

M.E Mechanical Engineering
1st year 2nd Semester Examination-2024-25
Jadavpur university
Sub : Optimisation Techniques for Engineering Design

Full Marks : 100

time : 3 hrs

Answer any five questions (20 X 5 = 100)

1. a) explain the role of optimization in design .
 b) Develop an N.L.P for design optimization based on any design problem.
 c) Describe the condition for optimality.
 d) Compare traditional method and non traditional methods for optimization.
4+7+5 +4
2. a) Discuss the basic principles of **Golden Section** method used in optimization techniques.
 b) Explain the algorithm for **Secant** method of optimization.
 c) Apply **Bisection method** (two iterations) to find out optimum solution for the following objective function ?

$$f(x) = x^2 + 5x + 3$$
6+6+8
3. a) Explain **Box's Evolutionary** method for optimisation.
 b) Explain **Cauchy's Steepest Descent** method for multivariable optimization. Why Marquard method is more efficient ?
 c) Explain **K-K-R condition for optimality with inequality constraint** for optimisation ?.
6+8+6
4. a) Explain the exterior and interior methods in constraint optimisation".
 b) Describe different types of penalty functions used for constrained optimisation ?.
 c) Explain the significance of Lagrange's multiplier in interior and exterior method.
6+8+6
5. a) Explain **genetic algorithm** used for optimisation.
 b) Write down the working principles of **Ant Colony Optimisation**
10 +10
6. a) Explain **Particle swarm optimization** technique .
 b) Explain the algorithm for **Simulated Annealing** .
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".
6+8+6
8. a) Explain the method of Artificial Neural Network for three inputs and two outputs with two hidden layer.
 b) Explain back-propagation algorithm with a suitable example.
10 +10