Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – WINTER 2023

Subject Code:3132606 Date:12-01-2024

Subject Name:Numerical methods & Viscoelastic models of Elastomers

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.**

Q.1	**(a)**	A wire is stretched by the application of a force of 50 kg wt/sq. cm. What is the percentage increase in the length of the wire? $Y = 7 \times 10^{10}$ N/m², g = 9.8 m/s²	**03**
	(b)	A rubber thread ($Y = 20 \times 10^{10}$ N/m². and $\sigma = 0.26$) of length 3 m and diameter 0.1 cm is stretched by a load of 10 kg. Calculate the decrease in diameter of the wire.	**04**
	(c)	Discuss in detail about the types of stresses with suitable example.	**07**
Q.2	**(a)**	Mention the effective ways of physical crosslink chains.	**03**
	(b)	Define the terms: (i)Viscosity (ii) Elasticity (iii) Viscoelasticity (iv) Newtonian fluid	**04**
	(c)	Describe the effect of Entropy of Elasticity in detail.	**07**
		OR	
	(c)	Discuss in detail about the phenomena of Viscous flow.	**07**
Q.3	**(a)**	Mention the requirement and properties of typical elastomer.	**03**
	(b)	Derive the equation of viscosity and write its nomenclature.	**04**
	(c)	Draw the figure of Oswald viscometer and explain it in detail.	**07**
		OR	
Q.3	**(a)**	Write about the Ideal elastomer with its equation.	**03**
	(b)	State the three assumptions of experiments on polydisperse polymers.	**04**
	(c)	Derive the equation of specific viscosity for a dilute solution of hard spheres.	**07**
Q.4	**(a)**	Classify the polymeric materials based on mechanical behaviour.	**03**
	(b)	Distinguished between Relaxation and Retardation spectra.	**04**
	(c)	Derive the equation of Creep experiment for Voigt model.	**07**
		OR	
Q.4	**(a)**	Draw the figure of Four parameter model and discuss it in brief.	**03**
	(b)	Explain a brief note on Time –Temperature superposition principle.	**04**
	(c)	Discuss in detail about the Ideal solid and Ideal liquid material model.	**07**
Q.5	**(a)**	State the three major observation of phase state of substance.	**03**
	(b)	Draw the figure and write the working principle of Dilatometer.	**04**
	(c)	Discuss in detail about the explanation of Dilatant fluid.	**07**

OR

Q.5	**(a)**	Distinguished between crystalline and amorphous.	**03**
	(b)	Write the effect of chain flexibility and geometric factor on glass transition temperature.	**04**
	(c)	Draw the classification flow chart of fluid and explain any one in detail.	**07**

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