

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2023****Subject Code:3172611****Date:14-12-2023****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     |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Q.1</b> | (a) Write the scope of optimization in rubber industry.                                                                                                                                                     | <b>03</b> |
|            | (b) What do you mean by Simulation? Give examples of optimization in rubber industries.                                                                                                                     | <b>04</b> |
|            | (c) Minimize the function of $f(X) = X^2 - X + 1$ by using Newton's method.                                                                                                                                 | <b>07</b> |
| <b>Q.2</b> | (a) Explain the concept of Black Box principle.                                                                                                                                                             | <b>03</b> |
|            | (b) Write the scope of AutoCAD in rubber industry.                                                                                                                                                          | <b>04</b> |
|            | (c) Define the term:-Design. How the Simulation differs from optimization?                                                                                                                                  | <b>07</b> |
|            | <b>OR</b>                                                                                                                                                                                                   |           |
|            | (c) Explain concept of region elimination methods and compare performance of different region elimination methods.                                                                                          | <b>07</b> |
| <b>Q.3</b> | (a) Explain feasible region in context of optimization.                                                                                                                                                     | <b>03</b> |
|            | (b) Analysis of functions for continuity. Are the following functions continuous? (A) $F(x) = 1/x$<br>(B) $F(x) = 1 + \ln x$ . in each case specify the range of x for which f(x) and f'(x) are continuous. | <b>04</b> |
|            | (c) Give the classification of theoretically and empirical base mathematical model.                                                                                                                         | <b>07</b> |
|            | <b>OR</b>                                                                                                                                                                                                   |           |
| <b>Q.3</b> | (a) What are the three factors of optimization?                                                                                                                                                             | <b>03</b> |
|            | (b) Write any four steps of a simulation Process.                                                                                                                                                           | <b>04</b> |
|            | (c) Minimize the function $F = X^4 - 20X^3 + 0.1X$ , interval (0, 1) by using Fibonacci method.                                                                                                             | <b>07</b> |
| <b>Q.4</b> | (a) List out the types of nodes.                                                                                                                                                                            | <b>03</b> |
|            | (b) List any four advantages of Finite element method.                                                                                                                                                      | <b>04</b> |
|            | (c) Based On Least Square Method Fit the Model $y = \beta_0 + \beta_1 x$ to the following data. Where y is the measured response and x is the dependent variable.                                           | <b>07</b> |

|   |   |   |   |   |    |    |
|---|---|---|---|---|----|----|
| x | 0 | 2 | 3 | 4 | 5  | 6  |
| y | 0 | 4 | 6 | 8 | 10 | 12 |

**OR**

--P.T.O.--

- Q.4** (a) Define the terms :-( 1) Node (2) Joint (3) Element. **03**  
(b) Explain the three phases of finite element method. **04**  
(c) Explain the step-by-step procedure of FEA. **07**
- Q.5** (a) Explain Biological Neural Network and Artificial Neural network? **03**  
(b) Write the method of deciding the concavity or convexity of a function. **04**  
(c) Explain some basic concepts and terms related to Genetic Algorithm. **07**
- OR**
- Q.5** (a) Define the Terms: - (1) Execute (2) Mutation (3) Crossover. **03**  
(b) How many types of the artificial neural network used in machine learning? **04**  
(c) What is roulette wheel selection? Explain in detail. **07**

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