Seat No.: _____ Enrolment No._____

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**

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