Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3132606 Date:11-07-2022

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: Stress, Bulk modulus and Viscosity.	**03**
	(b)	Give the concept of Auxetic materials with suitable examples and figures.	**04**
	(c)	Write a short note on Modulus of Rigidity.	**07**
Q.2	**(a)**	A nylon string has a diameter of 1.2mm, pulled by a force of 90N. Determine the tensile stress.	**03**
	(b)	List out the factors affecting Glass transition temperature.	**04**
	(c)	A rectangular block has been molded using SBR rubber with 30% styrene content. The area of the upper face of the block is 6m × 6m and the lower face is fixed. The height of the block is 15cm. A compressive force of 1.875 × 106 N applied to the top face produces a volume contraction of 15%. Calculate: (i) Contraction of volume (in m^3) (ii) Tg of the raw polymer (iii) Volumetric Stress (iv) Bulk modulus. And explain the consequence of replacing the raw polymer by SBR rubber with 10% styrene content.	**07**
		OR	
	(c)	Discuss in detail about "Molecular weight affect the glass transition temperature"	**07**
Q.3	**(a)**	Define the terms: (i) Retardation (ii) Rheopectic fluid (iii) Newtonian fluid	**03**
	(b)	Write a brief note on visco plastic fluids.	**04**
	(c)	Derive the relationship between viscosity and energy dissipation.	**07**
		OR	
Q.3	**(a)**	Write the importance of viscoelastic fluid.	**03**
	(b)	Give the difference between Newtonian and Non Newtonian fluid.	**04**
	(c)	Explain the different kinds of behavior of Dilatant and Bingham plastic fluids in detail.	**07**
Q.4	**(a)**	Write a brief note on Hook's model.	**03**
	(b)	Derive the stress relaxation experiment equation for Maxwell model.	**04**
	(c)	Discuss the Four parameter model in detail.	**07**
		OR	
Q.4	**(a)**	Explain a brief note on Retardation spectra.	**03**
	(b)	Give the broad classification of polymeric material based on mechanical behavior.	**04**
	(c)	Short note on Voight model.	**07**

Q.5	**(a)**	Define the terms : (i) Specific viscosity(ii) Dynamitic viscosity (iii) kinematic viscosity	**03**
	(b)	List out the factors affecting viscosity.	**04**
	(c)	Short note on “Capillary Viscometer”.	**07**

OR

Q.5	**(a)**	“Temperature affect the viscosity of Liquid” justify the statement.	**03**
	(b)	Write a brief note on Viscosity and its nomenclature.	**04**
	(c)	Describe the transitions and associated properties with respect to glass transition temperature.	**07**