

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER-VIII EXAMINATION- Summer 2020

Subject Code: 2180503

Date: 27/10/2020

Subject Name: PROCESS MODELING, SIMULATION & OPTIMIZATION

Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Draw the flow chart for implementing Fibonacci method. **03**
 (b) Show the advantages and disadvantages of Newton's method. **04**
 (c) What is Optimization? List the six general steps for the analysis and solution of optimization problems. **07**
- Q.2** (a) Explain the meaning of following terms for optimization: Feasible solution, feasible region, optimal solution. **03**
 (b) What is simulation? Explain linear system analysis. **04**
 (c) Discuss the degree of freedom analysis with suitable example. **07**
- OR**
- (c) Explain the attributes of the process affecting costs/profits make them attractive for the application of optimization. **07**
- Q.3** (a) Minimize $f(x) = x^4 - x + 1$ using Newton's method. Take starting point = 0.64. **03**
 (b) Explain equation oriented mode in simulation. **04**
 (c) For modular approach to process simulation, discuss sequential modular approach in detail. **07**
- OR**
- Q.3** (a) Determine whether the following function is convex or concave: **03**

$$f(x) = 4x_1^2 + 3x_2^2 + 5x_3^2 + 6x_1x_2 + x_1x_3 - 3x_1 - 2x_2 + 15$$

 (b) Define the different measures of profitability/economic performance along with their significance. **04**
 (c) Explain partitioning and tearing with example. **07**
- Q.4** (a) Find the Eigen value Hessian matrix for $f(x) = 2x_1^2 + 3x_1x_2 - 2x_2 + 15$. **03**
 (b) List out limitation of Region elimination methods. Compare different region elimination methods and suggest best method for initial interval of 3.5 for accuracy of 0.1. **04**
 (c) Discuss optimization of evaporator design. **07**
- OR**
- Q.4** (a) Write different conditions for a given function to be convex or concave in tabular form. **03**
 (b) Minimize $f(x) = 4X_1^2 + 5X_2^2$ subject to $2X_1 + 3X_2 - 6 = 0$ using Lagrange Multipliers method. **04**
 (c) List out multivariable analytical methods for optimization problems with restricted variables equality constraints and explain any one of them with example. **07**
- Q.5** (a) A poster is to contain 300 cm² of printed matter with margin of 6 cm at the top and bottom and 4 cm at each side. Find the overall dimensions that minimize the total area of poster. **03**
 (b) Discuss Distributed V/S Lumped Parameter models. **04**
 (c) List out the important model building steps for a process. **07**
- OR**
- Q.5** (a) Classify the following function that they are convex or concave. $f(x) = 2x_1^2 - 3x_1x_2 + 2x_2^2$ **03**
 (b) Explain Simultaneous modular approach in simulation. **04**
 (c) Discuss essential feature of optimization problem. **07**
