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Roll No .

**MECM - 201**

**M.E./M.Tech., II Semester**

Examination, June 2016

**Process Plant Optimization Techniques**

*Time : Three Hours*

*Maximum Marks : 70*

**Note :** Attempt any five questions. All questions carry equal marks.

1. a) Discuss constrained and unconstrained multivariable optimization.  
b) Discuss the industrial significance and importance of "Process Plant Optimization Techniques" in chemical process industries.
2. a) Describe quadratic and successive quadratic programming in detail.  
b) Maximize  $f(x) = 6x_1 + 5x_2$  using algebraic form simplex method.  
Subjected to constraints  $x_1 + x_2 \leq 5$ ,  
 $3x_1 + 2x_2 \leq 12$ ,  
 $x_1, x_2 \geq 0$
3. a) Discuss tabulated form simplex method, its advantages and disadvantages.

b) Minimize  $f(x) = 100(x_2 - x_1^2)^2 + (1 - x_1)^2$  with starting point  $[-1, 1]^T$  along the direction  $[4, 0]^T$ .

i) Bracket the optimum solution using bounding phase method with  $\Delta = 0.2$ .

ii) Using bracket obtained in part (i) find the optimum point using interval halving method for 3 iterations.

4. Compare the golden section search method and Fibonacci search method for 5 iterations for minimization of  $f(x) = x^2 - 10 \exp(0.1x)$  in the interval  $(-10, 5)$ .

5. a) How optimization techniques can be applied in energy conservation and chemical reactor design? Discuss in detail. <http://www.rgpvonline.com>

b) Minimizes  $f(x) = x^2 + 54/x$  using successive quadratic estimation method with initial guess 1 and  $\Delta = 1$ , till variable accuracy of 0.05.

6. A reservoir discharge water through sluices at a depth,  $h$  below the water surfaces has a surface area,  $A$  for various values of  $h$  as given below:

$h$ (ft):	10	11	12	13	14
$A$ (sq.ft):	950	1070	1200	1350	1530

If  $t$  denotes time in minutes, rate of fall of the surface is given

$$\text{by } \frac{dh}{dt} = \frac{-48h}{A}.$$

With applying numerical computational method, estimate the time taken for the water level to fall from 14ft to 10ft above the sluices.