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GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VIII (OLD) EXAMINATION – SUMMER 2019****Subject Code: 180503****Date: 13/05/2019****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) Discuss the features of basic tearing algorithm. **07**
(b) Explain the meaning of following terms for optimization: feasible solution, feasible region, optimal solution, underdetermined model and over determined model. **07**

- Q.2** (a) Discuss the optimization of pipe diameter. **07**
(b) Discuss the optimization recovery of waste Heat. **07**

OR

- (b) Explain fitting of VLE data by Non linear regression. **07**

- Q.3** (a) Describe the obstacles to optimization. **07**
(b) Explain steepest descent method. **07**

OR

- Q.3** (a) The analysis of labor costs involved in the fabrication of heat exchangers can be used to predict the cost of a new exchanger of the same class. Let the cost be expressed as a linear equation. $C = \beta_1 + \beta_2 A + \beta_3 N$, **07**
Where β_1, β_2 , and β_3 are constants, N=number of tubes, A=shell surface area. Estimate the values of the constants β_1, β_2 and β_3 from the data in following table.

Labor cost (\$)	310	300	275	250	220	200	190	150	140	100
Area (A)	120	130	108	110	84	90	80	55	64	50
Number of tubes (N)	550	600	520	420	400	300	230	120	190	100

- (b) 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.

- Q.4** (a) Minimize $f(x) = x^4 - x + 1$ using Newton's method. Take starting point = 3. **07**
(b) What is linear Programming Problem? State the linear programming in standard form and write down its application in chemical industries. **07**

OR

- Q.4** (a) Determine convexity or concavity for the following functions. **07**
 $f(x) = 4x_1^2 + 6x_1x_2 + 3x_2^2 + 5x_3^2 + x_1x_3 - 3x_1 - 2x_2 + 15$
(b) Minimize $f(x) = 4x_1^2 + 5x_2^2$ subject to $2x_1 + 3x_2 - 6 = 0$ using Lagrange Multipliers method. **07**

- Q.5** (a) Differentiate between equation oriented model and modular based model. **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**

OR

- Q.5** (a) Write short note on Simulation Software. **07**
(b) Explain partitioning and tearing with example. **07**
