



Mahindra University Hyderabad

Ecole Centrale School of Engineering

End-semester Examination

Program: B. Tech. Branch: CAM Year: II Semester: IV

Subject: Optimization Techniques (MA 2210)

SE23CAM20

Date: 27/05/2025

Time Duration: 3 Hours

Start Time: 10:00 AM

Max. Marks: 100

Instructions:

1. There are 5 questions, all of which are compulsory.
2. Justify your answer wherever required. Guesswork will not be considered in evaluation.
3. Use of non-programmable scientific calculator is allowed. However, sharing calculators during exams is strictly prohibited.

1. Consider the following transportation problem. There are 3 origins O_1, O_2, O_3 and 4 destinations D_1, D_2, D_3, D_4 . For the origins O_1, O_2 and O_3 , the supply is 300, 400 and 450 respectively. The destinations D_1, D_2, D_3 and D_4 have demands 250, 350, 400 and 200 respectively. The following table gives the corresponding cost matrix. 25 M

	D_1	D_2	D_3	D_4
O_1	3	1	5	4
O_2	2	6	4	9
O_3	8	10	3	2

Obtain an initial basic feasible solution using least-cost method. Then find an optimal solution using MODI method.

2. Five salesmen S_1, S_2, S_3, S_4, S_5 are to be assigned to five districts A, B, C, D, E. Estimates of sales revenue (in thousands) for each salesman are given as follows: 20 M

	A	B	C	D	E
S_1	32	38	40	28	40
S_2	40	24	28	21	36
S_3	41	27	33	30	37
S_4	22	38	41	36	36
S_5	29	33	40	35	39

We need to find an assignment that maximises the sales revenue. Solve the assignment problem using Hungarian Method.

-
3. A salesman is planning to visit 4 cities B, C, D and E starting from his home city A and wants to come back to city A. The inter-city distances are shown in the following table: 20 M

	A	B	C	D	E
A	∞	4	10	14	2
B	12	∞	6	10	4
C	16	14	∞	8	14
D	24	8	12	∞	10
E	2	6	4	16	∞

Solve the above travelling salesman problem so that he visits each city exactly once and travels minimum distance.

-
4. Solve the following Integer Programming Problem using Gomory's Cutting Plane Method: 30 M

$$\begin{aligned} \text{Maximize } Z &= x_1 + x_2 \\ \text{Subject to: } 2x_1 - x_2 &\leq 3 \\ x_1 + 2x_2 &\leq 7 \\ x_1, x_2 &\geq 0 \\ x_1, x_2 &\in \mathbb{Z} \end{aligned}$$

-
5. Answer the following questions:

5 M

- State Reduction Theorem for assignment problem. (3)
- How many possible routes are there in a Traveling Salesman problem with 5 cities? (2)
