Roll No. ……..

MAT–510

Mathematical Programming

M. Sc. Mathematics (MSCMAT-12)

Second Year, Examination, 2018

Time : 3 Hours **Max. Marks : 80**

Note : This paper is of **eighty (80)** marks containing **three (03)** Sections A, B and C. Attempt the questions contained in these Sections according to the detailed instructions given therein.

Section–A

(Long Answer Type Questions)

Note : Section 'A' contains four (04) long answer type questions of nineteen (19) marks each. Learners are required to answer *two* (02) questions only.

1. Solve the following Linear Programming Problem (L. P. P.) using Revised Simplex method :

   Minimize :

   $$z = -4x + y + 2z$$

   Subject to :

   $$2x - 3y + 2z \leq 12$$

   $$-5x + 2y + 3z \geq 4$$

   $$3x - 2z = -1$$

   $$x, y, z \geq 0$$

2. Solve the following NLPP :

   Maximize :

   $$z = f(x, y) = 3.6x - 0.4x^2 + 1.6y - 0.2y^2$$

   Subject to the constraints :

   $$2x + y \leq 10 \leq 0$$

   and $x, y \geq 0$.

3. Solve the following L. P. P. by dynamic programming technique :

   Max. :

   $$z = 3x + 5y$$

   Subject to :

   $$x \leq 4$$

   $$y \leq 6$$

   $$3x + 2y \leq 18$$

   $$x \geq 0, y \geq 0$$

4. Find the Kuhn-Tucker necessary condition for the optimality of the objective function in a GNLP problem.

Section–B

(Short Answer Type Questions)

Note : Section 'B' contains eight (08) short answer type questions of eight (8) marks each. Learners are required to answer *four* (04) questions only.

1. A hyperplane is a convex set.
2. Solve the following L. P. P. :

   Maximize :

   $$z = 3x + 5y + 4z$$

   Subject to :

   $$2x + 3y \leq 8$$

$$2y + 5z \leq 10$$

$$3x + 2y + 4z \leq 15$$

$$x, y, z \geq 0$$

3. Find the optimum integer solution to the LPP :

   Maximize :

   $$z = 5x + 8y$$

   Subject to :

   $$x + 2y \leq 8$$

   $$4x + y \leq 10$$

   $x, y, z \geq 0$ and are integers.

4. Solve the following non-linear programming problem graphically :

   Maximize :

   $$z = 8x - x^2 + 8y - y^2$$

   Subject to the constraints :

   $$x + y \leq 12$$

   $$x - y \geq 4$$

   and $x, y \geq 0$.

5. Explain Convex separable programming.
6. Use Branch and Bound technique to solve the I. P. P.
7. Explain Beale's method in QPP.
8. Discuss the relationship between linear programming and dynamic programming.

Section–C

(Objective Type Questions)

Note : Section 'C' contains ten (10) objective type questions of one (01) mark each. All the questions of this Section are compulsory.

Write True/False in the following questions :

1. Intersection of two convex sets is also convex.
2. The set of all feasible solutions of a L. P. P. is not a convex set.
3. A L. P. P. have bounded solution if the objective function can be increased arbitrarily.
4. (a) means the integral part of number a.
5. In I. P. P. we construct Gomory constraint.
6. Total number of stages in the process must be finite in multistage decision problem.
7. We use Lagrangian multipliers to solve NLPP.
8. The necessary condition for maximum of the objective function in NLPP with equality constraints also become sufficient condition if it is convex.
9. If a linear programming problem involving a large number of variables and constraints is to be solved by revised Simplex method.
10. The revised Simplex method works with a reduced tableau as it stores only the basic variables, the basic inverse and the contents.