M.Sc. (Mathematics) (NEP Pattern) Semester-II

Major Elective DSE-4 - Operations Research

P. Pages : 2 **GUG/W/24/15396**

Time : Three Hours Max. Marks : 80

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1. a) Write the algorithm of simplex method. **8**

b) Use simplex method to solve the following LPP: **8**

Max $Z = 3x_1 + 2x_2$

Subject to the constraints:

$x_1 + x_2 \le 4, x_1 - x_2 \le 2,\ x_1, x_2 \ge 0$.

OR

c) Use simplex Method to solve the following: **8**

Max $Z = 4x_1 + 10x_2$

Subject to the constraints

$2x_1 + x_2 \le 50,\ 2x_1 + 5x_2 \le 100,\ 2x_1 + 3x_2 \le 90, x_1, x_2 \ge 0$.

d) Use dual simplex method to Min $Z = x_1 + x_2$ **8**

Subject to the constraints: $2x_1 + x_2 \ge 4,\ x_1 + 7x_2 \ge 7,\ x_1, x_2 \ge 0$.

2. a) Write the algorithm of North-West Corner rule. **8**

b) Determine an initial basic feasible solution to following T.P. using row minima method. **8**

		To			
		A	B	C	Availability
From	I	50	30	220	1
	II	90	45	170	3
	III	250	200	50	4
	Requirement	4	2	2	8

OR

c) Write the algorithm of Row Minima Method. **8**

d) Determine an initial basic feasible solution to the following T.P., using north-west corner rule. **8**

	D	E	F	G	Availablity
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirement	200	225	275	250	

3. a) Write dynamic programming Algorithm. **8**

b) Divide a quantity b into n parts so as to maximize their product. Let $f_n(b)$ denote the maximum value. Show that $f_1(b) = b$ and $f_n(b) = \max_{0 \le 2 \le b} \{Zf_{n-1}(b - Z)\}$. **8**

OR

c) Write characteristics of dynamic programming problem. **8**

d) Use dynamic programming to show that $p_1 \log p_1 + p_2 \log p_2 + ... + p_n \log p_n$. **8**
Subject to the constraints: $p_1 + p_2 + ... + p_n = 1$ and $p_i \ge 0 (i = 1\,2.....n)$ is minimum when $p_1 = p_2 = ... = p_n = \frac{1}{n}$.

4. a) Consider a two-person coin tossing game. Each player tosses an unbiased coin simultaneously. Player B pays Rs. 7 to A if {H, H} occurs and Rs. 4 if {T, T}. Occurs; otherwise player A pay Rs. 3 to B obtain the payoff matrix to the player A. **8**

b) Determine which of the two person zero sum games are strictly determinable and fair. Give optimum strategies for each player in the case of strictly determinable games. **8**

$$\begin{bmatrix} 5 & 0 \\ 0 & 2 \end{bmatrix}$$

OR

c) Let (a_{ij}) be the payoff matrix for a two-person zero-sum game. If $\underline{v}$ denote the maximin value and $\bar{v}$ the minimax value of the game, then $\bar{v} \ge v$. That is **8**

$$\min_j \left[\max_i (a_{ij}) \right] \ge \max_i \left[\min_j (a_{ij}) \right].$$

d) Solve the following 2*2 game graphically. **8**

$$\begin{array}{cc} & \text{Player B} \\ \text{Player A} & \begin{bmatrix} 2 & 1 & 0 & -2 \\ 1 & 0 & 3 & 2 \end{bmatrix}. \end{array}$$

a) Show that G is strictly determinable whatever μ may be

b) Determine the value of G.

5. a) Prove that the dual of the dual is the primal. **4**

b) Write the algorithm of Matrix Minima Method. **4**

c) Define the DYNAMIC PROGRAMMING. **4**

d) Find the minimax and maximin for the following matrix. **4**

$$\begin{bmatrix} 1 & 3 & 6 \\ 2 & 1 & 3 \\ 6 & 2 & 1 \end{bmatrix}.$$

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