| BIMEE-022 |

B.Tech. MECHANICAL ENGINEERING (BTMEVI)

00530

Term-End Examination
June, 2013

BIMEE-022 : OPTIMIZATION FOR ENGINEERING DESIGN

Time : 3 hours   *Maximum Marks : 70*

Note : (i)   Answer **any five** questions.
         (ii) Scientific calculator is allowed.

1. (a) Discuss the following with suitable sketches.   **9**
         (i)   Local optimal point
         (ii) Global optimal point
         (iii) Inflection point

    (b) Find the optimal points of the given function   **5**
         $f(x) = (x-1)^2 - 0.01x^4$

2. Use three iterations of the golden section search   **14**
    method in order to maximize the following
    function :
    $f(x) = 10 + x^3 - 2x - 5e^x$ in the interval $(-5, 5)$

3. Use three iterations of the bi-section and secant   **14**
    method to minimize the following function :
    $f(x) = 2e^x - x^3 - 10x$
    Compare the algorithms in terms of the interval
    obtained at the end of three iterations.

4. Minimize the following function : **14**

$$f(x_1, x_2) = (x_1^2 + x_2 - 11)^2 + (x_1 + x_2^2 - 7)^2 \quad \text{using}$$

simplex search method. Assume the initial simplex points as :
$x^{(1)} = (0,0)$, $x^{(2)} = (2,0)$ and $x^{(3)} = (1,1)$
Take $\gamma = 1.5$, $\beta = 0.5$ and $\epsilon = 10^{-3}$.

5. Discuss in detail the algorithm of complex search method for solving multivariable constrained problem in optimization. **14**

6. Use two iterations of the cutting plane method to solve the following function : **14**
Maximize $f(x) = x_2$
subject to

$$4.5x_1 + x_2^2 \leq 18,$$
$$2x_1 - x_2 \geq 1,$$
$$x_1, x_2 \geq 0$$

choose a suitable feasible region.

7. Perform two iterations of the penalty function method to minimize the given INLP problem : **14**
Maximize :

$$x_1^4 + 3xy^2 + (10y+1)^2$$

subject to :

$x \geq y$

x,y are integers.