Third Semester M.Sc. Degree Examination, November 2022

SDE

Mathematics

MM 233 : OPERATIONS RESEARCH

(2017 Admission Onwards)

Time : 3 Hours

Max. Marks : 75

Answer **one** question from each unit.

UNIT – I

1. (a) Reddy Mikks company produces both interior and exterior paints from two raw materials, M_1 and M_2. The following table provides the basic data of the problem.

	Exterior paint	Interior paint	Max. dialy availability
Raw material, M_1	6	4	24
Raw material, M_2	1	2	6
Profit per ton ($1000)	5	4	

A market survey indicates that the daily demand for interior paint cannot exceed that of exterior paint by more than 1 ton. Also, the maximum daily demand of interior paint is 2 tons. Form an LP model for this problem. **5**

(b) Determine the optimum product mix of interior and exterior paint that maximizes the total daily profit using graphical method. **10**

OR

Maximize $z = 4x_1 + x_2$

Subject to, $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 4$

$x_1, x_2 \geq 0$

10

UNIT – II

3. (a) Explain Northwest-Corner method. **5**

   (b) Solve the following transportation problem using Northwest-Corner method. **10**

			Mill			
		1	2	3	4	Supply
1		10	2	20	11	15
		x_{11}	x_{12}	x_{13}	x_{14}	
Silo 2		12	7	9	20	25
		x_{21}	x_{22}	x_{23}	x_{24}	
3		4	14	16	18	10
		x_{31}	x_{32}	x_{33}	x_{34}	

OR

4. (a) What do you mean by a standard assignment problem? **5**

   (b) Joe Klyne's three children – John, Karen and Terri – want to earn some money to take care of personal expenses. Mr. Klyne has chosen three chores for his children. He asked them to submit bids for what they feel as fair pay. The following table summarizes the bids received. How should Mr. Klyne assign the chores? Solve using Hungarian method. **10**

	Mow the loan	Paint the garage	Wash the cars
John	$15	$ 10	$9
Karen	$ 9	$15	$10
Terri	$10	$12	$8

(c) v_4 can start after 3 days of work of v_3 and 6 days of work of v_2.

(d) v_5 can start after v_1 is finished and v_2 is half over.

(e) v_3, v_4 and v_5 can take respectively 6, 8 and 12 days to finish.

Find the critical path and minimum time of completion.   **15**

OR

6.   What are CPM and PERT? Write are the differences and similarities between CPM and PERT?   **15**

UNIT – IV

7.   (a)   Obtain Kuhn - Turker first order and second order conditions of a nonlinear programming problem.   **10**

(b)   Examine whether both the conditions are necessary and sufficient.   **5**

OR

8.   Find the minimum of $f(X) = (x_1 - 2)^2 - 2(x_2 - 1)^2$ subject to $g_1(X) = x_1 + 4x_2 \leq 3$, $g_2(X) = -x_1 + x_2 \leq 0, x_1, x_2 \geq 0$, using K-T conditions.   **15**

UNIT – V

9.   (a)   Explain backward recursion.   **6**

(b)   Using dynamic programming method solve the following problem.

Minimize $u_1^2 + u_2^2 + u_3^2$

Subject to $u_1 + u_2 + u_3 \geq 10$;
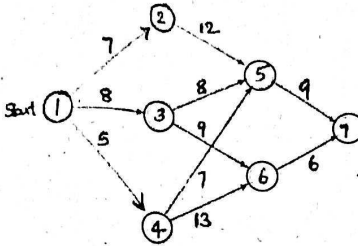
$u_1, u_2, u_3 \geq 0$.   **9**

OR

10. (a) Explain computational economy in dynamic programming. 5

(b) Find the shortest path from node 1 to node 7 in the following network. 10

(5 × 15 = 75 Marks)

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