

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VIII • EXAMINATION – WINTER • 2014

Subject Code: 180503**Date: 02-12-2014****Subject Name: Process Simulation and Optimization****Time: 02:30 pm - 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) Define simulation, partitioning, tearing, optimization and explain the need of optimization. **07**
 (b) Find the value of x and z that maximize $U = -x^2 + 10x + xz - z^2 + 8z + 2$. **07**
- Q.2** (a) List the structural components of general purpose sequential modular program. **07**
 (b) Describe the six steps used to solve optimization problem. **07**
- OR**
- (b) Describe the obstacles to optimization. **07**
- Q.3** (a) Define Hessian matrix for function of two variables and find the Hessian matrix for $f(x) = 2x_1^2 + 3x_1x_2 - 2x_2 + 15$. **07**
 (b) Define convexity and explain the evaluation of nature of convexity for multivariable function. **07**
- OR**
- Q.3** (a) Construct the region formed by the following constraints and determine the convexity: $x_1 \leq 6$; $x_2 \leq 6$; $x_1 \geq 0$; $x_1 + x_2 \leq 6$; $x_2 \geq 0$. **07**
 (b) Mention the conditions to be satisfied for extremum of function of single variable and find extremum for $f(x) = x^4$. **07**
- Q.4** (a) Minimize $f(x) = x^4 - x + 1$ using Newton's method. Take starting point = 0.64 **07**
 (b) Classify the optimization methods. **07**
- OR**
- Q.4** (a) Minimize $f(x) = 4x_1^2 + 5x_2^2$ subject to $2x_1 + 3x_2 - 6 = 0$ using Lagrange Multipliers method. **07**
 (b) Draw the flow chart for implementing Fibonacci method. **07**
- Q.5** (a) Maximize $Z = 3x_1 + 5x_2$ subject to $x_1 \leq 4$; $2x_2 \leq 12$; $3x_1 + 2x_2 \leq 18$; $x_1, x_2 \geq 0$ using Simplex method. **07**
 (b) Discuss the optimization of pipe diameter. **07**
- OR**
- Q.5** (a) Explain the equality constraints involved in optimal design and operation of a conventional staged-distillation column. **07**
 (b) Discuss the features of basic tearing algorithm. **07**
