Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – III • EXAMINATION – SUMMER • 2014

Subject code: 730403 **Date: 05-06-2014**

Subject Name: 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)** Define optimization. Give some applications of optimization in engineering problems. **07**

(b) (i) Find the maxima and minima, if any, of the function $f(x) = 4x^3-18x^2+27x-7$. **03**

(ii) Find the minimum of the function, **04**

$f(x) = 10x^6-48x^5+15x^4+200x^3-120x^{2-}480x+100$.

Q.2 **(a)** Explain Weierstrass theorem. **07**

(b) Maximize $f(x_1, x_2) = -x_1^2-x_2^2+8x_1+10x_2$ subject to $3x_1+ 2x_2 \le 6$, $x_1, x_2 \ge 0$ using Kuhn ï Tucker conditions. **07**

OR

(b) Use the simplex method to solve the following LP Unbounded problem: **07**

Minimize $f = -3x_1-2x_2$ subject to $x_1-x_2 \le 1$

$3x_1 ï 2x_2 \le 6$ where $x_1, x_2 \ge 0$.

Q.3 **(a)** Find the minimum of the function $f(x)= 0.65- [(0.75)/(1+ x^2)] ï 0.65 x\tan^{-1}(1/ x)$ using quasi-newton method with starting point $x_1 = 0.1$ and the step size $\Delta x = 0.01$ in central difference formulad. Use $\varepsilon = 0.01$ for checking the convergence. **07**

(b) Minimize the function $f(x) = 0.65 - [0.75/(1 + X^2)] - 0.65 \times \tan^{-1}(1/x)$ using the golden section method with n = 6. **07**

OR

Q.3 **(a)** Find the minimum of $f = x^5- 5x^3- 20x + 5$ by the Qudratic interpolation method up to two iterations. **07**

(b) Minimize the function $f(x) = 0.65 - [0.75/(1 + X^2)] - 0.65 \times \tan^{-1}(1/x)$ in the interval [0,3] by the Fibonacci method using with n = 6. **07**

Q.4 **(a)** State the iterative approach used in unconsrained optimization. **07**

(b) Minimize $f(x_1, x_2) = x_1 ï x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ from the starting point $x_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ using Powellôs method. **07**

OR

Q.4 **(a)** What are pattern directions? Describe the procedure to minimize a function by using Hooke and Jeevesômethod. **07**

(b) Minimize $f(x_1, x_2) = x_1-x_2+2x_1^2+2x_1x_2+x_2^2$ by taking the starting point as $X_1=\begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$, using Newtonôs method. **07**

Q.5 **(a)** Explain the approach of the exterior penalty function method with algorithm. **07**

(b) Explain the sequential programming method with algorithm. **07**

OR

Q.5 **(a)** Explain augmented Lagrange multiplier method for mixed Equality-Inequality constrained problems with the flowchart. **07**

(b) Minimize $f(x) = 6x_1^2+4x_1x_2+3x_2^2$ subject to $h(x) = x_1+x_2-5=0$ using the augmented lagrangian multiplier method. **07**