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

Major Elective DSE-1 - Operations Research

P. Pages : 3 | GUG/S/25/15396

Time : Three Hours | Max. Marks : 80

Notes : 1. Solve **all five** questions.
2. All questions carry equal marks.

UNIT-I

1. a) Explain the Two-Phase 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) Explain the Big-M Method. **8**

d) Write the simplex method algorithm. **8**

UNIT-II

2. a) Write the algorithm of Transportation Problem (MODI Method). **8**

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

From \ To	A	B	C	Availability
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	Availability
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirement	200	225	275	250	

UNIT-III

3. a) Use dynamic programming to find the value of **8**

Maximum $Z = y_1 \cdot y_2 \cdot y_3$ subject to the constraints

$y_1 + y_2 + y_3 + 5,\ y_1, y_2, y_3 \geq 0$

b) Divide a quantity b into n parts so as to maximize their product. Let $f_n(b)$ denote the maximum value. Show that **8**

$$f_1(b) = b$$

and

$$f_n(b) = \max_{0 \leq 2 \leq b} \{Zf_{n-1}(b - Z)\}$$

OR

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

d) Use dynamic programming to show that **8**

$p_1 \log p_1 + p_2 \log p_2 + ... + p_n \log p_n$

Subject to the constraints:

$p_1 + p_2 + ... + p_n = 1$ and $p_i \geq 0 (i = 1, 2, ..., n)$

is minimum when $p_1 = p_2 = ... = p_n = \dfrac{1}{n}$

UNIT-IV

4. a) Consider a two-person coin tossing game. Each player tosses an unbiased con 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. **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 $\overline{v}$ the minimax value of the game, then $\overline{v} \geq v$. **8**

That is

$$\min_j [\max_i (a_{ij})] \geq \max_i [\min_j (a_{ij})]$$

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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