

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III (NEW) EXAMINATION – SUMMER 2024****Subject Code:3132301****Date:19-07-2024****Subject Name:Plastics Material Science****Time:10:30 AM TO 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.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

- Q.1** (a) Identify the functionality of following monomers: (i) CH_3COOH (ii) $\text{CH}_2=\text{CH}_2$ (iii) $\text{H}_2\text{NCH}_2\text{COOH}$ **03**
- (b) Explain Bulk polymerization technique with its advantages. **04**
- (c) Give classification of different types of Polymers with suitable example. **07**
- Q.2** (a) Define: (i) Organic Polymer (ii) Functionality (iii) Glass transition temperature. **03**
- (b) Give structures of: PP, PS, PVC, PAN **04**
- (c) Explain Number average (M_n) and weight average molecular weight (M_w) concept for Polymers. **07**
- OR**
- (c) Explain isotactic, syndiotactic and atactic polymers with suitable example. **07**
- Q.3** (a) Define: (i) Degree of Polymerization (DP) (ii) Natural Polymer (iii) Homopolymer. **03**
- (b) Differentiate between polymers and low molecular weight compounds. **04**
- (c) State and explain various factors influencing glass transition temperature (T_g). **07**
- OR**
- Q.3** (a) Draw the Specific volume v/s temperature graph for (a) Highly crystalline (b) amorphous (c) Semi-crystalline polymers. **03**
- (b) The density of PET sample is 1.407 g/cm^3 . The density of PET crystalline phase is 1.515 g/cm^3 and of the PET amorphous phase is 1.335 g/cm^3 . Calculate volume and mass crystallinity. **04**
- (c) Explain cationic polymerization steps with suitable example. **07**
- Q.4** (a) Define Initiator. Give any three initiator used in free radical polymerization. **03**
- (b) Give difference between Step and Chain Polymerization **04**
- (c) Describe Polydispersity and Molecular weight distribution in polymers. **07**
- OR**
- Q.4** (a) State the difference between amorphous & crystalline polymers. **03**
- (b) Explain Linear, Branched and cross-linked polymer structures. **04**
- (c) Explain free radical polymerization steps using suitable example. **07**
- Q.5** (a) Give equation to calculate Number average, weight average molecular weight and poly dispersity index (PDI). **03**
- (b) Define Copolymer and explain different types of copolymers. **04**
- (c) Explain various factors affecting polymer crystallinity. **07**
- OR**
- Q.5** (a) Give T_g of PVC, PE and PS. **03**
- (b) Explain Suspension Polymerization Technique with its advantages and disadvantages. **04**
- (c) Calculate M_n , M_w and Polydispersity Index (PDI) for a polymer consisting of three fractions with molecular weights, 20000, 30000 and 40000. The mole fractions of each of these fractions are found to be 0.3, 0.4 and 0.3 respectively. **07**
