

**STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086**  
**(For candidates admitted from the academic year 2019–20 & thereafter)**

**B. Sc. DEGREE EXAMINATION, APRIL 2024**  
**BRANCH I – MATHEMATICS**  
**SIXTH SEMESTER**

**COURSE : MAJOR ELECTIVE**  
**PAPER : OPTIMIZATION TECHNIQUES**  
**SUBJECT CODE : 19MT/ME/OT45**  
**TIME : 3 HOURS**

**MAX. MARKS: 100**

**SECTION-A**

**ANSWER ANY TEN QUESTIONS:**

**10 × 2 = 20**

1. Define Slack variable.
2. Rewrite the LPP in standard form.  
Maximize  $z = 2x_1 + 3x_2 + 4x_3$   
Subject to constraints  
 $x_1 + x_2 + x_3 \geq 5$   
 $x_1 + 2x_2 = 7$   
 $5x_1 - 2x_2 + 3x_3 \leq -9$
3. What are artificial variables?
4. How to balance an unbalanced transportation problem?
5. What is Non-degenerate basic feasible solution in transportation problem?
6. Define an Assignment Problem.
7. State any two assumptions made in sequencing problems.
8. Define Total elapsed time.
9. Define payoff matrix.
10. What is zero –sum game?
11. What is meant by Critical path?
12. What are the three time estimates in PERT?

**SECTION-B**

**ANSWER ANY FIVE QUESTIONS:**

**5 × 8 = 40**

13. Explain the algorithm of graphical method in LPP?

14. Find an initial basic feasible solution to the following transportation problem using Vogel's approximation method.

To				Supply
from	2	7	4	5
	3	3	1	8
	5	4	7	7
	1	6	2	14
Demand	7	9	18	

15. Solve the following Assignment problem.

	I	II	III	IV
A	8	10	12	16
B	11	11	15	8
C	9	6	5	14
D	15	14	9	7

16. Explain the procedure for determining an optimal sequence for processing n jobs through two machines.

17. Determine the optimum strategies and value of the games.

	B1	B2	B3	B4	B5
A1	16	4	0	14	-2
A2	10	8	6	10	12
A3	2	6	4	8	14
A4	8	10	2	2	0

18. Write down the PERT procedure in network model.

19. Distinguish between PERT and CPM.

## SECTION-C

ANSWER ANY TWO QUESTIONS:

2×20 = 40

20. Solve the following LP using Simplex Method.

Minimize  $Z = x_1 - 3x_2 + 2x_3$

Subject to constraints

$3x_1 - x_2 + 2x_3 \leq 7$

$-2x_1 + 4x_2 \leq 12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

and  $x_1, x_2, x_3 \geq 0$ .

21. a) Solve the transportation problem .

	I	II	III	IV	SUPPLY
A	1	5	3	3	34
B	3	3	1	2	15
C	0	2	2	3	12
D	2	7	2	4	19
DEMAND	21	25	17	17	

b) Reduce the following game by dominance property and solve it.

		Player B				
		1	2	3	4	5
Player A	I	1	3	2	7	4
	II	3	4	1	5	6
	III	6	5	7	6	5
	IV	2	0	6	3	1

22. a) Construct a network diagram and find the critical path, EST and LFT for the following data.

Activities :	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Duration :	15	15	3	5	8	12	1	14	3	14

b) A machine operator has to perform two operations, turning and threading, on a number of different jobs. The time required to perform these operations(in minutes) for each job is known. Determine the order in which the jobs should be processed in order to minimize the total time required to turn out all the jobs.

Job	Time for Turning (mins)	Time for Threading (mins)
1	3	8
2	12	10
3	5	9
4	2	6
5	9	3
6	11	1

Also find the total processing time and idle times for turning and threading operations.

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