

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – III • EXAMINATION – WINTER • 2013

Subject code: 730801**Date: 26-11-2013****Subject Name: Engineering Optimization****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-1a What is Optimization? Explain Classification of Optimization. 7
- Q-1b Compare Genetics Algorithm and Simulated Annealing methods of optimization. 7
- Q-2a Explain different MATLAB functions for solving optimization problems. 7
- Q-2b What is a saddle point solution? What is its significance in constrained optimization? 7
- OR
- Q-2b What is Hessian matrix? Explain the characteristics of Hessian Matrix? 7
- Q-3a What are the characteristics of a direct search method? 4
- Q-3b Formulate a problem of a uniform column of tubular section, with hinge joints at both ends, to carry a compressive load $P = 2500$ kgf for minimum cost. The column is made up of a material that has a yield stress (σ_y) of 500 kgf/cm², modulus of elasticity (E) of 0.85×10^6 kgf/cm², and weight density of 0.0025 kgf /cm³. The length of the column is 250 cm. The stress induced in the column should be less than the buckling stress as well as the yield stress. The mean diameter of the column is restricted to lie between 2 and 14 cm, and columns with thicknesses outside the range 0.2 to 0.8 cm are not available in the market. The cost of the column includes material and construction costs and can be taken as $5W + 2d$, where W is the weight in kilograms force and d is the mean diameter of the column in centimeters. 10
- OR
- Q-3a Write and Explain the necessary and sufficient conditions for Kuhn-Tucker theorem. 4
- Q-3b Minimize $f(x, y) = (x - 2)^2 + 4(y - 3)^2$, subject to $-x + y \leq 2$, $x + 2y \leq 3$. 10
- Q-4a Explain the Characteristics of Geometric Programming Method of Optimization. 4
- Q-4b Maximize $f(x, y) = 10 - x^2 - (y - 2)^2$, subject to $x + 2y = 5$, using Lagrange Multiplier. 10
- OR
- Q-4a Define a stochastic programming problem and give it importance with suitable example. 4
- Q-4b Minimize $f = x_1 x_2^2 x_3^{-1} + 2x_1^{-1} x_2^{-3} x_4 + 10x_1 x_3$ 10
 subject to
 $3x_1^{-1} x_3 x_4^{-2} + 4x_3 x_4 \leq 1$, $5x_1 x_2 \leq 1$ using Geometric Programming Method.
- Q-5a Explain Golden section Method of Optimization. 4
- Q-5b Minimize $f(x) = (100 - x)^2$ over the bounded interval $60 \leq x \leq 150$ using Golden section method. 10
- OR
- Q-5a What is uni-modal property and what is its significance in single variable optimization? 4
- Q-5b Minimize the function $f(x_1, x_2) = 10x_1^2 + 5x_1 x_2 + 10(x_2 - 3)^2$, using steepest descent method where $(x_1, x_2) \in [-10, 10] \times [-15, 15]$. 10
