ROLL NO.....

MATH. 404/21

IV SEMESTER EXAMINATION, 2021

M. Sc. (MATHEMATICS)

PAPER-IV

OPERATIONS RESEARCH II

TIME: 3 HOURS **MAX.- 80**
MIN.- 16

Note: **The question paper consists of three sections A, B & C. All questions are compulsory.**
Section A- Attempt all multiple choice questions.
Section B- Attempt one question from each unit.
Section C- Attempt one question from each unit.

SECTION 'A'

$2 \times 8 = 16$

MCQ (Multiple choice questions)

1. Dynamic programming approach -

(a) help in reducing the computational effort in sequential decision making.

(b) is based on the principles of optimality due to Bellman.

(c) divided the given problem into a sequence of smaller self-problems called the stages.

(d) all of the above

2. Dynamic programming problem-

(a) can be solved only by recursive equation approach.

(b) cannot be solved using recursive equation approach.

(c) does not suggest an optimum solution.

(d) under certainty involves those problems whose conditions at each stage are known with certainty.

MATH. 404/21

[2]

3. The game in said to be fair, if -

(a) upper value is more than lower value of the game.

(b) upper and lower values of the game are not equal.

(c) upper and lower value of the game are same and zero.

(d) none of the above.

4. The pay-off value for which each player in a game always selects the same strategy is called the -

(a) equilibrium point (b) saddle point

(c) both (a) and (b) (d) None of the above

5. In cutting plane algorithm, each cut involves the introduction of -

(a) an equality constraint

(b) less than or equal to constraint

(c) greater than or equal to constraint

(d) an artificial variable

6. The 0-1 integer programming problem -

(a) requires the decision variables to have values either 0 or 1.

(b) requires that the decision variables have coefficients between zero and one.

(c) requires that the constraints all have coefficients between zero and one.

(d) all of the above

[7]

OR

Use Wolfe's method in solving the following quadratic programming problems –

$$Maximize\ z = 4x_1 + 6x_2 - 2{x_1}^2 - 2x_1x_2 - 2x_2^2$$

$$subject\ to\ the\ constraints:$$

$$x_1 + 2x_2 \leq 2$$

$$x_1, x_2 \geq 0$$

--------xxx----------

UNIT-III

Q.3. Solve the following I.P.P. :

$$Maximize \;\; z = 2x_1 + 3x_2$$

$$subject\ to\ the\ constraints:$$

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

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

$$x_1, x_2 \geq 0\ and\ are\ integers$$

OR

Solve the following mixed integer programming problem :

$$Maximize \;\; z = x_1 + x_2$$

$$subject\ to\ the\ constraints:$$

$$3x_1 + 2x_2 \leq 5$$

$$x_2 \leq 2,$$

$$x_1, x_2 \geq 0\ and\ x_1\ is\ an\ integer$$

UNIT-IV

Q.4. Solve the following non-linear programming problem, using the method of Lagrangian multiplier

$$Optimize \;\; z = \; 4x_1 + 9x_2 - {x_1}^2 - {x_2}^2$$

$$subject\ to\ the\ constraints:$$

$$4x_1 + 3x_2 = 15, \;\; 3x_1 + 5x_2 = 14$$

$$x_1 \geq 0, \qquad x_2 \geq 0$$

7. The general NLPP with inequality constraints-

(a) are usually solved by simplex method

(b) can be solved by using Kuhn-Tucker conditions

(c) can be solved only by Lagrange's method.

(d) Can be solved only if the constraints are of "≤" type.

8. Quadratic programming is concerned with the NLPP of optimizing the quadratic objective function subject to -

(a) linear inequality constraints

(b) non- linear inequality constraints

(c) non-linear equality constrains.

(b) no constraints

4 × 6 = 24

SECTION 'B'

Short Answer Type Questions (Word limit 200-250 words.)

UNIT-I

Q.1. State and explain Bellman's principle of optimality.

OR

Describe recursive equation approach to solve dynamic programming problems.

UNIT-II

Q.2. Explain the maximum and minimum principle used in Game Theory.

OR

Explain the term: Pure strategy, saddle point, Payoff matrix.

UNIT-III

Q.3. What is the need for integer programming.

OR

Describe the branch and bound method for the solution of integer programming problem.

UNIT-IV

Q.4. State the Kuhn-Tucker sufficient conditions in non-linear programming.

OR

Describe briefly the Beale's method for solving Quadratic programming problem.

SECTION 'C' $\boxed{4 \times 10 = 40}$

Long Answer questions (Word limit 400-450 words.)

UNIT-I

Q.1. Use dynamic progamming to solve the L.P.P.

$$maximize \;\; z = x_1^2 + 2x_2^2 + 4x_3$$

$$subject\ to\ the\ constraints:$$

$$x_1 + 2x_2 + x_3 \leq 8, \qquad x_2 \leq 2$$

$$and\ x_1 \geq 0, \qquad x_2 \geq 0$$

OR

Use dynamic progarmming to solve the L.P.P.

$$maximize \;\; z = 3x_1 + 7x_2$$

$$subject\ to\ the\ constraints:$$

$$x_1 + 4x_2 \leq 8, \qquad x_2 \leq 2$$

$$and\ x_1 \geq 0, \qquad x_2 \geq 0$$

UNIT-II

Q.2. Use dynamic method in solving the following game :

$$Player\ A$$

$$Palyer\ B \begin{bmatrix} 2 & 2 & 3 & -2 \\ 4 & 3 & 2 & 6 \end{bmatrix}$$

OR

Two companies A and B are competing for the same product, Their different strategies are given in the following payoff matrix:

$$Company\ A$$

$$Company\ B \begin{bmatrix} 2 & -2 & 3 \\ -3 & 5 & -1 \end{bmatrix}$$

use linear programming to determine the best strategies for both the players.