CHL 392 - Polymer Science and Engineering
Major - (30.04.08)

Time: 2 hour **Total Marks: 40**

Use separate answer booklet for each part

Part-I

Q1. (a) Show theoretieally why a polymeric liquid shows rod climbing effect.

(b) Write down the various types of flows most often used to charaeterize polymerie liquids.
Write down the veloeity field for eaeh of them in simple flows.

(C) Conc and plate viscometer: Find the expression of total thrust in the z-direction excrted by the fluid on the cone. State elcarly the assumption involved in the derivation. Why dctermination of the thrust important in the ease of non-Newtonian liquid?

Marks: 4+3+9

Q2. (a) Find thc effeet of interfacial tension bctween polymer melt and crystalline polymer on eritieal size of crystal nuclei formation in homogeneous polymer erystallization.
(b) In ease of polymer blends the miscibility depends entirely on the energetic of the intcrmoleeular interaetion (χ parameter)-Explain

Marks : 2+2

Q3. (a) State the differenee between a flexible and a semi flexible polymer?
(b)Find out the Kuhn length for polyethylene oxide of 10^5 molecular weight (M_w). Given: $R_g^2=1.176\times10^{-3}\ M_w\ nm^2$ for PEO in theta solvcnt, C-C and C-O bond length is 0.154, 0.144 nm respectively. State the assumptions.

(c)How the Square end to end distance varies with degree of polymerization or Kuhn segment length in good, poor and theta solvent? Explain the variation.

Marks : 1+2+2

Part – II

Q.1. a) Define relaxation time of a polymer.

b) Derive the expression for storage and loss moduli for a viscoelastic material behaving as Maxwell model subjected to sinusoidal loading.

c) Write the expression for stress relaxation modulus for a polymer which can be represented by two Maxwell models in parallel.

(5 Marks)

Q.2. a) List and discuss the steps involved in processing of polymers to make
i) car bumpers and ii) plastic pipes

b) State the significance of screw characteristic curve in extrusion process and list the parameters that control maximum output.

(6 Marks)

Q.3. a) List four unique characteristics of polymers.