Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII (OLD) - EXAMINATION – SUMMER 2017

Subject Code:180503 **Date:02/05/2017**

Subject Name: Process Simulation & Optimization

Time:10:30 AM to 01:00 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) Using Simplex Method, **14**

Maximize

$$y = 6x_1 + 5x_2;$$

subject to

$$2x_1 + 5x_2 <= 20;$$
$$-5x_1 - x_2 <= -5;$$
$$-3x_1 - 11x_2 <= -33$$

Q.2 (a) Using Lagrange Multipliers Method, **07**

Minimize

$$f(x) = 4x_1^2 + 5x_2^2$$

subject to

$$2x_1 + 3x_2 – 6 = 0;$$

(b) A log has the form of a frustum of cone 30 feet long, the diameters of its ends being 2 feet and 1 foot. A beam of square section is to be cut from the log. Find the length if the volume is maximum. **07**

OR

(b) Find the area of the largest rectangle with its lower base on the x-axis and whose corners are bounded at the top by the curve $y = 10 – x^2$. **07**

Q.3 (a) Minimize the quadratic function: $f(x)=x^2-x$ using Quasi-Newton Method. **07**

(b) Determine the convexity or concavity of the following function: **07**

(i) $f(x) = 2x_1^2+2x_1x_2+1.5x_2^2+7x_1+8x_2+24$

(ii) $f(x) = 2x_1 + 3x_2 + 6$

OR

Q.3 (a) Describe the steps to solve an optimization problem. What are the obstacles towards solving optimization problems? **07**

(b) Determine the optimum L/D ratio for a cylindrical storage vessel. Compare it with the thumb rule L/D = 3. List the necessary assumptions. **07**

Q.4 (a) Write a short note on degrees of freedom analysis. **07**

(b) Draw the flow chart for implementing Fibonacci method. **07**

OR

Q.4 (a) Discuss the optimization of pipe diameter. **07**

(b) List various professional simulation packages available and explain features of any one briefly. **07**

Q.5 (a) A chemical process is represented by following set of equations **07**

$f_1(x_3,x_4) = 0$; $f_2(x_5,x_2) = 0$; $f_3(x_6) = 0$; $f_4(x_6,x_1) = 0$; $f_5(x_3,x_2) = 0$; $f_6(x_4,x_5,x_1) = 0$

Determine Associated incidence matrix, digraph of the process and associated adjacency matrix.

	(b)	Explain any one tearing algorithm with all the necessary steps.	**07**

OR

Q.5	**(a)**	Discuss precedence ordering. Also write any one algorithm for precedence ordering.	**07**
	(b)	Explain equation oriented approach for simulation with example.	**07**

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