C 3411

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Second Semester

Textile Technology

TT 1151 — POLYMER SCIENCE

(Common to Textile Technology (Textile Chemistry))

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write down the structural formulae and IUPAC names of monomeric units that present in (a) PMMA and (b) Teflon.

2. Bring out the significance of degree of polymerisation.

3. What are living polymers? Why are they called so?

4. What is copolymerization?

5. Outline the principle involved in differential scanning calorimetry.

6. Differentiate between Tg and Tm.

7. How is polycarbonate produced?

8. Mention the applications of carbon fibres.

9. Why does crystal defects arise?

10. What is spin coating?

PART B — (5 × 16 = 80 marks)

11. (a) How are the following manufactured? Explain their uses.

(i) Acrylonitrile (4)

(ii) Vinyl chloride (4)

(iii) Styrene and (4)

(iv) Butadiene. (4)

Or

(b) Explain the following types of polymers, their origin, general characteristics and industrial uses.

(i) Natural and synthetic polymers (4)

(ii) Organic and Inorganic polymers (4)

(iii) Thermoplastic and thermosets and (4)

(iv) Plastics, elastomers and fibres. (4)

12. (a) (i) Explain ionic polymerisation reaction mechanism with a suitable example. (8)

(ii) Discuss the emulsion polymerisation technique and its merits. (8)

Or

(b) (i) What are Ziegler – Natta catalysts? How are they useful as coordination catalysts? Explain giving examples. (8)

(ii) Compare bulk and solution polymerisation techniques with their merits and demerits. (8)

13. (a) (i) A polymer sample consists of 10 % by weight of macromolecules of molecular weight 20,000 and 90% by weight of macromolecules with molecular weight 1,20,000. Calculate the number average and weight average molecular weights. (6)

(ii) Explain atactic, isotactic and syndiotactic polymers with examples. (6)

(iii) Briefly write down the influence of crystallinity on polymer properties. (4)

Or

(b) (i) 28.000 g of ethane was polymerized by radical polymerisation process and the average degree of polymerisation of polythene was found to be 5000. Calculate the number of ethane molecules in original sample and the number of molecules of polythene produced. (4)

(ii) Explain how thermogravimetry is useful for the characterization of polymers. (6)

(iii) Discuss the following properties of polymeric molecules.

(1) Optical property and

(2) Weather resistant property. (6)

14. (a) (i) Explain the preparation, characteristics and synthetic uses of polyurethane. (8)

(ii) What are conducting polymers? How are they produced? Indicate their uses. (8)

Or

(b) (i) Discuss in detail, the synthetic preparation, properties and industrial applications of polystyrene. (8)

(ii) Explain the preparation, properties and uses of carbon fibres. (8)

15. (a) (i) What are spherulites? How are they produced? (4)

(ii) Explain the powder coating technique and its merits. (8)

(iii) Give a brief account on U.V. stabilizers. (4)

Or

(b) (i) Discuss the role of the following in polymer processing with suitable examples.

(1) Flame retardants (3)

(2) Mold release agents (3)

(3) Viscosity control additives. (3)

(ii) Explain briefly the film extrusion process. (7)
