

Enrolment No./Seat No _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII EXAMINATION – SUMMER 2025

Subject Code:3172611

Date:21-05-2025

Subject Name:Rubber Product and Process Computer Aided Design

Time:02:30 PM TO 05:00 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 is the objective function in an optimization problem?	03												
	(b) Define design theory and its significance in rubber industry.	04												
	(c) Explain the importance of simulation in Computer-Aided Design (CAD).	07												
Q.2	(a) What are three essential features of optimization problems?	03												
	(b) Briefly describe computer-aided design (CAD) and its role in modern design processes.	04												
	(c) Fit a straight line $y=mx+c$ using the Least Squares Method	07												
Given Data:-														
<table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>y</td><td>2.2</td><td>2.8</td><td>3.6</td><td>4.5</td><td>5.1</td></tr></table>			x	1	2	3	4	5	y	2.2	2.8	3.6	4.5	5.1
x	1	2	3	4	5									
y	2.2	2.8	3.6	4.5	5.1									
OR														
(c)	Solve the following problem using the Least Squares Method and interpret the result:	07												
<table><tr><td>x</td><td>1</td><td>3</td><td>5</td><td>7</td><td>9</td></tr><tr><td>y</td><td>2</td><td>6</td><td>10</td><td>14</td><td>18</td></tr></table>			x	1	3	5	7	9	y	2	6	10	14	18
x	1	3	5	7	9									
y	2	6	10	14	18									
Is the relationship between x and y linear?														
Q.3	(a) Differentiate $5x^2$ with respect to x.	03												
	(b) Find whether the function $f(x) = \ln(x)$ is convex or concave on $(0, \infty)$.	04												
	(c) Apply Newton's Method to find an approximate root of $f(x) = x^2 - 4$ Starting with an initial guess $x_0=3$. Perform two iterations.	07												
OR														
Q.3	(a) Compute the derivative of $f(x) = \cos^2 x$.	03												
	(b) Show that the function $h(x) = -x^2$ is concave.	04												
	(c) Solve $f(x) = x^3 - x - 1 = 0$ using Newton's Method with an initial guess $x_0=1.5$. Perform two iterations.	07												
Q.4	(a) Draw the model of a single artificial neuron and derive its output.	03												
	(b) Distinguish between Learning and Training.	04												
	(c) Write any three basic components of Genetic Algorithm. Discuss the effect of Rank selection in Genetic Algorithm.	07												

OR

- Q.4** (a) List some applications of ANNs. **03**
- (b) Explain the Network Modes of training in ANN. **04**
- (c) Explain about the basic operations in genetic algorithms. **07**

- Q.5** (a) What is the basic concept of Finite Element Analysis (FEA)? **03**
- (b) Explain the concept of mesh generation in FEA. **04**
- (c) To Schedule the production in two plants, A&B each of which can manufacture two products. no1 & no2. How should scheduling take place to maximise profits while meeting the market requirements based on the following data **07**

Plant	Material Processed kg/day		Profit kg/day	
	1	2	1	2
A	M_{A1}	M_{A2}	S_{A1}	S_{A2}
B	M_{B1}	M_{B2}	S_{B1}	S_{B2}

How many days per year (365) should each plant operate processing each kind of material? Formulate the problem and discuss any one method to solve the problem.

OR

- Q.5** (a) What are the advantages and limitations of Finite Element Analysis? **03**
- (b) Explain the basic steps involved in the finite element analysis process. **04**
- (c) Discuss the continuity of the function f given by $f(x) = x^3 + x^2 - 1$. **07**