Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME SEMESTER II EXAMINATION – SUMMER 2017

Subject Code: 2720821 **Date: 30/05/2017**

Subject Name: Engineering Optimization

Time:02:30 PM to 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)** Classify Optimization Techniques. **07**

(b) Explain Kuhn-Tucker condition. **07**

Q.2 **(a)** A beam of uniform rectangular cross section is to be cut from a log having a circular cross section of diameter 2a. The beam has to be used as a cantilever beam (the length is fixed) to carry a concentrated load at the free end. Find the dimensions of the beam that correspond to the maximum tensile (bending) stress carrying capacity using the Lagrange multiplier method. **07**

(b) Prove: A sufficient condition for a stationary point $\mathbf{X}^*$ to be an extreme point is that the matrix of second partial derivatives (Hessian matrix) of f($\mathbf{X}$) evaluated at $\mathbf{X}^*$ is (i) positive definite when $\mathbf{X}^*$ is a relative minimum point, and (ii) negative definite when $\mathbf{X}^*$ is a relative maximum point. **07**

OR

(b) Differentiate Random jumping, Random walk and Random walk with direction Exploitations for unconstrained optimization. **07**

Q.3 **(a)** Explain Univariate method and identify significance of it. **07**

(b) Use simplex method to solve **07**

Minimize Z= x1-3x2+2x3

S/t $3x1-x2+2x3 \leq 7$

$-2x1+4x2 \leq 12$

$-4x1+3x2+8x3 \leq 10$

$x1, x2, x3 \geq 0$

OR

Q.3 **(a)** Draw flow chart for Powel's method. **07**

(b) Use simplex method to solve **07**

Maximize Z= 45x1+80x2

S/t $5x1+20x2 \leq 400$

$10x1+15x2 \leq 450$

$x1, x2 \geq 0$

Q.4 **(a)** Explain Interior penalty function method. **07**

(b) Solve following problem using Exterior Penalty function method: **07**

Minimize $f(x1,x2) = 1/3\ (x1+1)^3 + x2$

S/t $g1(x1, x2) = 1-x1 \leq 0$

$g2\ (x1, x2) = -x2 \leq 0$

OR

Q.4	**(a)**	Explain Golden section method. Give meaning of a “GOLDEN”.	**07**
Q.4	**(b)**	Explain Dichotomous search method.	**07**
Q.5	**(a)**	Can you consider SA as a zeroth – order search method? Explain detail with example.	**07**
	(b)	Write objective function and constraints for structural topology optimization problems.	**07**

OR

Q.5	**(a)**	Explain procedure for GA. Define fitness function of GA.	**07**
	(b)	What is topology optimization? Explain procedure for topology optimization.	**07**

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