

Time: 3 Hours

Total Marks: 80

N.B: (1) **Question No. 1** is compulsory(2) Attempt any **Three Questions between Questions No.2 to Question No.6**

Q1 A) Attempt any 4

[20]

1. Explain linear programming problem in detail.
2. Discuss Vogel's Approximation Method to obtain initial feasible solution.
3. Explain types of games.
4. Explain the concepts of Transportation Problem.
5. Find Solution using North-West Corner method

	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	

Q2 A) Maximize $Z=20x + 30y$

[10]

Subject To: $3x + 3y \leq 36$ $5x + 2y \leq 50,$ $2x + 6y \leq 60,$ $x \geq 0, y \geq 0$

Solve the above L.P.P. graphically

B) Customers arrives at a certain airline reservation booking counter [10]

manned by a single clerk at a rate of 6 per hour, assuming arrival of customer follows Poisson distribution. The clerk can serve a customer on an average of 4 minutes, with an exponentially distributed service time. Calculate:

- i. What is the probability that the system is busy?
- ii. What is the average time a customer spends in the system?
- iii. What is the average length of the queue?
- iv. What is the number of customer in the system.

Q3 A) Find the initial feasible solution using VAM Rule [10]

for the following Transportation problem:

Origin\Destination	D1	D2	D3	D4	Supply
O1	4	6	8	13	15
O2	13	11	10	8	70
O3	14	4	10	13	30
O4	9	11	13	8	50
Demand	40	35	105	20	

B) Solve the following assignment problem using the Hungarian method. [10]

Three jobs A, B and C are to be assigned to the machines. The processing cost of each job – machine combination matrix is given in the table

Table C.1 Machines

Job	I	II	III	IV
A	6	9	11	15
B	1	3	5	6
C	2	4	6	8

Q4 A) Find the optimal strategies for player A and player B in the following game. [10]

Also find the value of the game.

		Player B's Strategy				
Player A's Strategy		B1	B2	B3	B4	B5
	A1	4	8	6	16	2
	A2	18	16	14	18	16
	A3	10	14	12	12	14
	A4	16	18	10	10	4

B) Solve the following game by dominance principle. [10]

		Player B's Strategy				
Player A's Strategy		B1	B2	B3	B4	B5
	A1	7	9	8	13	10
	A2	9	10	7	11	12
	A3	12	11	13	12	11
	A4	8	6	12	9	7

Q5 A) Explain the concepts and computational steps of a Hungarian method for solving an Assignment Problem. [10]

B) Following is the pay-off matrix corresponding to four states of nature S1, S2, S3, S4 and four course of action A1, A2, A3 and A4. Calculate expected payoff and find best course of action using EMV. [10]

State of Nature	A1	A2	A3	A4	Probability
S1	50	400	-50	0	0.15
S2	300	0	200	300	0.45
S3	-150	100	0	300	0.25
S4	50	0	100	0	0.15

Q6 A) Use simplex method to solve the L.P.P: [10]

Maximize Z: $50X_1 + 20X_2$

Subject to : $20X_1 + 10X_2 \leq 500$

$50X_1 + 50X_2 \leq 300$

$X_1, X_2 \geq 0$

B) Explain Monte Carlo Method. State its advantages and disadvantage. [10]