Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER– VIII (New) EXAMINATION – WINTER 2019**

**Subject Code: 2180503 Date: 29/11/2019**

**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.**

| | | | MARKS |
|---|---|---|---|
| **Q.1** | **(a)** | List the applications of optimization in chemical process engineering. | **03** |
| | **(b)** | A poster is to contain 300 $cm^2$ of printed matter with margins of 6cm at the top and bottom and 4cm at each side. Find the overall dimensions that minimize the total area of the poster. | **04** |
| | **(c)** | Explain the six steps for solving optimization problems. List the general obstacles to solve optimization problems. | **07** |
| **Q.2** | **(a)** | Minimize the quadratic function $f(x) = x^2 - x$ by Qausi Newton method. Use the range of -3 to +3 | **03** |
| | **(b)** | Explain the necessary and sufficient conditions for an extermum of an unconstrained function. | **04** |
| | **(c)** | Minimize $f(x) = x^4 - x + 1$ using Newton's method. Take any suitable initial guess. Show at least 4 iterations. | **07** |
| | | **OR** | |
| | **(c)** | Explain the steps for finding the optimum L / D ratio for a pressurizes cylindrical storage vessel. List all the variables and the important assumptions. | **07** |
| **Q.3** | **(a)** | Explain equation solving approach in brief. | **03** |
| | **(b)** | Explain black box model. | **04** |
| | **(c)** | Give a detail classification of models. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Compare lumped parameter model and distributed parameter model. | **03** |
| | **(b)** | Compare linear and non linear model. | **04** |
| | **(c)** | Explain partitioning ,tearing, sequential modular approach. | **07** |
| **Q.4** | **(a)** | Classify the methods to solve unconstrained problems. | **03** |
| | **(b)** | Explain Random search and grid search method for unconstrained multivariable optimization. | **04** |
| | **(c)** | What is linear programming ? State the linear programming in standard form and write down its application in chemical industries. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | List out essential features of optimization. | **03** |
| | **(b)** | Determine convexity or concavity for the following function, $f(x) = 2x_1^2 - 3x_1x_2 + 2x_2^2$ | **04** |
| | **(c)** | Discuss the optimizing recovery of waste heat with suitable figure and equations. | **07** |

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|---|---|---|---|
| **Q.5** | **(a)** | List the various professional simulators and equation solver software. | **03** |
| | **(b)** | Explain modular approach in brief. | **04** |
| | **(c)** | Describe any one chemical process simulation and its silent features. | **07** |

**OR**

| | | | |
|---|---|---|---|
| **Q.5** | **(a)** | Define , simulation, optimization and tearing. | **03** |
| | **(b)** | Differentiate between steady state and dynamic simulation. | **04** |
| | **(c)** | Explain what are the obstacles towards solving optimization problems. | **07** |

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