(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0931 Roll No.

B.Tech

(SEM III) ODD SEMESTER THEORY EXAMINATION 2009-10

POLYMER SCIENCE & TECHNOLOGY

Time : 3 Hours] *[Total Marks : 100*

Note : (i) Attempt **all** questions.
(ii) Be precise in your answer.

1 Attempt any **four** parts of the following : **5×4=20**

(a) Define and give examples for
(i) monomer
(ii) functionality
(iii) degree of polymerisation
(iv) block co-polymer.

(b) Mention merits and demerits of various phase techniques used for polymerisation.

(c) A polymer sample consists of 10 molecules of molecular weight 5000, 15 molecules of molecular weight 7500, 15 molecules of molecular weight 10000, 20 molecules of molecular weight 15000, 30 molecules of molecular weight 20000 and 10 molecules of molecular weight 25000. Calculate the number average and weight average molecular weight of the polymer.

(d) Write short notes on :
(i) Starch
(ii) DNA.

(e) What are the factors on which the strength and crystalline nature of polymers depend ?

(f) Explain how end group analysis and colligative properties can be used to determine molecular weight during characterization of polymers ?

2 Attempt any **two** parts of the following : **10×2=20**

(a) Describe kinetics of chain polymerisation by free radicals. Obtain expression for rate of polymerisation.

(b) Write brief notes on :

(i) High performance polymers

(ii) Additives for polymers.

(c) What are composite polymers ? Give in brief the applications of composite polymers.

3 Attempt any **four** parts of the following : **5×4=20**

(a) Distinguish between chain growth and step growth polymerisation.

(b) What are initiators ? Show the generation of free radicals by the decomposition of -

(i) Benzoyl peroxide

(ii) Azobisisobutyronitrile

(iii) Persulphate

(iv) Fe^{2+} / H_2O_2.

(c) Write notes on the following :

(i) Epoxy resins

(ii) Urea-formaldehyde resins.

(d) In the monomer $R-CH=CH_2$, if R is an electron donating group, cationic polymerisation is favoured whereas if R is an electron withdrawing group anionic polymerisation is favoured, why ?

(e) Write mechanism of Zeigler-Natta polymerisation. What are the advantages of this process over free radical polymerisation. Write the structure of stereo-regular polypropylene.

(f) Discuss the mechanism of anionic polymerisation. Why is this process also called "LIVING POLYMERISATION" ? Explain.

Attempt any **two** parts of the following : **10×2=20**

(a) Write a brief note on :

(i) Elastomers

(ii) Emulsion polymerisation.

(b) Why monomers used in step growth polymerisation yield long chain polymers ? What polymer is formed when -

(i) adipic acid reacts with 1, 6-diamino hexane

(ii) terephthalic acid reacts with ethylene glycol

Discuss important applications of the above polymers.

(c) Provide a complete mechanism for the polymerisation reaction of styrene to give polystyrene using benzoyl peroxide as a catalyst. Explain the term "Back biting" as encountered in free radical chain growth polymerisation and its consequences.

5 Attempt any **four** parts of the following : **5×4=20**

(a) Distinguish between thermoplastic and thermosetting polymers. Give two examples for each type.

(b) Write a brief note on the application of polymers in space and in building construction.

(c) Describe the preparation and applications of Bakelite.

(d) Discuss preparation, structure and technical applications of SBR.

(e) What are Silicones ? Explain the special properties of silicones which have resulted in silicones being used in varied engineering and medical fields.

(f) Write brief note on :

(i) Application of polymers in medicine

(ii) PVA.
