

Subject Code: 3132606

Date: 26/11/2019

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.

		Marks
Q.1	(a) State the differences between Young modulus, Bulk modulus and Modulus of Rigidity.	03
	(b) Give the concept of Auxetic materials with suitable examples and figures.	04
	(c) Explain the importance of Poisson's Ratio and Derive equations for relation between the different modulus.	07
Q.2	(a) A nylon string has a diameter of 2mm, pulled by a force of 100N. Determine the tensile stress.	03
	(b) List out the factors affecting viscosity.	04
	(c) Explain the viscosity theory with suitable example.	07
	OR	
	(c) Draw the schematic diagram of "Oswald Viscometer" and explain it in detail.	07
Q.3	(a) Write a brief note on Newton's model.	03
	(b) Derive the stress relaxation experiment equation for Voight model.	04
	(c) Discuss in detail about the non Newtonian fluid.	07
	OR	
Q.3	(a) Explain a brief note on Deborah number.	03
	(b) Give the broad classification of polymeric material based on mechanical behavior.	04
	(c) Explain in detail about time dependent fluids.	07
Q.4	(a) How can you estimate the T_g with the help of Bulk properties?	03
	(b) List the required properties for Elastomers.	04
	(c) Discuss in detail about the structure of an ideal rubber.	07
	OR	
Q.4	(a) Show the dependence of shear rate on shear stress for Newtonian fluid with the help of diagram.	03
	(b) Summarize the molecular requirements of elastomer.	04
	(c) Derive the equation for force constant using entropy elasticity theory.	07
Q.5	(a) Define the terms: (i) Glass transition temperature (ii) Flow temperature (iii) Melting point	03
	(b) Classify the different types of motions exhibited within a polymeric material.	04
	(c) Discuss about the nature of curve showing variation in specific volume versus temperature for polymeric substances.	07
	OR	
Q.5	(a) Relate the Glass transition temperature and Melting point for symmetrical and unsymmetrical polymers respectively.	03
	(b) Summarize the change of state with temperature in polymeric materials.	04
	(c) Discuss in detail about the factors influencing the Glass transition temperature.	07
