# MASTER OF ENGINEERING EXAMINATION, 2017

## (1ST SEMESTER)

## OPTIMISATION TECHNIQUES FOR ENGINEERING DESIGN

Time : Three hours

Full Marks : 100

### Answer any *five* questions

1) a) Develop an N.L.P for optimum design of a component or system
   b) How optimization techniques are useful in design..
   c) Classify optimization algorithms.

   $$10+ 5+ 5$$

2) a) Write down the working principle and the algorithm of any two optimization method :-
   i). Golden Section method   ii). Point estimation method  iii). Seccant method.
   b) Compute for two iterations using Bisection method for optimization for the following objective function.
   Minimise, $f(x) = x^3 - 5/x^2 + 7$

   $$12+8$$

3) a ) Explain the working principle and write down the algorithm of Cauchy's steepest descent method with a suitable example.
   b) Distinguish between optimization algorithm for sinle variable and multi variable objective function.
   c) Explain ( any one)
   i). Simplex method   ii). Evolutionary method

   $$10 + 5 +5$$

4) a) How a constrained design problem can be optimized using penalty functions.
   b) Compare interior and exterior method.
   c) Write down the working principle and implementation scheme of Particle swarm optimization

   $$10 + 5+5$$

5) a)  Write down the working principle and implementation scheme of Simulated Annealing.
   b)  Distinguish between traditional and evolutionary algorithm.
   c)  Explain the working principle and algorithm for Differential Evolution method for optimization.

   $$8+4+8$$

6) a) Write down the working principle and implementation scheme of genetic algorithm.
   b) Explain the selection method' in GA in detail.
   c)  Discuss coding in GA

   $$10 +6 +4$$

7) a) Compare single objective and multiobjective optimization problem.
   b) Explain the principle of weighted metric method of multi objective optimization problem.
   c)  Discus the approach of goal programming method for multi-objective optimisation.
   d) How a multiobjective optimization problem can be converted to a single objective optimization problem.

   $$5+ 6 + 5 +4$$

8) a) What is meant by a convex function.
   b) Define and explain the following terms
   i) Pareto optimal points   ii) Utopia point iii) Nadir point. iv) ideal point
   c) A multiobjective optimization problem consists two objective functions $f_1$ and $f_2$ to be minimised. Six points in criterion space $(f_1, f_2)$ is given by (100,60), (125,87), (120,30), (280,300), (130,65), (190,45). Find out the set of non dominated solutions using any algorithm.

   $$4 + 10 + 6$$