**Roll No. ..................................**

# DD–768

## M. A./M. Sc. (Fourth Semester) EXAMINATION, 2020

MATHEMATICS

**(Optional—A)**

Paper Fourth

**(Operations Research)**

*Time : Three Hours*

*Maximum Marks : 80*

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

**Unit—I**

1. (a) Use Dynamic Programming to solve the following problem :

Minimize :

$$u_1^2 + u_2^2 + u_3^2$$

subject to :

$$u_1 + u_2 + u_3 = 10$$

and $$u_1, u_2, u_3 \geq 0.$$

(b) Write the applications of Dynamic Programming.

(c) Solve the following LPP by using dynamic programming :

Maximize :

$$z = 3x_1 + 4x_2$$

subject to :

$$2x_1 + x_2 \leq 40$$

$$2x_1 + 5x_2 \leq 180$$

$$x_1, x_2 \geq 0.$$

**Unit—II**

2\. (a) Calculate the value of game and probability of playing each strategy in the following game theory matrix :

A

| | | | |
|---|---|---|---|
| B | 30 | 40 | 60 |
| | 35 | 42 | 11 |

(b) Solve the following 2 × 4 game by graphical method :

Player B

| | | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Player A | 1 | 3 | 3 | 4 | 0 |
| | 2 | 5 | 4 | 4 | 7 |

(c) Solve the following 3 × 3 game by linear programming method :

Player B

| | | $B_1$ | $B_2$ | $B_3$ |
|---|---|---|---|---|
| Player A | $A_1$ | 1 | –1 | 3 |
| | $A_2$ | 3 | 5 | –3 |
| | $A_3$ | 6 | 2 | –2 |

## Unit—III

3. (a) Solve the following integer programming problem using branch and bound method :

Min. :

$$z = 3x_1 + 2.5x_2$$

subject to :

$$x_1 + 2x_2 \geq 20$$

$$3x_1 + 2x_2 \geq 50$$

and $x_1, x_2 \geq 0$ and integer.

(b) Write the limitations of integer programming.

(c) Solve the mixed integer programming problem :

minimize :

$$z = 2x_1 + 2x_2 + 4x_3$$

subject to :

$$2x_1 + 3x_2 + 5x_3 \geq 2$$

$$3x_1 + x_2 + 7x_3 \leq 3$$

$$x_1 + 4x_2 + 6x_3 \leq 5$$

and $x_1, x_2, x_3 \geq 0$.

## Unit—IV

4. (a) Write a short note on economic interpretation of dual linear programming.

(b) Explain about input-output analysis.

(c) Write a short note on indecomposable and decomposable economics.

**Unit—V**

5. (a) Determine $x_1$ and $x_2$ so as to :

Maximize :

$$z = 12x_1 + 21x_2 + 2x_1x_2 - 2x_1^2 - 2x_2^2$$

by using Kuhn-Tucker condition, subject to :

$$x_2 \leq 8$$

$$x_1 + x_2 \leq 10$$

and $x_1, x_2 \geq 0$ .

(b) Solve the following quadratic programming problem using Wolf's method :

Maximize :

$$z = 6x_1 + 3x_2 - 2x_1^2 - 3x_2^2 - 4x_1x_2$$

Subject to :

$$x_1 + x_2 \leq 1$$

$$2x_1 + 3x_2 \leq 4$$

and $x_1, x_2 \geq 0$.

(c) Solve the following non-linear programming problem using separable programming :

Maximize :

$$z = 2x_1^3 + \frac{5}{2}x_2$$

Subject to :

$$2x_1^2 + 3x_2 \leq 16$$

and $x_1, x_2 \geq 0$.