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S-1139/231165

M. A./M. Sc. (First Semester)

EXAMINATION, 2024-25

MATHEMATICS

Paper Fifth

(Operations Research–I)

(MATH–005)

Time : Two hours] **[Maximum Marks : 60**

Note : *Attempt any **four** questions. All questions carry equal marks.*

1.(a) Describe the application of OR in managerial decision-making.

(b) Explain opportunities and shortcomings of OR.

2.(a) Describe the nature and features of OR.

(b) Explain variation in the cost c_j of sensitivity analysis.

(P.T.O.)

3. Solve the following problem using the Dual Simplex Method.

$$Min.\, z = 6x_1 + 3x_2 + 4x_3$$

Subject to $x_1 + 6x_2 + x_3 = 10$

$$2x_1 + 3x_2 + x_3 = 15$$

and $x_1, x_2, x_3 \geq 0$

4. Solve the following L.P.P. by using the revised simplex method :

$$Min.\, z = 2x_1 + x_2$$

Subject to $3x_1 + x_2 \leq 3$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \leq 3$$

and $x_1, x_2 \geq 0.$

5. (a) Discuss the ''Hungarian'' method of solving the assignment problem, and also describe a method of drawing the minimum number of lines.

(b) A departmental head has four subordinates and tasks to be performed. The subordinates differ in efficiency and tasks differ in their intrinsic difficulty. His estimate of the time each man

would take to perform each task is given in the matrix below :

Tasks	Men			
	E	*F*	*G*	*H*
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

How should the tasks be allocated, one to a man, to minimize the total man-hours ?

6. What is an unbalanced transportation problem ? A steel company has three open hearth furnaces and five rolling mills. Transportation costs for shipping steel from furnaces to rolling mills are shown in the following table :

	Mills					
	M_1	M_2	M_3	M_4	M_5	Capacities
F_1	4	2	3	2	6	8
Furnaces F_2	5	4	5	2	1	12
F_3	6	5	4	7	3	14
Requirement	4	4	6	8	8	

What is the optimal shipping schedule ?

7.(a) Two players, A and B, without showing each other, put on a table a coin with a head or tail up. A wins Rs. 8 when both the coins show head and Re 1 when both the tails. B wins Rs. 3 when the coins do not match. Given the choice of being a matching player (A) or non-matching player (B), which one would you choose and what would be your strategy ?

(b) Solve the following (2 × 4) game :

$$\begin{array}{c} \\ \text{player } A \end{array} \begin{array}{c} \text{player } B \\ \begin{array}{cccc} I & II & III & IV \end{array} \\ \begin{array}{c} I \\ II \end{array} \begin{bmatrix} 2 & 2 & 3 & -1 \\ 4 & 3 & 2 & 6 \end{bmatrix} \end{array}$$

8. Find the optimum integer solution to the following I.P.P. by Gomory's method.

$$Max.\ z = x_1 + 2x_2$$

$$Subject\ to\ 2x_2 \leq 7, x_1 + x_2 \leq 7, 2x_1 \leq 11,$$

$$x_1, x_2 \geq 0,\ and\ x_1, x_2\ are\ integers.$$