

Duration: 3 Hrs

Total Marks: 80

- N.B:** (1) Question 1 is **compulsory**.
 (2) Attempt any **Three questions** out of remaining **Five questions**.
 (3) Assume any **necessary data**, if required, but **justify the same**.
 (4) **Figures to the right** indicate **full marks** for that question.
 (5) Use of Scientific **calculator** is **allowed**.

Q.1 A) Solve the following LPP using Graphical Method [05]

Maximize $Z = 4x + y$
 Subject to $x + y \leq 50$
 $3x + y \leq 90$
 $x, y \geq 0$

B) Write Applications of Simulations. [05]

C) Determine the optimum strategies for the players and the value of the game. [05]

		Player B		
		B1	B2	B3
Player A	A1	1	8	3
	A2	6	7	5
	A3	8	3	0

D) Solve the following assignment problem and find the optimum assignment that will result in minimum man hours needed. [05]

		Jobs				
		A	B	C	D	E
Workers	1	20	15	18	20	25
	2	18	20	12	14	15
	3	21	23	25	27	25
	4	17	18	21	23	20
	5	18	18	16	19	20

Q.2 A) Solve the following LPP by using Simplex Method [10]

Maximize $Z = 4x_1 + 10x_2$
 Subject to $2x_1 + x_2 \leq 10$
 $2x_1 + 5x_2 \leq 20$
 $2x_1 + 3x_2 \leq 18$
 $x_1, x_2 \geq 0$

- B) Find the optimum strategies and value of the game where pay-off matrix of the two player is given by [10]

		Player B		
		B1	B2	B3
Player A	A1	4	10	2
	A2	12	4	6
	A3	2	4	2

- Q.3 A) Find optimum solution for the following transportation problem by using MODI method. [10]

	D1	D2	D3	D4	Supply
S1	10	7	9	8	22
S2	9	13	6	11	15
S3	9	11	12	10	8
Demand	7	12	17	9	

- B) Solve the following LPP by using Two Phase Method [10]

Maximize $Z = 4x_1 + 3x_2$

Subject to $2x_1 + x_2 \leq 12$

$3x_1 + 3x_2 \leq 10$

$4x_1 + 2x_2 \leq 8$

$x_1 + x_2 \geq 1$

$x_1, x_2 \geq 0$

- Q.4 A) A salesman wants to visit cities A, B, C and D. He does not want to visit any city twice before completing the tour of all the cities and wishes to return to his home city, the starting station. Cost of going from one city to another in rupees is given in the table. Find the least cost route. [10]

		To city			
		A	B	C	D
From city	A	0	30	80	50
	B	40	0	140	30
	C	40	50	0	20
	D	70	80	130	0

B) The state of natures and strategies of food products company are as follows: [10]

		Strategies		
		S1	S2	S3
States of nature	N1	7000	5000	3000
	N2	3000	4500	3000
	N3	1500	0	3000

Which strategy should the concerned executive choose on the basis of

- i) Maximin criterion
- ii) Maximax criterion
- iii) Minimax regret criterion
- iv) Laplace criterion

Q.5 A) At railway ticket window, eight customers arrive on an average every 4 minutes, while the ticket vendor can serve 9 customers in 4 minutes. Use Poisson distribution for arrival rate and exponential distribution for service rate. Determine: [10]

- a) Average time a customer keeps waiting in line
- b) Average number of customer in the system
- c) Average queue length
- d) Utilization factor

B) Solve the following LPP by using Big M Method [10]

Maximize $Z = 3x_1 - x_2$
 Subject to $2x_1 + x_2 \geq 2$
 $x_1 + 3x_2 \leq 3$
 $x_2 \leq 4$
 $x_1, x_2 \geq 0$

Q.6 A) Find initial basic feasible solution for the following transportation problem by using [10]

- i) North West Corner Method
- ii) Least Cost Method

	B1	B2	B3	Supply
A1	5	8	4	50
A2	6	6	3	40
A3	3	9	6	60
Demand	20	95	35	

- B) A cloth store keeps stock of a popular brand of shirts. Previous experience [10] shows the daily demand for the shirt with associated probabilities as given below:

Daily Demand	0	10	20	30	40	50
Probabilities	0.01	0.20	0.15	0.50	0.12	0.02

Use the following sequence of random numbers to simulate the demand for next 10 days.

Random Numbers: 26, 40, 66, 77, 13, 09, 74, 90, 18, 48.

Also estimate the daily average demand for the fabric on the basis of the simulated data. Use Monte-Carlo method.
