

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-VII (NEW) EXAMINATION – WINTER 2024****Subject Code:3172611****Date:07-12-2024****Subject Name: Rubber Product and Process Computer Aided Design****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.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

- Q.1**
- (a) What are the uses of optimization techniques in Rubber Industry? **03**
- (b) What do you mean by Computer Aided Design? Explain the use of CAD. **04**
- (c) Newton's Method applied to a quartic equation **07**
 $f(x)=4+8x^2-x^4$. Find the derivative of $f(x)$ and the second derivative, $f''(x)$.

- Q.2**
- (a) Explain the concept of optimization problem. **03**
- (b) What are the Five steps of optimization? **04**
- (c) Based on Least square method Fit the model $y=\beta_0+\beta_1x$ to the following data. Where y is the measured response and x is the dependent variable **07**

x	0	1	2	3	4	5
y	0	2	4	6	8	10

OR

- (c) Fit the straight line to the following data by using least square method. **07**

x	1	2	3	4	5
y	1	2	3	4	5

- Q.3**
- (a) Differentiate $5x^2$ with respect to x . **03**
- (b) Check the continuity of the function f given by **04**
 $f(x) = 3x + 2$ at $x = 1$.
- (c) Explain the concept of Fitting models to Data. **07**

OR

- Q.3**
- (a) Compute the derivative of $f(x) = \sin^2 x$. **03**
- (b) Check whether the given function is continuous. **04**
 (1) $f(x) = 1 + \ln x$. (2) $f(x) = 1/x$. In each case specify the range of x for which $f(x)$ and $f'(x)$ are continuous.
- (c) Describe the obstacles to solution of optimization problems. **07**

- Q.4**
- (a) State the three phases of finite element method. **03**
- (b) List the method of deciding the concavity or convexity of a function. **04**
- (c) What do you mean by Execution? Write down the sequence of steps in performing a Finite Element Analysis. **07**

OR

- Q.4**
- (a) Define the terms: - (1) Element (2) Mesh (3) Execute. **03**
- (b) Explain feasible region and constraints in context of optimization. **04**
- (c) Explain the theory and working of FEA and discuss basics of FEA for Rubber product design. **07**

- Q.5** (a) Define the terms: - (1) Node (2) Neural Network (3) Hidden layer. **03**
(b) Schematically represent the structure of a simple Artificial neural network. **04**
(c) Write algorithm steps for simple GA for optimization and explain its working with flow chart. **07**
- OR**
- Q.5** (a) List out different ways by which training/learning takes place in ANN and Explain each briefly. **03**
(b) Explain the Network Modes of training in ANN. **04**
(c) Discuss effects of population size, number of generations, crossover probability and mutation probability on performance of GA. **07**
