

Total No. of Questions : 5]

SEAT No. :

**P4064**

[5255]-562

[Total No. of Pages : 2

**M.E. (Mechanical Design Engineering)**  
**OPTIMIZATION TECHNIQUES**  
**(2013 Credit Pattern) (Semester - III) (602213)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

**Q1) a)** Explain in brief classification of optimization problem? **[5]**

b) Define engineering optimization and explain the following terms **[5]**

- i) Design Vector.
- ii) Design Constraint.
- iii) Objective Function.

**Q2)** Solve by simplex method the following L.P. Problem **[10]**

$$Z = X_1 - 3X_2 + 3X_3$$

$$\text{Subjected to } 3X_1 - X_2 + 2X_3 \leq 7,$$

$$2X_1 + 4X_2 \geq -12,$$

$$-4X_1 + 3X_2 + 8X_3 \leq 10$$

$$X_1, X_2, X_3 \geq 0$$

**Q3)** Find the minimum of  $f = \lambda(\lambda - 1.5)$  in the interval (0.0, 1.00) to within 5% of exact value. **[10]**

**P.T.O.**

**Q4)** a) Minimize the function

$f(X) = 0.65 - \frac{0.75}{1+X^2} - 0.65 * X \tan^{-1}\left(\frac{1}{X}\right)$  Using Quasi-Newton method with the starting point  $X_1 = 0.1$  and the step size  $\Delta X = 0.01$  in central difference formulas. Use  $\epsilon = 0.01$  for checking the convergence. [5]

b) Explain any one in details. [5]

i) Fuzzy optimization.

ii) Simulated Annealing.

iii) Genetic algorithm.

**Q5)** a) What are the different methods involved in problem formulation and parameterization of design? Explain one method in details. [5]

b) Write a short note on Bi-directional evolutionary structural optimization based on Vonmises stress. [5]

**x x x**