

- B.E. Civil Engineering - Third Year - Second Semester  
 B.E. Information Technology - Third Year - Second Semester  
 B.E. Metallurgical and Material Engineering - Third Year - Second Semester  
 B.E. Construction Engineering - Fourth Year - Second Semester  
 B.E. Electrical Engineering - Fourth Year - Second Semester  
 B.E. Electronics and Tele-Communication Engineering - Fourth Year - Second Semester  
 B.E. Instrumentation and Electronics Engineering - Fourth Year - Second Semester  
 B.E. Mechanical Engineering - Fourth Year - Second Semester  
 B.E. Power Engineering - Fourth Year - Second Semester  
 B.E. Production Engineering - Fourth Year - Second Semester  
 B.E. Computer Science & Engineering - Fourth Year - Second Semester

**Sub : Optimisation Techniques for Engineering Design ( Open Elective)**

Full Marks : 100

time : 3 hrs

Answer any five questions (20 X5 = 100)

1. a) Classify optimization techniques. Explain the role of optimization in design.  
 b) Develop the N.L.P of an engineering problem for optimum design.

10 + 10

2. a) find out the value of x at which the following function is minimum, maximum or point of inflection.

$$F(x) = x^4 - 2x^3 + 6x^2 - 5x + 4$$

- b) Apply Interval halving method or Golden Section method to find out minimum value of the following objective function ( 2 iterations)

$$f(x) = x^2 + 25/x .$$

- c) How is secant method used to find an optimum solution?

5+10+5

3. a) Explain Simplex method for multivariable optimisation.

- b) Apply Cauchy's Steepest Descent method for multivariable optimization for the following function

$$f(x) = (x_1 - 2x_2 - x_1x_2)^2 \quad (\text{two iterations})$$

5+10+5

- c) Why Marquard method is more efficient ?

[ Turn over

4. a) Explain the interior and exterior penalty function method for constrained optimization.

b) Describe optimality criteria for equality constraints.

c) Explain Particle swarm optimization technique.

8+6+6

5. a) Explain genetic algorithm used for optimisation.

b) Explain the algorithm for Simulated annealing.

14 +6

6. a) Describe the working principle of Artificial Neural Network

b) Explain Ant colony optimization algorithm.

10 +10

7. a) Explain "Pareto optimal solution".

b) Explain weighted metrics method for multivariable optimization.

c) explain any technique for finding "non dominated solution".

d) Discuss the  $\epsilon$  – constraint method for multi-objective optimization.

5+5+5+5