Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 710903N **Date: 12-01-2013**

Subject Name: Engineering Optimization

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)** What is the difference between linear and nonlinear programming and what is the difference between design variables and pre-assigned parameters? **07**

(b) Define: Design space, feasible region, active constraints, constrained surface and behavior constrained. **07**

Q.2 **(a)** Determine the maximum and minimum value of the function. **07**

$$f(X) = 12X^5 - 45X^4 + 40X^3 + 5$$

(b) Minimize $f(X) = 2X^2 + \frac{16}{X}$ using Newton's Rapson method. **07**

OR

(b) Minimize $f(X) = (100 - X^2)$ in an interval of (60 150) using golden section method. **07**

Q.3 **(a)** Find the minimum of $f(X) = 4X^3 - 20X + 4$ using quadratic interpolation method. **07**

(b) State and explain the standard form of LPP **07**

OR

Q.3 **(a)** How do you classify optimization problem based on nature of design variable explain by taking example. **07**

(b) Maximize $Z = 3X_1 - X_2$ **07**

Subject to

$$2X_1 + X_2 \geq 2$$

$$X_1 + 3X_2 \leq 3$$

$$X_2 \leq 4$$

$$X_1 \geq 0$$

Q.4 **(a)** Find the minimum of the function $f = X^3 - 2X + 10$ by the Newton's method with the starting value of X_0=1 carry out at least 5 integrations. **07**

(b) State whether each of the following function is convex, concave or neither. **07**

a) $f(X) = e^x$

b) $f(X) = e^{-x}$

c) $f(X) = \frac{1}{x^2}$

d) $f(X) = X + \log X _ \text{For} _ X > 0$

OR

Q.4 Find the maximum function of the **14**

$$f(X) = 8X_1 + 10X_2 - X_1^2 - X_2^2$$

Subject to $3X_1 + 2X_2 \le 6$

$X_2 \ge 0$

$X \ge 0$

Using Kuhn Tucker conditions.

Q.5 **(a)** Use Fibonacci search method to find the minimum of **07**

$$f(X) = X^2 + \frac{54}{X}$$

In the interval of (0, 5) with 3 steps.

Q.5 **(b)** Explain GA in details. **07**

OR

(a) Explain any one constrained optimization techniques **07**

Q.5 **(b)** State the necessary and sufficient conditions for the unconstraint minimum of function. **07**

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