Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2013

Subject code: 1722905 Date: 03-06-2013

Subject Name: Optimization Techniques

Time: 10.30 am – 01.00 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)**	Discuss utility of optimization techniques with a case study in engineering field.	**06**
	(b)	Plot f(x). Also, minimize a quadratic function $f(x) = x^2 - x$ using (i) Newton's method and (ii) Quasi – Newton method. Comment on the result obtained.	**08**
Q.2	**(a)**	State necessary and sufficient conditions for stationary points. Sketch $y = x^2 - 4x$ and find stationary points.	**07**
	(b)	Define convex function. Also, determine whether the function is convex or concave? (i) $f(x) = 2x_1^2+2x_1x_2+1.5x_2^2+7x_1+8x_2+24$ (ii) $f(x) = 2x^2-x^3$ in the range $-\infty \leq x \geq \infty$.	**07**
		OR	
	(b)	Show that (0,0) is the saddle point to the function $f(x_1, x_2) = 18\, x_1x_2 + 5\, x_2^2$	**07**
Q.3	**(a)**	Write down the Kuhn_ Tucker necessary conditions. State its applications.	**07**
	(b)	Minimize $z = x_1^2+x_2^2 + x_3^2$ subject to $4x_1+ x_2^2 +2x_3-14 = 0$ using Lagrangian method.	**07**
		OR	
Q.3	**(a)**	Why penalty method is used? Discuss in detail the penalty method.	**07**
	(b)	Minimize using dual simplex method $z = 3\, x_1 + 2\, x_2$ subject to $3\, x_1 + x_2 \geq 3$, $4\, x_1 + 3\, x_2 \geq 6$, $x_1 + x_2 \leq 3$, $x_1, x_2 \geq 3$.	**07**
Q.4	**(a)**	How box method is useful to find optimal solution?	**07**
	(b)	"Geometric programming method is used to solve NLP problems" Justify the statement.	**07**
		OR	
Q.4	**(a)**	Discuss pattern search algorithm.	**07**
	(b)	Enlist various region elimination methods. Discuss any one in detail.	**07**
Q.5	**(a)**	Describe Successive Linear Programming. How it differs from Successive Quadratic Programming?	**07**
	(b)	Using line search and QP sub - problem QP (x, B), develop a typical algorithm based on Successive Quadratic Programming.	**07**
		OR	
Q.5	**(a)**	Discuss GRG algorithm.	**07**
	(b)	Explain stochastic programming with a suitable example.	**07**

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