LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **STATISTICS**

SIXTH SEMESTER – **APRIL 2025**

UST 6502 – OPERATIONS RESEARCH

Date: 26-04-2025 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 PM

SECTION –A

Answer any FOUR of the following **4x10 = 40 Marks**

1. Solve the following L.P.P. graphically:
   Minimize $z = 400x_1 + 360x_2$
   subject to the constraints:
   $5x_1+3x_2 \geq 45$, $x_1 \geq 8$, $x_2 \geq 10$
   $x_1 \geq 0$ and $x_2 \geq 0$.
2. Write the algorithm of Big M method to solve a linear programming problem.
3. Explain the dual simplex method for solving a linear programming problem.
4. Find the initial solution using (i) North-West corner rule and (ii) Vogel's approximation Method:

Warehouse / Factory	I	II	III	IV	Capacity
A	42	48	38	37	160
B	40	49	52	51	150
C	39	38	40	43	190
Demand	80	90	110	160	

5. Four operators O_1, O_2, O_3 and O_4 are available to a manager who has to get four jobs J_1, J_2, J_3 and J_4 done by assigning one job to each operator. Given the times needed by different operators for different jobs in the table given below:

To / From	J_1	J_2	J_3	J_4
O_1	12	10	10	8
O_2	14	12	15	11
O_3	6	10	16	4
O_4	8	10	9	7

   How should the manager assign the jobs so that the total time needed for all jobs is minimum?

6. Write the steps involved in the construction of a network diagram.
7. The following are the details of estimated times of a certain project.

Activity	Immediate predecessors	Normal time (days)
A	-	16
B	-	20
C	A	8
D	A	10
E	B, C	6
F	D,E	12

   Draw the network diagram and find the critical path and also the expected time of the project.
8. Explain the linear programming method for solving a game.

SECTION –B

Answer any THREE of the following **3x20 = 60 Marks**

9. Use simplex method to solve the following L.P.P. :

Maximize $z = 4x_1+10x_2$

Subject to the constraints:
$2x_1+x_2 \leq 50$; $2x_1+5x_2 \leq 100$; $2x_1+3x_2 \leq 90$; $x_1 \geq 0$ and $x_2 \geq 0$.

10. Write the dual of the following L.P.P. and solve:
Minimize $z = 15x_1 + 10x_2$
Subject to the constraints:
$3x_1 + 5x_2 \geq 5$, $5x_1 + 2x_2 \geq 3$
$x_1 \geq 0$ and $x_2 \geq 0$.

11. Find the optimum solution to the following transportation problem:
A company has three cement factories A, B, and C and four area distributors W,X,Y and Z. With identical costs of production at the three factories, the only variable cost involved is the transportation cost. The monthly production capacity (in tons) of the three factories, monthly demand of the four distributors, and the transportation cost per ton (in Rs.) from the different distribution centers, are given below:

Factory \ Distributor	W	X	Y	Z	Supply
A	20	25	50	10	45000
B	45	50	15	40	50000
C	22	10	45	35	55000
Demand	50000	40000	30000	30000	150000

12. The following optimistic (O) , pessimistic (P) and most likely (M) time estimates(days) for each task have been given for a project:

Task	Predecessors	O	M	P
A	-	10	12	15
B	-	6	10	16
C	A,B	3	5	10
D	C	8	12	17
E	C	4	7	12
F	C	3	4	6
G	D,E	5	8	13
H	F,G	5	7	10

Construct the network diagram for this project and find the critical path. Also find the expected duration of the project.

13. Using dominance method solve the game with the following payoff matrix:

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	18	4	6	4
	A_2	6	2	13	7
	A_3	11	5	17	3
	A_4	7	6	12	2

14. Solve the following problem graphically:

		Player B		
		B_1	B_2	B_3
Player A	A_1	3	-3	4
	A_2	-1	1	-3

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