



M.Tech I Semester Regular & Supplementary Examinations January/February 2019

ADVANCED OPTIMIZATION TECHNIQUES

(Common to PE&ED and PE)

(For students admitted in 2017 & 2018 only)

Time: 3 hours

Max. Marks: 60

Answer all the questions

- 1 Solve by mixed integer programming

Maximize $Z = -3x_1 - 2x_2 + 10$,Subject to: $x_1 - 2x_2 + x_3 = 5/2$, $2x_1 + x_2 + x_4 = 3/2$, $x_j \geq 0$ ($j = 1, 2, 3, 4$), x_2 and x_3 integer.

This problem is in canonical form, with x_3 and x_4 optimal basic variables for the associated linear program

OR

- 2 Summarizes the general procedure of Branch-and-bound for integer-programming maximization with flow chart.

- 3 Find the optimum solution of the following constrained multivariable problem:

Minimize $Z = x_1^2 + (x_2 + 1)^2 + (x_3 - 1)^2$ Subject to $x_1 + 5x_2 - 3x_3 = 6$.**OR**

- 4 Describe the solving process of constrained multivariable optimization problems with inequality constraints.

- 5 Describe the six steps involved in Genetic algorithm.

OR

- 6 Compute the mutation and crossover in a genetic algorithm with real numbers. Explain in detail.

- 7 One of management's goals in a goal programming problem is expressed algebraically as,
- $3x_1 + 4x_2 + 2x_3 = 60$
- , where 60 is the specific numeric goal and the left-hand side gives the level achieved toward meeting this goal.

(i) Letting y^+ be the amount by which the level achieved exceeds this goal (if any) and y^- the amount under the goal (if any), show how this goal would be expressed as an equality constraint when reformulating the problem as a linear programming model.

(ii) If each unit over the goal is considered twice as serious as each unit under the goal, what is the relationship between the coefficients of y^+ and y^- in the objective function being minimized in this linear programming model?

OR

- 8 Describe how the NSGA-Nondominated Sorting Genetic Algorithm differs from basic simple GA with example.

- 9 Discover the advance optimization techniques for the design of four-bar mechanism.

OR

- 10 Explain application of optimization in design and analysis of springs and gears.

