F-4/429/20 **ROLL NO. .....**

IV Semester Examination, May-June, 2020
M.Sc.
Mathematics
Paper IV
(Operation Research-II)

Time : 3 Hours M.M. 80

Note: All Questions are Compulsory. Question Paper comprises of 3 sections. ***Section A*** *is objective type/Multiple Choice questions with no internal Choice.* ***Sections B*** *is short answer type with internal Choice.* ***Section C*** *is long answer type with internal Choice.*

SECTION 'A'
(Objective Type/Multiple Choice questions) **1x10=10**

Choose the Correct Answer-

1. Bellman's Principle of optimality is used to solve
a) The transportation problem
b) The Dynamic programming problem
c) An Assignment problem
d) None of Above

2. The stages involved in solving an 'n' variable dynamic programming problem are –
a) n+1 b. n
c. n -1 d. None of the Above

3. A suddle point exists if
a) Maxmin value = Minimax value
b) Maximin value = Maximax value
c) Minimax value = Minimin value
d) None of the above

4. Dominance principle in game theory
a) Reduces the size of the pay-off matrix
b) Reduces the game value
c) Both (a) and (b)
d) None of the Above

5. To solve an All integers programming problem, the method used is
a) Branch and bound method
b) Cutting plane method
c) Both (a) and (b)
d) None is above

6. In mixed integers programming problem decision variable are required to be
a) All integer
b) All fractional
c) Some integer, and some fractional
d) None of these

7. An Non linear programming problem in which the objective function is quadratic and constraints are linear is called-
a) A quadratic programming problem
b) A separable programming problem
c) Both (a) and (b)
d) None of these

8. Quadratic programming techniques provide solution to an NLPP-
a) Exact
b) Approximate
c) Some times exact and some times approximate
d) None of these

9. Input –output economic Analysis was developed by
a) Wassily Leontief b) Beal's
c) King fisher d) None of these

10. Which of the following has maximum hydrogen/Carbon Ration (by weight)?

a) Naphtha b) Gasoline

c) Diesel d) Fuel Oil

SECTION 'B'

(Short Answer Type Questions) **4x5=20**

Unit-I

1. Solve the following problem using Dynamic Programming.

Min Z= $x_1^2 + x_2^2 + x_3^2$

Subject to

$x_1+x_2+x_3 \geq 15$

and $x_1+x_2+x_3 \geq 0$

Or

Use the Principle of Optimality to find the maximum value of

$b_1x_1+b_2x_2+b_3x_3+$---------- $+ b_nx_n$

When

$x_1+x_2+x_3$ ------ $+x_n = c$

$x_i \geq 0$, i = 1,2,3 ----- n

Unit-II

2. Define the following

(i) Saddle Point

(ii) Solution of a game

Or

Let $\{V_ij\}$ be the pay- off matrix for a two person zero sum game.

If $\underline{v}$ denotes the maxmin value and $\overline{V}$ the minimax value of the game then prove. $\underline{v} \leq \overline{V}$

Unit-III

3. Find the optimum all integers solution to the following IPP

Max $z = x_1 + 2x_2$

Subject to

$2x_2 \leq 7$

$x_1 = x_2 \leq 7$

$2x_1 \leq 11$,

$x_1 x_2 \geq 0$ and integers

Or

Solve the following Mixed integers programming problem.

Max $z = x_1 + 2x_2$

Subject to

$3x_1 + 2x_2 \leq 5$

$x_2 \leq 2$

$x_1 x_2 \geq 0$ and x_1 is an integers

Unit-IV

4. Write short notes on blending problems.

Or

What is Input-Output Analysis?

Unit-V

5. Obtain the set of necessary Conditions for the Nonlinear programming problem.

Min $Z_1 = 3\ x_1^2 + x_2^2 + 2\ x_1x_2 + 6x_1 + 2x_2$

Subject to the Constraints.

$2x_1 - x_2 = 4$, $x_1, x_2 \geq 0$

Or

Find the necessary conditions for maximum or minimum of the function.

$Z_1 = f(X) = f(X_1\ X_2$ ---- $X_n)$

Subject to

$g_1 (x_1 x_2 \text{ ------ } x_n) = b_1$

$g_2 (x_1 x_2, x_3 \text{ ------ } x_n) = b_2$

$x_1 x_2 \text{ - ------ } x_n \geq 0$, b_1, b_2 are constants

SECTION 'C'

(Long Answer Type Questions) **10x5=50**

Unit-I

1. Use dynamic programming to solve

Max Z = $500x_1 + 800x_2$

Subject to

$5x_1+6x_2 \leq 60$

$x_1 + 2x_2 \leq 16$

$x_1 \leq 8$

$x_2 \leq 6$

$x_1 x_2 \geq 0$

Or

Solve by using Dynamic Programming

Max Z = $x_1 + 9x_2$

Subject to

$2x_1+x_2 \leq 25$

$x_2 \leq 11$

$x_1 x_2 \geq 0$

Unit-II

2. Solve the game Graphically whose pay- off matrix is

		B I	B II
A	*I*	2	7
	II	3	5
	III	11	2

Or

For any zero sum two person game where the optimal strategies are not pure strategies and for which A pay off matrix is

		B $I(y_1)$	B $II(y_2)$
A	$I(x_1)$	a_{11}	a_{12}
	$II(x_2)$	a_{21}	a_{22}

Prove that the optimal strategies (x_1,x_2) and (y_1, y_2) given by

$$\frac{x_1}{x_2} = \frac{a_{22} - a_{21}}{a_{11} - a_{12}}, \frac{y_1}{y_2} = \frac{a_{22} - a_{12}}{a_{11} - a_{21}}$$

and the value of the game to A is given by

$$v = \frac{a_{11}a_{22} - a_{12} - a_{21}}{(a_{11} + a_{22}) - (a_{12} + a_{21})}$$

Unit-III

3. Find the optimum integers solution to the following integers Programming problem.

Max Z= $2x_1+20x_2-10x_3$

Subject to the Constraints

$2x_1+ 20x_2\ 4x_3 \leq 15$

$6x_1 + 20x_2 + 4x_3 = 20$

And $x_1 x_2 x_3 \geq 0$ and integer

Or

Solve the following MIPP.

Max Z= $4x_1+6x_2+2x_3$

Subject to

$4x_1-4x_2 \leq 5$

$-x_1 + 6x_2 \leq 5$

$-x_1+x_2 + x_3 \leq 5$

$x_1\ x_2\ x_3 \geq 0$ and x_2 is an integer.

Unit-IV

4. Explain in brief Petrolium refinery operations.

Or

Explain how to Determine an optimal product mix?

Unit-V

5. Apply Wolfe's method to solve the following quadratic programming problem.

Max Z $= 2x_1 + x_2 - x_1^2$

Subject to

$2x_1 + 3x_2 \leq 6$

$2x_1 + x_2 \leq 4,$

and $x_1\ x_2 \geq 0$

Or

Solve the following NLPP using the method of Lagrangian multipliers method.

Min Z $= x_1^2 + x_2^2 + x_3^2$

Subject to

$4x_1 + x_2^2 + 2x_3 = 14,$

$x_1 , x_2 , x_3 \geq 0,$

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