Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2142606 **Date: 03/06/2017**

Subject Name: Viscoelasticity 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. Use the Graph paper whenever necessary.

Q.1		**Answer the following.**	**14**
	1	Define the term Plasticity.	
	2	What is the unit of Viscosity?	
	3	What do mean by Hookean Elasticity?	
	4	Write about the Deborah number.	
	5	What do you mean by Relaxation spectra?	
	6	List the instrument to measure the shear viscosity.	
	7	Give the importance of Compression and Tensile test.	
	8	Write the name of time independent Fluid.	
	9	What is the Glass transition temperature of polybutadiene and Polystyrene?	
	10	Write the observation from the phase states of substance and their comparison with the states of aggregates.	
	11	What do you mean by Viscous Flow?	
	12	Define the term "Rheopectic fluid".	
	13	Write the Superposition principal.	
	14	Give the difference between Viscosity and Apparent Viscosity	
Q.2	**(a)**	**Write the Importance of Modulus of rigidity.**	**03**
	(b)	**Find the stress on a bone (1 cm in radius and 50 cm long) that supports a mass of 100 kg. Find the strain on the bone if it is compressed 0.15 mm by this weight. Find the proportionality constant C for this bone.**	**04**
	(c)	**Derive the relationship between Viscosity and Energy dissipation.**	**07**
		OR	
	(c)	**Short note on: "Viscoelastic Fluids".**	**07**
Q.3	**(a)**	**Give the difference between Bulk Modulus and Young Modulus.**	**03**
	(b)	**Write about the Ideal Elastomer.**	**04**
	(c)	**Describe the Kinetic theory of Rubber Elasticity.**	**07**
		OR	
Q.3	**(a)**	**Define the term Viscosity & Write it's Nomenclature.**	**03**
	(b)	**Write a short note on "Hook's Law".**	**04**
	(c)	**Explain about the Glassy state & Glass transition.**	**07**
Q.4	**(a)**	**Write the Newton's law & Give the classification of Fluid behaviour.**	**03**
	(b)	**Write about Dilatant behaviour of fluid.**	**04**
	(c)	**Explain about the Non Newtonian fluids in detail.**	**07**

OR

…..P.T.O…..

Q.4 (a) Write about the viscoplastic fluid behaviour. 03

(b) Toluene behaves as a plasticizer for polystyrene. Estimate Tg of a polystyrene sample containing 20 vol% toluene. 04

(c) An unknown polymer melt shear stress rate of shear data is given below. 07

Shear stress (τ,N/m2)	2.5	5.2	7.4	17	33	59
Shear rate (-du/dr, s-1)	0.75	2	3.1	13.5	33.9	67.7

(a) Characterize the Fluid behaviour.

(b) Plot the graph shear stress vs. shear rate and find out the viscosity of polymer melt.

Q.5 (a) Write about the Creep Compliance and Relaxation Modulus. 03

(b) Write about the Stress relaxation experiment with respect to Maxwell Model. 04

(c) Short note on Four-Parameter Model. 07

OR

Q.5 (a) Write the molecular requirements of Elastomer. 03

(b) Describe the transitions and associated properties with respect to glass transition temperature. 04

(c) Explain the Voigt Model in detail. 07

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