Seat No.:

Enrolment No. **GUJARAT TECHNOLOGICAL UNIVERSITY** ME - SEMESTER- I (OLD course)• EXAMINATION - SUMMER 2015 Subject Code: 714704 Date: 15/05/2015 **Subject Name: Optimization Theory and Practice**

Time: 10:30 am to 1:00 pm

Total Marks: 70

07

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q:1 A firm produces three products A,B and C, each of which passes 14 through three departments: Fabrication, Finishing and Packaging. Each unit of product A requires 3, 4 and 2; a unit of product B requires 5, 4 and 4, while each unit of product C requires 2, 4 and 5 hours respectively inn the three departments. Everyday, 60 hours are available in the fabrication department, 72 hours in finishing department and 100 hours in packaging department. The unit contribution of product A is Rs. 5, of product B is Rs. 10, and of product C is Rs. 8. **Required** :
 - 1. Formulate the problem as an LPP and determine the number of units of each of the products, that should be made each day to maximize the total contribution. Also determine if any capacity would remain unutilized.
 - 2. What would be the effect on the solution of each of the following:
 - (a) Obtain an order for 6 units of product A, which has to be met.
 - (b) An increase of 20 percent capacity in the fabrication department.

Q:2 Explain the Particle Swam Optimization Technique. 07 **(a)** How is the crossover operation performed in Genetic Algorithms(GA)? 07 **(b)** What is the purpose of mutation? How is it implemented in GA? OR (b) Explain the various steps of Random Walk Method used to optimize non 07 linear unconstrained problem. Find the dimensions of a cylindrical tin (with top and bottom) made up Q:3 **(a)** 07 of sheet metal to maximize its volume such that the total surface area is

equal to 24π . Find the dimension of a box of largest volume that can be inscribed in a 07 **(b)** sphere of unit radius.

OR

0:3 **(a)** Find the maximum of the function

$$f(x) = 2x_{1} + x_{2} + 10$$

subject to

$$g(x):x_{1}+2x_{2}^{2}=3$$

Using Lagrange multiplier method. Also find the effect of the right hand side of the constraint on the optimum value of function f.

(b) A DC generator has an internal resistance of R ohms and develops an open circuit voltage of V volts. Find the value of load resistance r for which the power delivered by generator will be maximum.



- Q:4 (a) Explain the algorithm of sequential linear programming method to solve 07 non linear programming problem.
 - (b) Find the maximum of the function $f(x) = \begin{cases} x / 2 \text{ for } x \leq 2 \\ -x + 3 \text{ for } x > 2 \end{cases}$

By using unrestricted search method with $x_1 = -1.0$ and s = 0.4.

OR

- Q:4 (a) Find the maximum of f(x) = x(1.5-x) in interval (0.0 1.0) to within 10% 07 of exact value.
 - (b) Find the minimum of the following function in the interval [60, 150] 07 using Golden section method in six steps.

$$\mathbf{f}(\mathbf{x}) = \left(100 - \mathbf{x}\right)^2$$

- Q:5 (a) Explain the Interval Halving method for minimization of non linear 07 programming problem.
 - (b) Minimize 07 $f(x_1, x_2) = x_1 - x_2 + 2 x_1^2 + 2 x_1 x_2 + x_2^2$ with the starting point (0, 0). Use univariate method.

07

07

- Q:5 (a) Explain various steps of variable transformation method to find 07 the dimensions of a rectangular prism-type box that has the largest volume when the sum of its length, width, and height is limited to a maximum value of 60 in. and its length is restricted to a maximum value of 36 in.
 - (b) Which are the indirect methods used to find optimum solution of non 07 linear programming unconstrained problems? Explain the algorithm of any one of them.
