

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III(NEW) EXAMINATION – WINTER 2022

Subject Code:3132606

Date:20-02-2023

Subject Name:Numerical methods & Viscoelastic models of Elastomers

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.

- Q.1** (a) Define the term: Plasticity, Flow and Modulus of Rigidity. **03**
(b) Write the definition of Poisson's ratio and Give the reason for Poisson's ratio to be positive. **04**
(c) Discuss in detail about the Young modulus and Bulk modulus. **07**

- Q.2** (a) A volume of 5 liters of water is compressed by a pressure of 20 atmospheres. If the bulk modulus of water is 20×10^8 N/M². Find the change produced in the volume of water. Density of Mercury = 13600 kg/m³, $g=9.8$ m/s². Normal Atmospheric pressure = 75cm of mercury. **03**
(b) List out the factors affecting Glass transition temperature. **04**
(c) Discuss in detail about the state of aggregation. **07**

OR

- (c) Explain in detail about the Transition and associated properties. **07**

- Q.3** (a) Define the terms: (i) Time dependent fluid (ii) Thixotropic fluid (iii) Bingham fluid **03**
(b) Write a brief note on Rheopectic fluids. **04**
(c) Derive the relationship between viscosity and energy dissipation. **07**

OR

- Q.3** (a) Write the importance of Newtonian fluid. **03**
(b) Give the difference between Newtonian fluid and Bingham plastic fluid. **04**
(c) Explain the different kinds of behavior of Thixotropic fluid and Rheopectic fluids in detail. **07**

- Q.4** (a) Write a brief note on Newton's model. **03**
(b) Derive the stress relaxation experiment equation for Maxwell model. **04**
(c) Derive the equation of Creep experiment for Voigt model. **07**

OR

- Q.4** (a) Explain a brief note on Deborah number. **03**
(b) Give the broad classification of polymeric material based on mechanical behavior. **04**
(c) Derive the equation of Creep experiment for Maxwell model. **07**

- Q.5** (a) Write about the structure of an Ideal Rubber **03**
(b) List out the factors affecting viscosity. **04**
(c) Short note on “Capillary Viscometer”. **07**

OR

- Q.5** (a) “Molecular weight affect the viscosity of Liquid” justify the statement. **03**
(b) Write a brief note on Viscosity and its nomenclature. **04**
(c) Discuss in detail about the elasticity of network. **07**
