

Paper-M.C.-205 : Operations Research

(Same for USOL Candidates)

Time Allowed : 3 Hrs.

Maximum Marks : 80

Note : Attempt any five questions selecting at least one question from each Unit. All questions carry equal marks.

UNIT-I

1. What is the role of Operations Research in decision making ? Discuss various applications of Operations Research.
2. (a) A retailer deals in two items only, item A and item B. He has 50,000 rupees to invest and a space to store at the most 60 pieces. Item A costs him Rs. 2,500 and B costs Rs. 500. A net profit to him in item A is Rs. 500, and item B is Rs. 150. If he can sell all the items he purchases, how should he invest his amount to have maximum profit? Formulate the LPP and solve the problem using graphical method.
(b) Solve the following LPP by using Dual Simplex Method :

$$\text{Minimize } Z = 10x_1 + 6x_2 + 2x_3$$

$$\text{Subject to } -x_1 + x_2 + x_3 \geq 1$$

$$3x_1 + x_2 - x_3 \geq 2$$

$$\text{and } x_1, x_2, x_3 \geq 0.$$

3. (a) Solve the following LPP by using Dual Simplex Method :

$$\text{Minimize } Z = 10x_1 + 6x_2 + 2x_3$$

$$\text{Subject to } -x_1 + x_2 + x_3 \geq 1$$

$$3x_1 + x_2 - x_3 \geq 2$$

$$\text{and } x_1, x_2, x_3 \geq 0.$$

(b) Solve the following LPP by Big-M Method :

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

Subject to the constraints

$$3x_1 + x_2 = 3$$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \leq 4$$

$$\text{and } x_1, x_2 \geq 0.$$

UNIT-II

4. Solve the following assignment problem :

Machines

		M ₁	M ₂	M ₃	M ₄	M ₅
Jobs	J ₁	11	17	8	16	20
	J ₂	9	7	12	6	15
	J ₃	13	16	15	12	16
	J ₄	21	24	17	28	26
	J ₅	14	19	12	11	13

5. (a) Find an optimal solution to the following transportation problem :

Sources	Destination			Supply
	X	Y	Z	
A	2	7	4	50
B	3	3	7	70
C	5	4	1	80
D	1	6	2	140
Demand	70	90	180	340

(b) Suggest optimum solution to the following assignment problem and also the maximum sales :

Salesman	Markets (Sales in Lakhs Rupees)			
	I	II	III	IV
A	44	80	52	60
B	60	56	40	72
C	36	60	48	48
D	52	76	36	40

UNIT-III

6. The following failure rates have been observed for a certain type of light bulbs :

End of Week	1	2	3	4	5	6	7
Probability of failure	.05	.13	.25	.43	.68	.88	.96

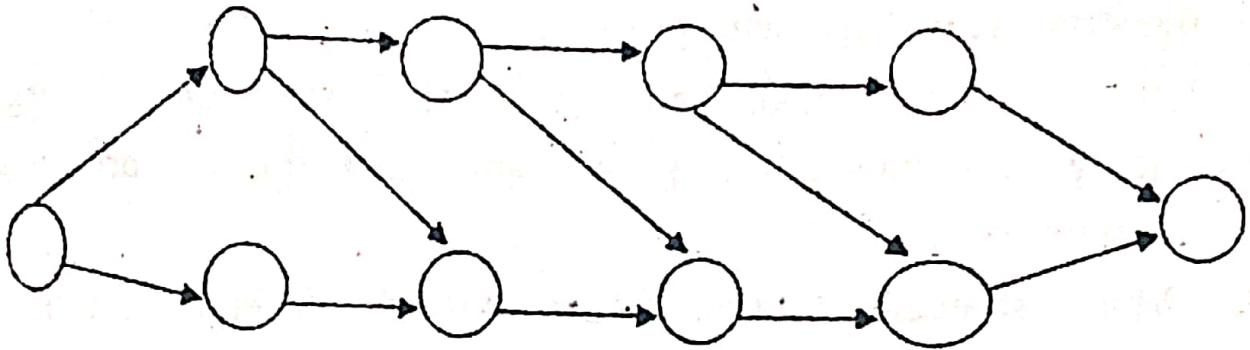
The cost of replacing an individual failed bulb is Rs. 12.50. The cost of group replacement is Rs. 3.00 per bulb. Determine whether individual replacement or replacement or group replacement is best suited for this situation.

7. The following table represents a set of activity times for a PERT network:

Activity	A	B	C	D	E	F	G	H	I	J	K
t_0 (week)	6	1	1	1	1	1	2	4	4	2	2
t_m	7	2	4	2	2	5	2	4	4	5	2
t_p	8	9	7	3	9	9	8	4	10	14	8
Predecessors	—	—	—	A	A, B	C	C	E, F	E, F	D, H	I, G

Draw the network and determine the critical path, expected time of completing the project. Determine the probability that the project will be completed within 25 weeks.

8. In the following network if all the activity timings are of two minutes, calculate the total project duration and the critical path using EST, EFT and LST and LFT.



UNIT-IV

9. (a) Two players 'A' and 'B' throw 2 coins on a table. 'A' wins 8 when both coins show head and 1 when both are tail. 'B' wins 3 when coins does not match. Prepare the payoff matrix and determine optimal strategies for each player.
- (b) With reference to Game Theory define the following, with an example:
- Pure strategy
 - Mixed strategy
 - Saddle point
 - Payoff matrix
 - Two-person-zero-sum-game.
10. (a) What is Simulation ? What are the advantages, uses and limitations of simulation to a business manager ?
- (b) The cost of machine is Rs. 6,000 and its scrap value is Rs. 100. The maintenance cost from experience is as follows :
- | Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-------------|---|-----|-----|-----|-----|------|------|------|
| Maintenance | 1 | 250 | 400 | 600 | 900 | 1200 | 1600 | 1800 |
- When should the machine be replaced ?