Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – WINTER • 2014

Subject Code: 152604 Date: 01-12-2014

Subject Name: Rheology of Rubber

Time: 10.30 am - 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.**

Q.1 Answer the following **14**

(i) Define the term viscosity and derive its unit.

(ii) Differentiate pseudoplastic and dilatant fluid behavior with the help of stress strain curve.

(iii) Write power law model.

(iv) Calculate the viscosity of a fluid which flows at 1.2 s^{-1} when 2.5 N/m^2 stress is applied.

(v) Explain the test for determination of PRI.

(vi) Give the difference between rotation plastimeter and compression plastimeter.

(vii) Write in brief about working of Extrusion plastimeter.

Q.2 **(a)** Explain and derive Newton's law of viscosity. **07**

(b) Derive the equation of maximum velocity for flow through a circular tube. **07**

OR

(b) Derive the expression for velocity distribution of Newtonian fluid flowing through an extruder. **07**

Q.3 **(a)** Derive the mathematical expression for determining viscosity of Newtonian fluid in Cup and bob viscometer **10**

(b) Draw the table showing different viscometers and their viscosity range. **04**

OR

Q.3 Derive the expression for determining viscosity of pseudoplastic fluid flowing through capillary viscometer. **14**

Q.4 **(a)** For an unknown polymer melt shear stress- shear rate data is given below. Apply Bingham model to this data and calculate the constants. **10**

τ x $10^{-4} N/m^2$	(-du / dr) s^{-1}
2.5	0
5.0	1.0
7.5	1.5
10.0	2.0
12.5	2.5
15.0	3.0
17.5	3.5
20.0	4.0
22.5	4.5
25.0	5.0
27.5	5.5

(b) Discuss the rheology of mixing mill. **04**

OR

Q.4 **(a)** Discuss the parameters affecting viscosity of polymer melts. Explain any one in detail. **08**

	(b)	Write a note on creep behavior.	**06**
Q.5	**(a)**	Explain Burger model for Viscoelasticity.	**07**
	(b)	Describe coaxial cylinder viscometer with axial motion.	**07**
		OR	
Q.5	**(a)**	Write a note on plunger and Gallen Kamp Torsion viscometer.	**07**
	(b)	Discuss Relaxation phenomena.	**07**

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