Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME SEMESTER–II • EXAMINATION – SUMMER 2015

Subject Code: 2724712 **Date: 03/06/2015**

Subject Name: Optimization Theory and Practice

Time:02:30 PM To 5:00 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		Explain the interior penalty and exterior penalty optimization techniques for single variable function $f(X) = \alpha x_1$, subjected to $g_1(X) = \beta - x_1$.	**14**
Q:2	**(a)**	Explain the various steps of Grid Search Method used to optimize non linear unconstrained problem.	**07**
	(b)	How is the crossover operation performed in Genetic Algorithms(GA)? What is the purpose of mutation? How is it implemented in GA?	**07**
		OR	
	(b)	Explain the Particle Swam Optimization Technique.	**07**
Q:3	**(a)**	Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ from the starting point $X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ using univariate method.	**07**
	(b)	Draw the flow chart for Powell's method of unconstrained optimization.	**07**
		OR	
Q:3	**(a)**	Discuss various steps of Hooke's Jeeve's method of unconstrained optimization.	**07**
	(b)	Minimize $f(\lambda) = 0.65 - \dfrac{0.75}{1+\lambda^2} - 0.65\lambda \tan^{-1}\dfrac{1}{\lambda}$ using secant method with an initial step size of $t_0 = 0.1$, $\lambda_1 = 0.0$. Use $\varepsilon = 0.01$ for checking convergence.	**07**
Q:4	**(a)**	Explain the Kuhn–Tucker conditions for a constrained optimization.	**07**
	(b)	Find the dimensions of a cylindrical tin (with top and bottom) made up of sheet metal to maximize its volume such that the total surface area is equal to $A_0 = 24\pi$.	**07**
		OR	
Q:4	**(a)**	Explain the Necessary and Sufficient conditions for multivariable optimization with no constraints.	**07**

(b) Find the minimum of the function **07**

$$f(x,y) = k/(xy^2)$$
$$\text{subject to}$$
$$g(x,y): x^2 + y^2 = a^2$$

Using Lagrange multiplier method.

Q:5 **(a)** Find the minimum of f =x(x-1.5) in the interval (0.0, 1.0) to within 10% of the exact value using interval halving method. **07**

(b) Discuss the applications of optimization techniques in various field of engineering. **07**

OR

Q:5 **(a)** Minimize $f(x) = 0.65 - \frac{0.75}{1+x^2} - 0.65x\tan^{-1}\frac{1}{x}$ in the interval [0,3] by Golden section method using n = 6. **07**

(b) Explain the procedure for converting primal form of LPP into Dual form. Also discuss that the solution of Dual form can be derived from available simplex solution of primal LPP. **07**

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