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Roll No .....

ME-8004(1)-CBGS

B.E. VIII Semester

Examination, December 2020

Choice Based Grading System (CBGS)

Optimization Technique

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.
ii) Each question carry equal marks.

1. a) What is an Optimization Problem and explain various engineering applications.
   b) Explain various Classical Optimization Methods.

2. a) What is Linear Programming? What are its major assumptions and limitations.
   b) Use the Simplex Method to solve the following L.P problem subject to constraints

$$2x_1 + 3x_2 \leq 8$$
$$2x_2 + 5x_3 \leq 10$$
$$3x_1 + 2x_2 + 4x_3 \leq 15$$
$$x_1, x_2, x_3 \geq 0$$

3. a) Find the maximum or minimum of the function

$$f(x) = x_1^2 + x_2^2 + x_3^2 - 4x_1 - 8x_2 - 12x_3 + 56.$$

   b) Obtain the set of necessary conditions for the non-linear programming problem.

Max. $Z = x_1^2 + 3x_2^2 + 5x_3^2$

subject to constraints: $x_1 + x_2 + 3x_3 = 2$

$5x_1 + 2x_2 + x_3 = 5$, and $x_1, x_2, x_3 \geq 0$

4. a) What is a non-linear programming problem?
   b) Give a formulation of the general mathematical programming problem and obtain the linear programming as a special case of the same.

5. Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from the point x_1 = [:]

6. Solve the following LP problem by Dynamic Programming:

   Maximize $f(x_1, x_2) = 10x_1 + 8x_2$

   Subject to $2x_1 + x_2 \le 25$

   $3x_1 + 2x_2 \le 45$

   $x_2 \le 10 x_1 \ge 0, x_2 \ge 0$

   Verify your solution by solving it graphically

7. a) Explain the cutting plane method of solving an integer problem.
   b) Solve the integer programming problem:

   Max $Z = 7x_1 + 9x_2$

   Subject to $-x_1 + 3x_2 \le 6$, $7x_1 + x_2 \le 35$, $x_1 \ge 0$, $x_2 \ge 0$ and integers.

8. Define the following terms:
   a) Principle of optimality
   b) Boundary value problem
   c) Monotonic function
   d) Separable function

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