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, $f(x) = 10x^6-48x^5+15x^4+200x^3-120x^2-480x+100$.	**04**
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 $3x_1+ 2x_2$ Ò 6, x_1, x_2 Ó 0 using Kuhn ï Tucker conditions.	**07**
		OR	
	(b)	Use the simplex method to solve the following LP Unbounded problem: Minimize $f = -3x_1-2x_2$ subject to x_1-x_2 Ò 1, $3x_1$ ï $2x_2$ Ò 6 where x_1, x_2 Ó 0.	**07**
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 ù = 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 Jeevesô method.	**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**