GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–III (NEW) EXAMINATION – SUMMER 2021

Subject Code:3132606   **Date:06/09/2021**
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.

			Marks
Q.1	**(a)**	Define the term: Stress, Bulk modulus and Viscosity.	**03**
	(b)	Give the difference between Bulk modulus and Young modulus.	**04**
	(c)	Write a short note on Modulus of Rigidity.	**07**
Q.2	**(a)**	List out the factors affecting Glass transition temperature.	**03**
	(b)	A 2.0-m-long steel rod has a cross-sectional area of 0.30cm2. The rod is a part of a vertical support that holds a heavy 550-kg platform that hangs attached to the rod's lower end. Ignoring the weight of the rod, what is the tensile stress in the rod and the elongation of the rod under the stress? Young's modulus for steel is $Y=2.0\times10^{11}$ Pa.	**04**
	(c)	Discuss Transition and associated properties with respect to glass transition temperature in detail.	**07**

OR

	(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**
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)**	"Temperature affect the viscosity of Liquid" justify the statement.	**03**
	(b)	Write a brief note on Viscosity and its nomenclature.	**04**
	(c)	Explain in detail about states of aggregation and stats of Phase.	**07**

OR

Q.4	**(a)**	Define the terms : (i) Intrinsic viscosity(ii) Dynamic viscosity (iii) kinematic viscosity	**03**
	(b)	List out the factors affecting viscosity.	**04**
	(c)	Short note on "Capillary Viscometer".	**07**

Q.5	**(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**

OR

Q.5	**(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**

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