DEPARTMENT OF MECHANICAL ENGINEERING

UNIVERSITY INSTITUTE OF ENGINEERINGAND TECHNOLOGY, CSJM UNIVERSITY, KANPUR

Operation research (MEE-S504)

Semester: 2023-24 (Even Semester) Year (2K20) **Year: 4th**

Mid-1 Semester Examination

Time: 1.5 h **Maximum marks: 30**

Section-A

1. A company has three plants at locations A, B and C which supply to warehouses located at D, E, F,G and Monthly plant capacities are 800, 500 and 900 units respectively. Monthly warehouse requirements are 400, 400, 500, 400 and 800 units respectively. The unit transportation costs are given below:

	Warehouse	Warehouse	Warehouse	Warehouse	Warehouse	Plant Capacity
Plant (A)	5	8	6	6	3	800
Plant (B)	4	7	7	6	6	500
Plant (C)	8	4	6	6	3	900
Warehouse Requirement	400	400	500	400	800	

(a) Find initial feasible solution using north west corner method
(b) Find initial feasible solution using least cost method
(c) Find initial feasible solution using vogel approximation method.
(d) Determine an optimum distribution for the company, in order to minimise the total transportation cost.
(**Note**: Use u-v method or stepping stone method to find the optimum solution)

[1 + 2 + 2 + 5]

Section-B

2. Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and is given in the following table:

Jobs

		I	II	III	IV	V
Men	**A**	2	9	2	7	1
	B	6	8	7	6	1
	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

3. Solve the LP problems graphically

(i) Min Z = $4x_1 - 2x_2$

Subject to $x_1 + x_2 \leq 14$

$3x_1 + 2x_2 \geq 36$

$2x_1 + x_2 \leq 24$

$x_1, x_2 \geq 0$

[4 + 4]

Section-C

4. A company is manufacturing two different types of products A and B. Each product to be processes on two machines M_1 and M_2. Product A requires 2 hours on machine M_1 and 1 hour on machine M_2 , product B requires 1 hour on machine M_1 and 2 hours on machine M_2. The available capacity of machine M_1 is 104 hours and that of machine M_2 is 76 hours. Profit per unit for product A is Rs. 6 and that for B is Rs 11. Calculate (i) Formulate the problem (ii) Find out the optimal solution by Simplex method.

5. Solve the LP problems graphically

Min Z = $3x_1 + 5x_2$

subject to $-3x_1 + 4x_2 \leq 12$

$2x_1 - x_2 \geq -2$

$\mathbf{2x_1 + 3x_2 \geq 12}$ $\mathbf{x_1 \leq 4}$; $\mathbf{x_2 \geq 2}$ **and** $\mathbf{x_1, x_2 \geq 0}$

[6 + 6]