

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-III (NEW) EXAMINATION – WINTER 2024****Subject Code:3132301****Date:26-11-2024****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.

- Q.1** (a) Define: Polymer, Initiator and Homopolymer **03**
 (b) Give structures of: PVC, PP, Polyvinyl alcohol, PE **04**
 (c) Give classification of polymers and explain them with suitable example. **07**
- Q.2** (a) Calculate average functionality of (i) CH_3COOH , (ii) $\text{H}_2\text{NCH}_2\text{COOH}$, (iii) $\text{HOOCCH}_2\text{CH}(\text{OH})\text{COOH}$ **03**
 (b) Explain Bulk polymerization technique with its advantages. **04**
 (c) Explain factors affecting polymer crystallinity. **07**
- OR**
- (c) Explain free radical Polymerization. **07**
- Q.3** (a) Explain Linear, Branched and crosslinked polymer structures. **03**
 (b) Define Copolymer and give different types of copolymers with suitable example. **04**
 (c) Differentiate between Low molecular weight compounds and Polymers **07**
- OR**
- Q.3** (a) Define Degree of polymerization (DP). Calculate the molecular weight of a sample of polyethylene $[(\text{CH}_2-\text{CH}_2)_n]$, which has number of repeating units i.e, DP is 2000. **03**
 (b) Explain Suspension Polymerization technique. **04**
 (c) Define Glass transition temperature. Explain various factors affecting glass transition temperature with suitable examples. **07**
- Q.4** (a) Give definition of following with example. (i)Homochain Polymer(ii) Heterochain Polymer **03**
 (b) Differentiate between step and chain polymerization **04**
 (c) Discuss Polydispersity and Molecular weight distribution in polymers. **07**
- OR**
- Q.4** (a) Describe following polymer reactions (i) Hydrolysis (ii) Acidolysis **03**
 (b) Explain Cationic polymerization. **04**
 (c) Explain Number average (M_n) and weight average molecular weight (M_w) concept for Polymers. **07**
- Q.5** (a) Define Inhibitors. Give two examples of inhibitors. **03**
 (b) The density of PET sample is 1.450 g/cm^3 . The density of PET crystalline phase is 1.550 g/cm^3 and of the PET amorphous phase is 1.350 g/cm^3 . Calculate volume and mass crystallinity. **04**
 (c) Define tacticity. Explain Isotactic, syndiotactic and atactic polymers with suitable example. **07**

OR

- Q.5** (a) Draw the Specific volume v/s temperature graph for (a) Highly crystalline (b) amorphous (c) Semi-crystalline polymers. **03**
- (b) Differentiate between amorphous & crystalline polymers. **04**
- (c) Calculate M_n , M_w and Polydispersity Index (PDI) for a polymer consisting of three fractions with molecular weights, 10000, 20000 and 40000. The mole fractions of each of these fractions are found to be 0.3, 0.5 and 0.2 respectively. **07**
