

# ***B.Tech. Degree III Semester Examination in Polymer Science and Rubber Technology, November 2008***

## **PTF 1303 POLYMER SCIENCE I** (New Scheme)

Time : 3 Hours

Maximum Marks : 100

### **PART A**

(Answer **ANY FIVE** questions)  
(Each question carries **FIVE** marks)

(5 x 5 = 25)

- I
- a) Distinguish linear, branched and cross linked polymers. How are they formed?
  - b) Are initiators catalysts? How will you choose an initiator for a free radical polymerization? How is redox initiation different from free radical initiation?
  - c) Why is the choice of the solvent very critical in cationic polymerizations?
  - d) Distinguish polycondensation type and polyaddition type step growth polymerizations with examples.
  - e) Explain Flory's equal reactivity principle. How is this principle justified?
  - f) What is the need for several molecular weight averages like  $\overline{Mn}$  and  $\overline{Mw}$  for characterizing polymers? What is the significance of  $\overline{Mw} / \overline{Mn}$ ?
  - g) Distinguish a good solvent from a poor solvent.

### **PART B**

(Answer **FIVE** questions)  
(Each question carries **FIFTEEN** marks)

(5 x 15 = 75)

- II
- a)
    - i) Distinguish thermoplastic polymers and thermosetting polymers. (3)
    - ii) Describe the preparation, properties and applications of thermoplastic and thermosetting polymers taking a typical example each from these polymers. (12)
- OR**
- b)
    - i) Explain the structural difference between plastics and rubbers giving typical examples. (8)
    - ii) Which types of polymers can be used both as plastics and fibres? Why? (7)
- III
- a)
    - i) Describe the use of chain transfer agents, inhibitors and retarders giving examples. (10)
    - ii) What is auto acceleration? How does it affect the polymerization? (5)
- OR**
- b) Distinguish cationic and anionic polymerizations with respect to the types of monomers, typical catalysts and polymerization reactions. (15)
- IV
- a) Explain the conditions for getting commercially useful condensation polymers from reactants of functionality two. (15)
- OR**
- b)
    - i) What is gel point in three dimensional network step reaction polymerization? (5)
    - ii) What is the significance of gel point? (5)
    - iii) How can you predict gel point? (5)

(Turn over)

- V a) i) Why does membrane osmometry give  $\overline{Mn}$  while light scattering yields  $\overline{Mw}$ ? (5)
- ii) Describe the working principle of a membrane osmometer and how  $\overline{Mn}$  can be determined. (10)
- OR**
- b) i) What is meant by polymer fractionation? (3)
- ii) Explain how molecular weight distribution can be obtained by Gel permeation chromatography. (12)
- VI a) i) What is an ideal solution? (3)
- ii) Derive an expression for the free energy of mixing for an ideal solution. (9)
- iii) Why do polymer solutions exhibit large deviations from the ideal law? (3)
- OR**
- b) i) Explain the significance of polymer-solvent interaction parameter  $\chi$ . (3)
- ii) Derive the Flory-Huggins expression for the free energy of mixing of a polymer solution. (12)