generation of random numbers. Generate 10 random numbers by the method suggested. **10**
- (b) Describe the simulation process. What are reasons to use simulation ? **10**
6. Following are the record of demand of an item for the past 300 days : **20**

Demands in Unit	No. of Days	Probability
10000	18	0.06
11000	90	0.30
12000	120	0.40
13000	60	0.20
14000	12	0.04
	<u>300</u>	<u>1.00</u>

- (a) What is expected demand ?
- (b) If it cost Rs. 15 to make an item which sells for Rs. 20 normally, but at the end of the day any surplus has to be disposed of at Rs. 10. What is optimum output ?

Unit IV

7. The tool room company's quality department is manned by a single clerk who takes an average of 5 minutes in checking parts of each of the machine coming for inspection. The machine arrives once in every 8 minutes on the average. Ont hour of the machine is valued at Rs. 15 and the clerk's time is valued at Rs. 4/hour. What is the average hourly queuing system costs associated with the quality control department ? 20
8. Find the optimal strategy for Y and the value of game : 20

		Y				
		4	-1	4	-1	2
X	2	2	3	-4	2	
	1	-3	1	0	-4	

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