

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014****Subject code: 2712704****Date: 06-01-2015****Subject Name: First Course in Optimization Techniques****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain the necessary and sufficient conditions for the relative maximum. **07**
 (b) Analyze the function $F(x) = 12x^5 - 45x^4 + 40x^3 + 5$ and classify the stationary points as maxima, minima or inflection point. **07**

- Q.2** (a) Explain the convex function of one variable. **07**
 (b) Discuss the necessary and sufficient condition for the optimization of unconstrained function of several variables. **07**

OR

- (b) Minimize $F = x_1^2 + 2x_2^2 + 3x_3^2$ subject to constraints $g_1 = x_1 - x_2 - 2x_3 \leq 2$ and $g_2 = x_1 + 2x_2 - 3x_3 \leq 8$ using Kuhn-Tucker conditions. **07**

- Q.3** (a) List the classification of optimization problems and explain any one. **07**
 (b) Minimize the given function $\min f(x_1, x_2) = -120x_1 - 80x_2$ subject to $x_1 \leq 40$, $x_2 \leq 10$, $20x_1 + 10x_2 \leq 500$ and $x_1, x_2 \geq 0$ using Simplex method **07**

OR

- Q.3** (a) Explain Lagrange's multiplier method for solution of multivariable function with equality constraint. **07**
 (b) List the engineering applications of optimization and describe any one of them. **07**
- Q.4** (a) Describe in Brief: Linear programming problem with its standard form. **07**
 (b) Explain Fibonacci method for minimization with one dimension and also list the limitation of this method. **07**

OR

- Q.4** (a) Describe the different kinds of minimization methods of one dimensional and explain interpolation method in brief. **07**
 (b) Describe constraint optimization technique : Random search method. **07**
- Q.5** (a) Describe in brief : Classical optimization techniques. **07**
 (b) Explain the basic components of optimization problem. **07**

OR

- Q.5** (a) Describe the steps for model building for optimization. **07**
 (b) Locate the stationary points of $F(x)$ and find out if the function is convex, concave or neither at the points of optima. **07**

$$F(x) = \frac{2}{3}x^3 - 2x^2 - 5x + 2x + 4x + 5$$
