Code No: MB1932/19

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM

MBA III Semester Regular/Supplementary Examinations, November -2025

Operations Research (Common to all Specializations)

Time: 3 Hours **Max. Marks: 75**

Answer any FIVE Questions, One from Each Unit
Question No.11 is Compulsory

UNIT-I

1. a Explain the steps involved in the solution of an operations research problem 4M

 b Using graphical method to solve the following Linear Programing problem 8M

 Maximize $Z = 10x_1 + 6x_2$

 subject to the constraints

 $5x_1 + 3x_2 \le 30$

 $x_1 + 2x_2 \le 18$

 $and\ x_1, x_2 \ge 0$

OR

2. a Use the simplex method to solve the following Linear Programming problem 12M

 Maximize $Z = 3x_1 + 2x_2 + x_3$

 subject to the constraints

 $2x_1 + 5x_2 + x_3 = 12$

 $3x_1 + 4x_2 = 11$

 $and\ x_2, x_3 \ge 0, x_1\ unresticted$

UNIT-II

3. a A computer center has tree programmers. The center wants three application programmes to be developed. The head of the computer center, after studying carefully the programmes to be developed, estimate the computer time in minutes required by the experts for the application programmes as follows. 12M

Programmers

Programmes		A	B	C
	1	120	100	80
	2	80	90	110
	3	110	140	120

 Assign the programmers to the programmes in such way that the total computer time is minimum.

OR

4. a Write the steps involved in North-West Corner Method 4M

 b Determine the basic feasible solution to the following transportation problem 8M

Destination

Source		A	B	C	Supply
	S_1	2	7	14	5
	S_2	3	3	1	8
	S_3	5	4	7	7
	S_4	1	6	2	15
	Demand	7	9	18	

UNIT-III

5. a Use the Dynamic programming to solve the following problem 12M

 Minimize $Z = y_1^2 + y_2^2 + y_3^2$

 Subject to the constraints

 $y_1 + y_2 + y_3 = 10$

 $y_1, y_2, y_3 \ge 0$

OR

6. a Solve the following linear programming problem by dynamic programming approach 12M

Maximize $Z = 2x_1 + 5x_2$

subject to the constraints

$2x_1 + x_2 \leq 43$

$2x_2 \leq 46 \; and \; x_1 \geq 0, x_2 \geq 0$

UNIT-IV

7. a State, explain and prove the minimax theorem for two-person zero-sum games 6M

b Solve the game whose pay off matrix is given below 6M

$$\begin{array}{c c} & \begin{array}{cccc} B_1 & B_2 & B_3 & B_4 \end{array} \\ \begin{array}{c} A_1 \\ A_2 \\ A_3 \\ A_4 \end{array} & \begin{bmatrix} 3 & 2 & 4 & 0 \\ 3 & 4 & 2 & 4 \\ 4 & 2 & 4 & 0 \\ 0 & 4 & 0 & 8 \end{bmatrix} \end{array}$$

OR

8. a XYZ spare parts company wishes to determine the levels of stock it should carry for the items in its range. Demand is not certain and there is a lead time for stock replenishment. For one item X, the following information is obtained. 12 M

Demand(Units/day)	3	4	5	6	7
Probability	0.1	0.2	0.3	0.3	0.1

Carrying cost(per unit/day) : Rs 2/-

Ordering Cost(per order) : Rs 50/-

Lead time for replenishment: 3 days

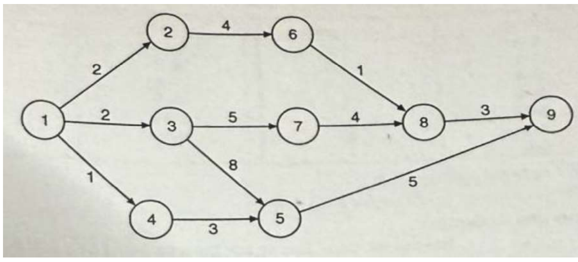
Stock on hand at the beginning of the simulation exercise was 20 units

Carry out a simulation run over a period of 10 days with the objective of evaluating the inventory rule: Order 15 units when present inventory plus any outstanding order falls below 15 units.

The sequence of random numbers to be used is 0, 9, 1, 1, 5, 1, 8, 6, 3, 5, 7, 1, 2, 9 using the first number for the day one.

UNIT-V

9. a Find the critical path and calculate the stack time for each event for the following PERT diagram. 12 M



OR

10. a The following table gives data on normal time and cost and crash time and cost for a project. 12M

Activity	Normal		Crash	
	Time(weeks)	Cost(Rs.)	Time(weeks)	Cost(Rs.)
1-2	3	300	2	400
2-3	3	30	3	30
2-4	7	420	5	580
2-5	9	720	7	810
3-5	5	250	4	300
4-5	0	0	0	0
5-6	6	320	4	410
6-7	4	400	3	470
6-8	13	780	10	900
7-8	10	1000	9	1200

Indirect cost is Rs. 50 per week.

i. Draw the network and identify the critical path with a double line.
ii. What are the normal project duration and associated cost?
iii. Find out the total float associated with each activity.
iv. Crash the relevant activities systematically and determine the optimal project completion time and cost.

CASE STUDY

11 A car manufacturer (Player A) is deciding on a new car model to launch (Strategies 1, 2, 3, or 4). A competing manufacturer (Player B) is reacting with different counter-strategies (Strategies 1, 2, or 3). The payoff matrix represents Player A's profit. 15M

Payoff Matrix (Profit for Player A):

	Player B: Strategy 1	Player B: Strategy 2	Player B: Strategy 3
Player A: Strategy 1	8	3	6
Player A: Strategy 2	10	11	9
Player A: Strategy 3	6	2	5
Player A: Strategy 4	7	5	8

Use the principle of dominance to reduce the size of the payoff matrix.

Once the matrix is reduced, solve for the optimal mixed strategies for both players using the algebraic method.

Determine the value of the game.