

Subject Code: H1501/R13

M. Tech –II Semester Regular/ Supply Examinations, October, 2015

**OPTIMIZATION AND RELIABILITY
(Common to MD, MED and CAD/CAM)**

Time: 3 Hours

Max Marks: 60

**Answer any FIVE questions
All questions carry EQUAL marks**

1. (a) State the principle behind the method of constrained variation.
(b) Find the maxima and minima, if any, of the function
 $f(x) = 4x^3 - 18x^2 + 27x - 7$
2. Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$. Take the points defining the initial simplex as $\mathbf{X}_1 = (4.0, 4.0)^T$, $\mathbf{X}_2 = (5.0, 4.0)^T$, and $\mathbf{X}_3 = (4.0, 5.0)^T$ and $\alpha = 1.0$, $\beta = 0.5$, and $\gamma = 2.0$. For convergence, take the value of ϵ as 0.2.
3. Construct the ϕ_k function, according to (a) interior and (b) exterior penalty function methods and plot its contours for the following problem:
Maximize $f = 2x$ subject to $2 \leq x \leq 10$
4. (a) Explain the working principle of genetic algorithm.
(b) What is random population generation? Explain with an example.
5. (a) How do you select the length of the binary string to represent a design variable?
(b) What are the drawbacks of genetic algorithm? Explain.
6. (a) Explain Pareto's analysis.
(b) What is Non-dominated sorted GA? Explain.
7. Explain the optimization model of a weight of a cantilever beam
8. Explain
 - a. Nelder Mead's Simplex method
 - b. Types of penalty methods for handling constraints.