

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 182605****Subject Name: Rubber Process & Product Computer Aided Design****Date: 14/05/2012****Time: 10.30 am – 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) Differentiate between design and simulation of product/process giving examples. **06**

(b) What is Optimization? Give examples of optimization in rubber industries. **04**

(c) Explain feasible region and constraints in context of optimization. **04**

Q.2 (a) Explain concept of region elimination methods and compare performance of different region elimination methods. **07**

(b) Write necessary and sufficient conditions for an extreme value of multivariable objective function and find out stationary point for **07**

$$y = 1 + 8x + 2x^2 - \frac{10}{3}x^3 - \frac{1}{4}x^4 + \frac{4}{5}x^5 - \frac{1}{6}x^6$$

OR

(b) An open top box is to be made out of a piece of cardboard measuring 3m X 2m by cutting off equal surfaces from the corners and turning up the side. Find height of the box for maximum volume. **07**

Q.3 (a) Write algorithm steps for simple GA for optimization and explain its working with flow chart. **07**

(b) The analysis of labor cost in the fabrication of heat exchanger can be used to predict the cost of a new exchanger of the same class. Let the cost be expressed as a linear equation **07**

$$C = \beta_0 + \beta_1 N + \beta_2 A$$

Where β_0 , β_1 , β_2 are constants, N = number of tubes and A = shell-surface area.. Estimate the values of the constants β_0 , β_1 , β_2 from the data in the table below.

Labor Cost C	Area A	Number of Tubes N
310	120	550
300	130	600
275	108	520
250	110	420
220	84	400
200	90	300
190	80	230
150	55	120
140	64	190
100	50	100

OR

Q.3 (a) Discuss effects of population size, number of generations, crossover **08**

probability and mutation probability on performance of GA.

- (b) List out numerical integration algorithms and described fourth order Runge-Kutta method. **06**
- Q.4** (a) What is black box principle? Schematically represent the structure of a simple artificial neural network and explain the terms involved. **05**
- (b) Using Newton's method minimize a quadratic function $f(x) = x^2 - x$ **05**
- (c) Explain the graphical method of solving two variable optimization problems with linear objective function and constraints. **04**

OR

- Q.4** (a) If the optimization problem is to minimize objective function **08**
 $y = 4x_1 - 3x_2$ subject to the constraints
$$x_1 - 3x_2 \leq 4$$
$$2x_1 + 4x_2 \leq 15$$
$$-x_1 + x_2 \leq 6$$
$$x_1, x_2 \geq 0$$

Find the optimum values of x_1, x_2 and y
- (b) Discuss how one dimensional search is applied to a multidimensional problem. **03**
- (c) List out different ways by which training/learning takes place in ANN and Explain each briefly. **03**

- Q.5** (a) Explain the theory and working of FEA and discuss basics of FEA for rubber product design **08**
- (b) Discuss system architecture for extruder design optimization using genetic algorithm. **06**

OR

- Q.5** (a) Discuss applications of FEA in rubber product and process design. **06**
- (b) Explain back propagation algorithm for ANN. **08**
