

Duration: 3 Hrs

Marks: 80

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

- (2) Attempt any four out of remaining six questions.
- (3) Assume any additional data, if required, but justify the same.
- (4) Figures to the right indicate full marks for that question.
- (5) Use of calculator is allowed.

Q1 a) Solve the following LPP using graphical method

$$\text{Maximize } Z = 20X_1 + 35X_2$$

$$\text{Subject to } 3X_1 + 3X_2 \leq 36$$

$$5X_1 + 2X_2 \leq 50$$

$$2X_1 + 6X_2 \leq 60$$

$$\text{and } X_1, X_2 \geq 0$$

(10)

b) Solve the following assignment problem and find the optimum assignment that will result in minimum man hours needed.

		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

(10)

Q2 a) Solve the following LPP by Simplex Method

$$\text{Maximize } Z = 3X_1 + 9X_2$$

$$\text{Subject to, } X_1 + 4X_2 \leq 8$$

$$X_1 + 2X_2 \leq 4$$

$$\text{and } X_1, X_2 \geq 0$$

(08)

b) Find the initial basic feasible solution for the following transportation problem by Vogel's approximation Method.

		Destination				Supply
Source	2	3	11	7	6	
	1	0	6	1	1	
	5	8	15	9	10	
Demand	7	5	3	2		

(07)

Q3 a) Solve the following LPP using Big-M Method.

$$\text{Minimize } z = 2X_1 + 8X_2$$

$$\text{Subject to, } 5X_1 + 10X_2 = 150$$

$$X_1 \leq 20$$

$$X_2 \geq 14$$

$$\text{and } X_1, X_2 \geq 0$$

(08)

b) Suppose the following estimates of activity times (days) are provided

Activity	Optimistic time	Most Likely time	Pessimistic time
1-2	6	6	24
1-3	6	12	18
1-4	12	12	30
2-5	6	6	6
3-5	12	30	48
4-6	12	30	42
5-6	18	30	54

i) Draw a network

ii) Find the expected duration and variance for each activity.

iii) Find the critical path of the project

(07)

Q4 a) Six jobs are to be processed at three machines A, B and C in the order BAC. The time taken by each job on the three machines is given below. Each machine can process one job at a time.

Determine the optimum sequence for the jobs and total elapsed time; also find the idle time for each machine.

Task	1	2	3	4	5	6
A	30	40	20	10	50	35
B	50	80	90	70	60	75
C	40	80	70	60	20	45

(08)

b) Find the optimal strategies and value of the game where pay-off matrix of the two player is given by

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

(07)

PTD

Q5 a) Solve the following using Dual Simplex Method.

$$\text{Minimize } Z = X_1 + 2X_2 + 3X_3$$

$$\text{Subject to, } 2X_1 - X_2 + X_3 \geq 4$$

$$X_1 + X_2 + 2X_3 \leq 8$$

$$X_2 - X_3 \geq 2$$

$$\text{and } X_1, X_2, X_3 \geq 0$$

(08)

b) A company has a machine whose cost is Rs 30,000. Its maintenance cost and resale value at the end of different years are given below.

Year	1	2	3	4	5	6
Maintenance cost (Rs.)	4500	4700	5000	5500	6500	7500
Resale price (Rs.)	27000	25300	24000	21000	18000	13000

At what time interval, in your opinion, should the machine be replaced?

(07)

Q6 a) Draw the network diagram. Find total, free and independent floats and determine the critical path

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration	2	8	10	6	3	3	7	5	2	8

(08)

b) The following matrix gives the payoff of different strategies S1, S2, S3 against different conditions N1, N2, N3 and N4

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

Indicate the decision taken under the following approach i) pessimistic ii) optimistic and iii) regret

(07)

Q7 a) A salesman wants to visit cities A, B, C, D and E. He does not want to visit any city twice before completing his tour of all the cities and wishes to return to the point of starting journey. Cost of going from one city to another (in Rupees) is shown in the following table. Find the least cost route.

		To City				
		A	B	C	D	E
From City	A	-	4	7	3	4
	B	4	-	6	3	4
	C	7	6	-	7	5
	D	3	3	7	-	7
	E	4	4	5	7	-

(08)

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- b) i. Explain in brief 'Pure and mixed strategies in game theory'.
ii. Obtain the dual of the following

$$\text{Maximize } Z = 7X_1 + 5X_2$$

$$\text{Subject to. } 3X_1 + X_2 \leq 48$$

$$2X_1 + X_2 \leq 40$$

$$\text{and } X_1, X_2 \geq 0$$

(07)



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