

Duration: 3 Hrs

Total Marks: 80

N.B: (1) Question 1 is compulsory.

(2) Attempt any **Three questions** out of remaining **Five questions**.

- Q.1 A) Solve the following LPP using graphical method [10]
 Minimize $Z = 3x_1 + 2x_2$
 Subject to

$$7x_1 + 2x_2 \geq 30$$

$$5x_1 + 4x_2 \geq 20$$

$$2x_1 + 8x_2 \geq 16$$

And

$$x_1, x_2 \geq 0$$

- B) Solve the following assignment problem and find the optimal assignment that will result in minimum man hours needed [10]

		Jobs			
		A	B	C	D
Workers	I	5	3	2	8
	II	7	9	2	6
	III	6	4	5	7
	IV	5	7	7	8

- Q.2 A) A department store keeps stock of a popular brand of shirts. Previous experience shows the daily demand for the shirt with associated probabilities as given below: [10]

Daily Demand	0	10	20	30	40	50
Probability	0.0	0.2	0.1	0.5	0.1	0.0
	1	0	5	0	2	2

Use the following sequence of random numbers to simulate the demand for the next 10 days: 26, 40, 66, 77, 13, 09, 74, 90, 18, 48. Also estimate the daily average demand for the shirt on the basis of the simulated data.

- B) The following matrix gives the payoff of different strategies (alternatives) S1, S2 and S3 against conditions (events) N1, N2, N3 and N4. Indicate the decisions taken under the following criterion: (a) Optimistic (b) Pessimistic (c) Realism (d) Equal Probability [10]

Alternatives	States of Nature			
	N1	N2	N3	N4
S1	4000	-100	6000	18000
S2	20000	5000	400	0
S3	20000	15000	-2000	1000

- Q.3 A) Customers arrive at a sales counter manned by a single person according to a Poisson process with a mean rate of 20 per hour. The time required to serve a customer has an exponential distribution with a mean of 100 seconds. Find the [10]
- Average waiting time of a customer in the queue
 - Average number of customers in the system
 - Probability that a customer is required to wait
 - Probability that there are at least 4 customers in the system

- 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	6	10	5
	A2	12	8	10
	A3	5	6	5

- Q.4 A) Solve the following LPP by using Simplex Method [10]

$$\text{Maximize } Z = 300x + 200y$$

$$\text{Subject to } 5x + 2y \leq 180$$

$$x + y \leq 45$$

$$x, y \geq 0$$

- B) Find initial basic feasible solution for the following transportation problem by using: [10]

- North West Corner Method
- Least Cost Method

	B1	B2	B3	Supply
A1	26	23	10	61
A2	14	13	21	49
A3	16	17	29	90
Demand	52	68	80	

Q.5 A) Solve the following LPP using 2-Phase method [10]

Maximize $Z = 3x_1 - x_2$

Subject to

$$2x_1 + x_2 \geq 2$$

$$x_1 + 3x_2 \leq 2$$

And

$$x_1, x_2 \geq 0$$

Q.6 B) Explain Monte Carlo Simulation. List the advantages and limitations of simulation. [10]

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

Minimize $Z = 12x + 20y$

Subject to $6x + 8y \geq 100$

$$7x + 12y \geq 120$$

and

$$x, y \geq 0$$

B) Find optimum solution for the following transportation problem by using MODI method. [10]

	D1	D2	D3	D4	Supply
S1	6	8	8	5	30
S2	5	11	9	7	40
S3	8	9	7	13	50
Demand	35	28	32	25	
