## GUJARAT TECHNOLOGICAL UNIVERSITY M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2014

Subject code: 714704Date: 30-06-2014Subject Name: Optimization Theory and Practice			
Time	Time: 02:30 pm - 05:00 pm Total Marks: 70 Instructions:		
insti u	1. 2.	Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full mark.	
Q:1	(a)	1. Find the extreme points of the function:	04
		<ul> <li>f(x<sub>1</sub>, x<sub>2</sub>) = x<sub>1</sub><sup>3</sup> + x<sub>2</sub><sup>3</sup> + x<sub>1</sub><sup>2</sup> + 2x<sub>2</sub><sup>2</sup> + 10</li> <li>Show that the right circular cylinder of given surface (including the ends) and maximum volume is such that its height is equal to the diameter of the base</li> </ul>	04
	(b)	Find the dimensions of a rectangular box of volume $V = 1000 \text{ cm}^3$ for which the total length of the 12 edges is minimum using the Lagrangeøs method of multipliers.	06
Q:2	(a)	Explain the Kuhn-Tucker conditions (using suitable example) for maximization	07
	(b)	and minimization problem. Solve the following LPP graphically Minimize $Z = 3x_1 + 5x_2$	07
		Subject to $-3x_1 + 4x_2 \le 12$	
		$2\mathbf{x}_1 + 3\mathbf{x}_2 \ge 12$	
		$2\mathbf{x}_1 - \mathbf{x}_2 \ge -2$	
		$\begin{aligned} \mathbf{x}_1 &\leq 4; \\ \mathbf{x}_2 &\geq 2  \text{and} \qquad \mathbf{x}_1, \mathbf{x}_2 &\geq 0 \end{aligned}$	
		$x_2 = 2$ and $x_1, x_2 = 0$ OR	
	(b)	Solve the following LPP by simplex method Maximize $Z = 40x_1 + 35x_2$	07
		Subject to $2x_1 + 3x_2 \le 60$	
		$4\mathbf{x}_1 + 3\mathbf{x}_2 \le 96$	
		$\mathbf{x}_1, \mathbf{x}_2 \ge 0$	
Q:3	(a)	Minimize $f(x) = 0.65 [0.75/(1 + x^2)] = 0.65x \tan^{-1}(1/x)$ in the interval [0,3] by the Fibonacci method using $n = 6$ .	07
	(b)	of 2m radius.	07
Q:3	(a) (b)	<b>OR</b> What are pattern directions? Draw the flow chart of Powelløs method. Explain the different steps of interior penalty method for nonlinear constrained optimization.	07 07
Q:4	(a)	Use Quasi Newton method to find minimum of	07

function  $f(x) = \frac{x}{\log(x)}$ , initial point = 1.5, step size = 0.1 and accuracy =

0.01.

(b) Find the minimum of following function in interval (0.0, 1.0) to within 10% 07 accuracy of the exact value. Use interval halving method. function f(x) = x(x - 1.8)

## OR

Q:4	<b>(a)</b>	Perform five iteration of secant method to find minimum of	07
		function $f(x) = \frac{x}{\log(x)}$ , step size = 0.1 and accuracy = .01.	
	(b)	Find the minimum of following function in interval (0.0, 1.0) to within 10%	07
		accuracy of the exact value. Use Dichotomous search method.	

function 
$$f(x) = x^2 / \sin(x)$$

Q:5 (a) Write the algorithm of Univariarte method. 07

(b) Explain the classical optimization techniques with their specific applications. 07

## OR

- Q:5 (a) Minimize  $f(x_1, x_2) = 4x_1^2 + 3x_2^2 5x_1x_2 8x_1$  from the starting point 07  $X_1 = \begin{cases} 0 \\ 0 \end{cases}$ . Perform four iterations of Hooke and Jeevesø method ( $\Delta x_1 = \Delta x_2 = 0.8$ ,  $\epsilon = 0.01$ ).
  - (b) Describe the application of LPP in engineering field. Explain the primal and dual 07 form of LPP with suitable example.

\*\*\*\*\*