4. Given the following data:

		DESTINATIONS			
		I	*II*	*III*	CAPACITIES
SOURCES	1	2	2	3	10
	2	4	1	2	15
	3	1	3	x	40
DEMANDS		20	15	30	

$x_{12} = 10$

$= 15$

$x_{31} = 20$

$x_{32} = 15$

$x_{33} = 5$

The cost of transportation from the third source to the third destination is not known. How many units should be transported from the sources to the destinations so that the total cost of all the units to their destinations is a minimum?

5. A salesman has to visit 5 cities. He wishes to start from a particular city, visit each city once and then return to his starting city. Cost of going from one city to another is shown below: Find the least-cost route and minimum total cost.

Min Cost = 30

A → B → C → D → E → A

FROM CITY \ TO CITY	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	∞

6. Using artificial constraints procedure, solve the following L.P.P by dual simplex method:

$$\text{Maximize } z = -x_1 + x_2$$

$$\text{subject to } x_1 - 4x_2 \geq 5,$$
$$x_1 - 3x_2 \leq 1$$
$$2x_1 - 5x_2 \geq 1, \text{ and } x_1, x_2 \geq 0$$

Not feasible

7. Use revised simplex method to solve the following L.P.P:

$$\text{Maximize } z = x_1 + x_2 + 3x_3$$

$$\text{subject to } 3x_1 + 2x_2 + x_3 \leq 3,$$
$$2x_1 + x_2 + 2x_3 \leq 2$$
$$\text{and } x_1, x_2, x_3 \geq 0$$

——The End——

$x_1 = x_2 = 0$

$x_3 = 1$

$Z_{max} = 3$

Indian Institute of Technology, Kharagpur

Date..... Time: 55 mins Full Marks: 10 Sub. No. MA

Second Class Test (Autumn) Semester 2022-23 No. of Students: 176

61019/ MA 30227

Subject Name: Optimization Techniques

Instruction: Each question carry 2 marks. Answer as many as you can, but the maximum score is 10. Notations used are as explained in the class.

1. Use duality to find the optimal solution, if any, of the the following L.P.P:

$$\text{Maximize } z = 8x_1 + 6x_2$$
$$\text{subject to } x_1 - x_2 \leq \tfrac{3}{5},$$
$$x_1 - x_2 \geq 2$$
$$\text{and } x_1, x_2 \geq 0$$

No feasible soln.

2. Apply (i) Vogel's approximation method and (ii) row minima method to find initial basic feasible solutions of the following transportation problem and state whether the solutions are optimal or not in each case:

	1	2	3	4	a_i
1	21	16	25	13	11
2	17	18	14	23	13
3	32	27	18	41	19
b_j	6	10	12	15	

(i) $x_{14} = 11$, $x_{21} = 6$, $x_{22} = 3$, $x_{24} = 4$, $x_{32} = 7$, $x_{33} = 12$

(ii) $x_{14} = 11$, $x_{21} = 1$, $x_{22} = 12$, $x_{31} = 5$, $x_{32} = 10$, $x_{34} = 4$.

3. Is

	1	2	3	4
1			50	20
2	55			
3	30	35		25

an optimal solution of the following transportation problem?

	1	2	3	4	a_i
1	6	1	9	3	70
2	11	5	2	8	55
3	10	12	4	7	90
b_j	85	35	50	45	

If not, modify it to obtain a better feasible solution and find the solution of the modified problem.

——P.T.O.——

$x_{12} = 30$, $x_{14} = 40$, $x_{22} = 5$, $x_{23} = 50$, $x_{31} = 5$, $x_{34} = 5$, Cost = 1160.

(6.) 2 mark