

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

Subject Code: 180503**Date: 03-06-2014****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)** A manufacture requires an alloy consisting of 40% tin, the remainder being made up of lead and zinc in equal proportions. This alloy can be made up by mixing a number of available tin-lead-zinc alloy, the properties and cost of which are tabulated below. Find the cost of the cheapest blend and the amount of each type of alloy which should be purchased per unit weight of alloy produced. **14**

		Available Alloys			
		1	2	3	4
Analysis	% lead	10	10	40	60
	% zinc	10	30	50	30
	% tin	80	60	10	10
Cost	Rs/ Kg	41	43	58	60

- Q.2 (a)** A length of wire is to cut in two parts. One portion is to be bent into the form of a circle, and the other into the form of a square. In what ratio must the wire be cut if the sum of the areas enclosed by the circle and square is to be the least possible? **07**
- (b)** Find the value of x in the interval $(0,1)$ which minimizes the function $f=x(x-1.5)$ with ± 0.05 using Golden Section search or Fibonacci search technique. **07**

OR

- (b)** List out limitation of Region elimination methods. Compare different region elimination methods and suggest best method for initial interval of 3.5 for accuracy of 0.1. **07**

- Q.3 (a)** Discuss optimization of evaporator design. **07**
- (b)** Minimize the function $y=(x-3)^2$ subject to the restriction $x \geq 1$. **07**

OR

- Q.3 (a)** Discuss optimization of design and operating parameters of shell and tube heat exchanger. **07**
- (b)** Explain the meaning of following terms for optimization: **07**
Feasible solution, feasible region, optimal solution, underdetermined model and over determined model.

- Q.4 (a)** Discuss feature of basic tearing Algorithm. **07**
- (b)** Discuss Newton's method of convergence promotion. Using this method solve equation $x^2-2=0$ with initial guess of $x=2$. **07**

OR

- Q.4 (a)** For modular approach to process simulation, discuss sequential modular approach in detail. **07**

- Q.4 (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.5 (a)** Find the maximum of **07**
 $Y = 10x_1^2 - 4x_1x_2 + 3x_2^2 + 5x_2x_3$
 Subject to $x_1 + 2x_2 \leq 3$, $x_2 - x_3 \geq 2$, $x_1 \geq 1$ using lagrangian multipliers.
- (b)** Find the global minimum and maximum of the function $y = x_2 - x_1^2$ if it is subject to the **07**
 restriction that $1 - x_1^2 - x_2^2 = 0$ using the penalty function method.
- OR**
- Q.5 (a)** List out multivariable analytical methods for optimization problems with restricted **07**
 variables equality constraints and explain any one of them with example
- (b)** List various professional simulation packages available and explain features of any one **07**
 briefly.
