ED-768

M.A./M.Sc. 4th Semester
Examination, May-June 2021

MATHEMATICS

Optional - A

Paper - IV

Operations Research

Time : Three Hours] [*Maximum Marks* : 80

Note : Answer any **two** parts from each question. All questions carry equal marks.

Unit-I

1. (*a*) Use dynamic programming to solve

Minimize $z = p_1 \log p_1 + p_2 \log p_2 \; ..... + p_n \log p_n$

Subject to the constraints :

$p_1 + p_2 + p_3 + ... + p_n = 1$ and $p_j \geq 0 \; (j=1, 2, ... n)$

(*b*) What is principle of optimality ? Write the recursive equation approach to solve dynamic programming problem.

(*c*) Use dynamic programming to solve the following L.P.P.

Maximize $z = 3x_1 + 5x_2$

Subject to the constraints :

$x_1 \leq 4,$

$x_2 \leq 6,$

$3x_1 + 2x_2 \leq 18$ and

$x_1, \; x_2 \geq 0$

Unit-II

2. (*a*) Consider a 'modified' form of 'matching biased wins' game problem. The matching player is paid ₹ 8 if the two coins turns both heads and ₹ 1 if the coins turns both tails. The non-matching player is paid ₹ 3 when two coins do not match. Given the choice of being the matching or non-matching player, which one would you choose and what would be your strategy ?

(*b*) Solve the following problem graphically :

$$\begin{array}{cc} & \text{Player } B \\ \text{Player } A & \begin{bmatrix} 3 & -3 & 4 \\ -1 & 1 & -3 \end{bmatrix} \end{array}$$

(*c*) For the following playoff matrix, find the value of the game and the strategies of player A and B by using Linear Programming :

$$\text{Player } A \begin{matrix} 1 \\ 2 \end{matrix} \overset{\text{Player } B}{\begin{bmatrix} 3 & -1 & 4 \\ 6 & 7 & -2 \end{bmatrix}}$$

Unit-III

3. (*a*) Solve the following integer P.P. :

Maximize $z = 2x_1 + 3x_2$

Subject to the constraints :

$-3x_1 + 7x_2 \leq 14,$

$7x_1 - 3x_2 \leq 14,$

$x_1,\ x_2 \geq 0$

and are integers

(*b*) Use branch and bound method to solve the following L.P.P. :

Minimize $z = 4x_1 + 3x_2$

Subject to the constraints :

$5x_1 + 3x_2 \geq 30,$

$x_1 \leq 4,$

$x_2 \leq 6,$

$x_1,\ x_2 \geq 0$

and are integers

(*c*) Maximize $z = x_1 + x_2$

Subject to the constraints :

$3x_1 + 2x_2 \leq 5,$

$x_2 \leq 2,$

$x_1,\ x_2 \geq 0$ and

x_1 is an integer.

Unit-IV

4. (*a*) Write the applications of operations reserach to industrial problems.

(*b*) Explain petroleum and refinery operations.

(*c*) Explain blending problems.

Unit-V

5. (*a*) Obtain the necessary and sufficient conditions for the optimum solutions of the following NLPP :

Minimize $z = f(x_1, x_2)$

$= 3e^{2x_1+1} + 2e^{x_2+5}$

Subject to the constraints :

$x_1 + x_2 = 7$ and

$x_1, x_2 \geq 0$

(*b*) Use Wolfe's method to solve

Max. $z = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2$

Subject to the constraints :

$x_1 + 2x_2 \leq 2$ and

$x_1, x_2 \geq 0$

(*c*) Solve the following quadratic programming problems by using Beale's method :

Maximize $z = 2x_1 + 3x_2 - x_1^2$

Subject to the constraints :

$x_1 + 2x_2 \leq 4$ and

$x_1, x_2 \geq 0$