Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**ME- SEMESTER II– EXAMINATION – SUMMER 2015**

**Subject Code: 2720821** **Date: 01/06/2015**

**Subject Name: Engineering Optimization**

**Time: 2:30 PM – 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 (a) Classify the optimization problems in detail. 06

(b) Solve the following LPP using Simplex method. 08

$$Max\, Z = 3x1 + 5x2$$
$$s/t \quad 3x1 + 2x2 \le 18$$
$$x1 \le 4$$
$$x2 \le 6$$
$$x1, x2 \ge 0$$

Q.2 (a) Maximize the volume of a cylindrical oil tank subject to a demand for constant surface area using Lagrangean method. 07

(b) Explain the Exterior penalty function method for constrained optimization problem. 07

OR

(b) Minimize $f(x_1, x_2) = (x - 2/20)^2$ 07

subject to , $\frac{1-x}{2} \le 0, \frac{x-2}{2} \le 0$

Using Interior penalty function method.

Q.3 (a) Compare the ratios of intervals of uncertainty ($L_n/L_0$) obtainable in the following methods for n =5 and n=10 06

(a) Exhaustive search.

(b) Fibonacci method.

(c) Golden section method.

(b) What is the difference between exhaustive search method and Dichotomous search method? Describe the Dichotomous search method. 08

OR

Q.3 (a) Explain the Fibonacci method for solving of 1D minimization NLP problem. 05

(b) Use the Newton-Raphson method of finding roots of the following equation to find the minimum of function. Conduct three iterations to estimate the root of 09

the above equations. Take the initial guess $n_0$=0 and relative Find the absolute relative approximate error at the end of each iteration.

$$f(n) = 40n^{1.5} - 875n + 35000 = 0$$

Q.4 (a) Classify the Unconstrained minimization methods. State the difference between Direct search methods Descent methods. 05

(b) Solve the following NLP using KKT conditions; 09

Minimize $C = (x_1 - 4)^2 + (x_2 - 4)^2$

s.t. $2x_1 + 3x_2 \geq 6;$

$12\text{-}3x_1 - 2x_2 \geq 0;$

$x_1, x_2 \geq 0$

OR

Q.4 (a) Explain Univariate method. 07

(b) Explain Steepest descent method. 07

Q.5 (a) Explain the procedure for topological optimization. 07

(b) Name and describe the main features of Genetic Algorithms. 07

OR

Q.5 (a) Describe the PSO method. 07

(b) What do you understand by topology optimization? Write objective function and constraints for structural topology optimization problems. 07

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