

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

SUBJECT CODE: 19MT/ME/OT45

B. Sc. DEGREE EXAMINATION, APRIL 2023
BRANCH I – MATHEMATICS
SIXTH SEMESTER

COURSE : MAJOR ELECTIVE
PAPER : OPTIMIZATION TECHNIQUES
TIME : 3 HOURS

MAX. MARKS: 100

SECTION-A

ANSWER ANY TEN QUESTIONS:

10 × 2 = 20

1. How can you detect that a LPP has no feasible solution?
2. What is the purpose of introducing artificial variable in simplex method?
3. Write the primal of the following dual:
 $Min Z = 10y_1 + 8y_2$ subject to: $y_1 + 2y_2 \geq 5$, $2y_1 - y_2 \geq 12$, $y_1 + 3y_2 \geq 4$ and
 $y_1 \geq 0$, y_2 unrestricted in sign.
4. What is meant by non-degenerate basic feasible solution of a transportation problem?
5. Give two areas for the application of Assignment problem.
6. Define the terms Total elapsed time and Idle time on a machine.
7. Distinguish between pure and mixed strategies.
8. Find the value of τ in the game
$$\begin{bmatrix} 2 & 6 \\ -2 & \tau \end{bmatrix}$$
9. Write any two merits and demerits of AON Diagram.
10. Define an activity in a PERT network.
11. Reduce the following linear problem to the standard form
 $Max Z = 5x_1 + 3x_2 + 4x_3$
subject to the constraints $2x_1 - 5x_2 \leq 6$, $2x_1 + 3x_2 + x_3 \geq 5$, $3x_1 + 4x_2 \leq 3$, $x_1, x_2, x_3 \geq 0$.
12. What is the objective of travelling salesman problem?

SECTION-B

ANSWER ANY FIVE QUESTIONS:

5 × 8 = 40

13. Solve the following LPP Graphically.
 $Minimize Z = x + 2y$
subject to $-x + 3y \leq 10$, $x + y \leq 6$, $x - y \leq 2$ and $x, y \geq 0$.

14. Construct the Primal of the following, Hence solve it

$$\text{Minimize } Z = x_1 + x_2$$

subject to $2x_1 + x_2 \geq 4$, $x_1 + 7x_2 \geq 7$, and $x_1, x_2 \geq 0$ by solving its dual problem.

15. A company has 5 machines and 5 jobs to be done. The return in rupees of assigning i^{th} machine to the j^{th} job ($i, j=1,2,\dots,5$) is as follows. Assign the five job to the five machines so as to maximize the total profit.

		Job				
		1	2	3	4	5
Machine	A	5	11	10	12	4
	B	2	4	6	3	5
	C	3	12	5	14	6
	D	6	14	4	11	7
	E	7	9	8	12	5

16. Determine the optimum sequence of 5 jobs on machine given that the jobs are to processed on all the machines in the same order I-II-III and the processing time are as per the table.

Processing time on machine			
jobs	I	II	III
1	3	4	7
2	8	5	9
3	7	1	5
4	5	2	6
5	4	3	10

17. The project scheduling has the following characteristic

Activity: Time	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Days	4	1	1	1	6	5	4	8	1	2	5	7

Draw the network diagram and find the critical path.

18. Solve the transportation problem by least cost method to obtain the total cost.

		Destination				Supply
		D ₁	D ₂	D ₃	D ₄	
Source	S ₁	3	1	7	4	300
	S ₂	2	6	5	9	400
	S ₃	8	3	3	2	500
Demand		250	350	400	200	

19. Solve the game whose pay off matrix is given by

	Player B		
	B_1	B_2	B_3
Player A	0	-2	7
	2	5	6
	3	-3	8

SECTION-C

ANSWER ANY TWO QUESTIONS:

2×20 = 40

20. a) Solve the following LPP by Big M method.

Minimize $Z = 10x_1 + 15x_2 + 20x_3$ subject to

$$2x_1 + 4x_2 + 6x_3 \geq 24, 3x_1 + 9x_2 + 6x_3 \geq 30, x_1, x_2, x_3 \geq 0.$$

b) Solve the following transportation problem for minimum cost

Destination	Origins				Requirements
	A	B	C	D	
1	7	4	3	4	15
2	3	2	7	5	25
3	4	4	3	7	20
4	9	7	5	3	40
Availability	12	8	35	25	

21. a). A company has 4 machines to do 3 jobs, each job can be assigned to one and only one machine. The cost of each job on machine is given in the following table. What are the job Assignments which will minimize the total cost?

JOB	Machine			
	W	X	Y	Z
A	18	24	28	32
B	8	13	17	18
C	10	15	19	22

b) Determine the Sequence of these jobs that will minimize the total elapsed time and the idle time.

Job	1	2	3	4	5	6	7
Machine-1	3	12	15	6	10	11	9
Machine-2	8	10	10	6	12	12	3

22. a) Use dominance property to reduce the following game to 2x2 and hence find the optimal strategies and the value of the same.

		Player B			
		6	2	4	8
Player A	2	-1	1	12	
	2	3	3	9	
	5	2	6	10	

- b) A Project schedule has the following

Activity	1-2	2-3	2-4	3-5	4-5	4-6	5-7	6-7	7-8	7-9	8-10	9-10
t_o	1	1	1	3	2	3	4	6	2	4	1	3
t_m	2	2	3	4	3	5	5	7	4	6	2	5
t_p	3	3	5	5	4	7	6	8	6	8	3	7

Construct a PERT network and find out i) the earliest possible time to complete the different stages of the project ii) The latest allowable time TL for them(LST) iii) the critical path iv)The probability factor for completing the project in 30 weeks.

