

**Subject Code: H1501/R13**

**M. Tech –II Semester Regular Examinations, September, 2014**

**OPTIMIZATION AND RELIABILITY**

**(Common to MD, ME and CAD/CAM)**

**Time: 3 Hours**

**Max Marks: 60**

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

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1. Maximize  $f(x) = 1/2 (x_1^2 + x_2^2 + x_3^2)$

Subject to  $g_1(x) = x_1 - x_2 = 0$

$g_2(x) = x_1 + x_2 + x_3 - 1 = 0$

By Lagrange multiplier method.

2. (a) Maximize  $f = 8x_1 + 4x_2 + x_1x_2 - x_1^2 - x_2^2$

Subject to  $2x_1 + 3x_2 \leq 24$

$-5x_1 + 12x_2 \leq 24$

$x_2 \leq 5$

By applying Kuhn- Tucker conditions.

(b) What is the significance of Lagrange multiplier method.

3. (a) Minimize  $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$  starting from the point  $X_1 = [0 \ 0]^T$

(b) Show that the Newton's method finds the minimum of a quadratic function in one iteration.

4. (a) What is the reason for possible divergence of Newton's method.

(b) What are types of penalty methods for handling constraints?

5. How do you perform i) crossover and ii) Mutation in GA? Explain with examples.

6. (a) Write the differences between GA and GP.

(b) What is a genetic programming? What for it is used?

7. Discuss the procedural steps involved in NSGA.

8. Write the typical optimization model for a machining problem. Discuss the objective functions and the constraints involved.

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