REG.NO.:

VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2024-2025

SLOT: E2

Programme Name & Branch	**: B.Tech. - BBS - Computer Science and Engineering and Business Systems**
Course Code and Course Name	**: CBS1008 - Operations Research**
Faculty Name(s)	**: Dr. M. Mubashir Unnissa**
Class Number(s)	**: VL2024250105125**
Date of Examination	**: 17.10.2024**
Exam Duration	**: 90 minutes**

Maximum Marks: 50

General instruction(s): Graph sheet can be provided

Answer All Questions

- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- CO2 - Solve allocation problems using various OR methods.
- CO3 - Analyze various OR models like Inventory, Replacement, Queueing, Decision etc and apply them for optimization.
- CO4 - Understand the concepts of integer linear programming

Q. No	Question	M	CO	BL
1.	Consider a transportation problem where the initial allocation is determined using the North-West Corner Method. The first iteration for the optimality test is conducted using MODI (Modified Distribution) Method, resulting in the following table:	10	2	3

	D_1	D_2	D_3	D_4	Supply	u_i
S_1	6 (70)	1 [1]	8 [12]	3 [3]	70	$u_1 = -5$
S_2	11 (15)	5 (35)	2 (5)	8 [3]	55	$u_2 = 0$
S_3	10 [-3]	12 [5]	4 (45)	7 (45)	90	$u_3 = 2$
Demand	85	35	50	45		
v_j	$v_1 = 11$	$v_2 = 5$	$v_3 = 2$	$v_4 = 5$		

In the table,

- Allocation are indicated in parenthesis "( )"
- Opportunity costs d_{ij} are shown in square brackets "[ ]"
- The value u_i and v_j are calculated using the formula $d_{ij} = c_{ij} - (u_i + v_j)$

Using appropriate loops for the transportation problem obtain the final optimal basic feasible solution of the above problem.

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2.	Use branch and bound algorithm to solve the problem : $Max\ Z = 2x_1 + 3x_2$ Subject to $6x_1 + 5x_2 \leq 25$ $x_1 + 3x_2 \leq 10$ $x_1, x_2 \geq 0$ and are integers. Use x_2 as the branching variable.	10	3	3
3.	The non-integer optimal solution of the maximization LPP is given in the following table. Find the optimum solution when x_1, x_2 are integers.	10	4	3
4.	An office equipment manufacturer produces two kinds of products, chairs and lamps. Production of either a chair or a lamp requires one hour of production capacity in the plant. The plant has maximum production capacity of 10 hours per week. Because of the limited sales capacity, the maximum number of chairs and lamps that can be sold are 6 and 8 per week respectively. The gross margin from the sale of a chair is Rs. 80 and Rs. 40 for that of a lamp. The plant manager has set the following goals arranged in order of importance: **Goal 1:** He wants to avoid any underutilization of production capacity. **Goal 2:** He wants to sell as many chairs and lamps as possible. Since the gross margin from the sale of a chair is set at twice the amount of profit from a lamp, he has twice as much desire to achieve the sales goal for chairs as for lamps. **Goal 3:** He wants to minimize overtime operation of the plant as much as possible. Formulate the problem as a GP problem so that the plant manager makes a decision that will achieve his goals as closely as possible.	10	4	3
5.	Find the possible solution to achieve the goals by graphical method. $Minimize\ Z = P_1 d_1^- + P_2 d_4^+ + 5P_3 d_2^- + 3P_3 d_3^- + P_6 d_1^+$ Subject to : $x_1 + x_2 + d_1^- - d_1^+ = 80$ $x_1 + d_2^- = 70$ $x_2 + d_3^- = 45$ $x_1 + x_2 + d_4^- - d_4^+ = 90$ $x_j, d_i^-, d_i^+ \geq 0\ for\ i = 1,2,3,4; j = 1,2$	10	3	3

	C	7	6	0	0	
CBV	BV	X_1	X_2	S_1	S_2	θ
6	X_2	0	1	3/4	- 1/4	3/2
7	X_1	1	0	- 5/8	3/8	15/4
	Z	7	6	1/8	9/8	
	Z-C	0	0	1/8	9/8	

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