M.Sc. - II (Mathematics) New CBCS Pattern Semester-III

PSCMTH15A - Operations Research-I (Optional)

P. Pages : 3 **GUG/W/23/13763**

Time : Three Hours * 7 3 4 9 * Max. Marks : 100

Notes : 1. Solve all the **five** questions.
2. Each question carry equal marks.

UNIT – I

1. a) Prove that any convex combination of k different optimum solutions to an LPP is again an optimum solution to the problem. **10**

b) Use simplex method to solve the LPP. **10**
Maximize : $Z = 2x_1 + 3x_2$ subject to constraints
$x_1 + x_2 \le 4, \; -x_1 + x_2 \le 1 \; \& \; x_1 + 2x_2 \le 5, \; x_1 \ge 0, \; x_2 \ge 0$

OR

c) Formulate the dual of the LPP : $Z = 5x_1 + 3x_2$ **10**
$3x_1 + 5x_2 \le 15, \; 5x_1 + 2x_2 \le 10, \; x_1 \ge 0, \; x_2 \ge 0$

d) Write the dual & solve the LPP **10**
$Z = 5x_1 + 2x_2$ subject to constraints
$6x_1 + x_2 \ge 6, \; 4x_1 + 3x_2 \ge 12, \; x_1 + 2x_2 \ge 4, \; x_1, \; x_2 \ge 0$

UNIT – II

2. a) Explain the North-West corner method. **10**

b) Find the initial basic feasible solution to the LPP by VAM, the given cost matrix: **10**

$$\begin{array}{cc} & \begin{array}{cccc} D_1 & D_2 & D_3 & D_4 \end{array} \text{ Supply} \\ \begin{array}{c} S_1 \\ S_2 \\ S_3 \end{array} & \begin{bmatrix} 20 & 25 & 28 & 31 \\ 32 & 28 & 32 & 41 \\ 18 & 35 & 24 & 32 \end{bmatrix} \begin{array}{c} 200 \\ 180 \\ 110 \end{array} \\ \text{Demand} & \begin{array}{cccc} 150 & 40 & 180 & 170 \end{array} \end{array}$$

OR

c) Explain the degeneracy in transportation problem. **10**

d) Solve the transportation problems: **10**

From	To			Available
	A	B	C	
I	50	30	220	1
II	90	45	170	3
III	250	200	50	4
Requirement	4	2	2	

UNIT – III

3. a) Solve Maximize $Z = y_1, y_2, \ldots.. y_n$ subject to the constraints $y_1 + y_2 + \ldots.. + y_n = c$ & $y_j \geq 0$, j = 1, 2, ……, n. **10**

b) Use dynamic programming to solve the problem **10**
Minimize : $Z = y_1^2 + y_2^2 + y_3^2$ subject to constraints :
$y_1 + y_2 + y_3 \geq 15$ & $y_1, y_2, y_3 \geq 0$.

OR

c) Use dynamic programming to solve the LPP: **10**
Maximize $Z = 3x_1 + 5x_2$ subject to the constraints :
$x_1 \leq 4,\ x_2 \leq 6,\ 3x_1 + 2x_2 \leq 18$ & $x_1, x_2 \geq 0$.

d) Explain how to solve the L.P.P. by dynamic programming. **10**

UNIT – IV

4. a) Solve the game whose payoff matrix is **10**

$$\text{Player B}$$
$$\begin{array}{cc} & \begin{array}{ccc} B_1 & B_2 & B_3 \end{array} \\ \text{Player A} \begin{array}{c} A_1 \\ A_2 \\ A_3 \end{array} & \begin{bmatrix} 1 & 3 & 1 \\ 0 & -4 & -3 \\ 1 & 5 & -1 \end{bmatrix} \end{array}$$

b) For what value of λ the game with following payoff matrix is strictly determinable? **10**

$$\text{Player B}$$
$$\begin{array}{cc} & \begin{array}{ccc} B_1 & B_2 & B_3 \end{array} \\ \text{Player A} \begin{array}{c} A_1 \\ A_2 \\ A_3 \end{array} & \begin{bmatrix} \lambda & 6 & 2 \\ -1 & \lambda & -7 \\ -2 & 4 & \lambda \end{bmatrix} \end{array}$$

OR

c) Solve the game **10**

$$\begin{array}{cc} & \text{Player B} \\ \text{Player A} & \begin{bmatrix} 1 & -1 & 3 \\ 3 & 5 & -3 \\ 6 & 2 & -2 \end{bmatrix} \end{array}$$

by linear programming technique.

d) Use the oddment method to solve the 3 x 3 game : **10**

$$\begin{bmatrix} 0 & 1 & 2 \\ 2 & 0 & 1 \\ 1 & 2 & 0 \end{bmatrix}$$

5. a) Show that the system of equations **5**

$2x_1 + x_2 - x_3 = 2,\ 3x_1 + 2x_2 + x_3 = 3$

Has degenerate solution.

b) Explain the mathematical formulation of the assignment problem. **5**

c) Define the dynamic programming algorithm. **5**

d) Explain shortly the maximin-minimax principle. **5**

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