

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III EXAMINATION – SUMMER 2025****Subject Code:3132301****Date:29-05-2025****Subject Name: Plastics Material Science****Time:02:30 PM TO 05:00 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) Draw the structures of PP, PVC, PS. 03
 (b) What are Homopolymers and copolymers? Explain types of copolymers. 04
 (c) Explain Bulk polymerization technique with its advantages, limitations and applications. 07
- Q.2** (a) Define: Initiator. Write brief about initiators used for polymers. 03
 (b) Differentiate between polymers and low molecular weight compounds. 04
 (c) Explain free radical polymerization steps in detail. 07
- OR**
- (c) Explain different type of polymers with suitable example. 07
- Q.3** (a) Give the difference between amorphous and crystalline polymers. 03
 (b) Explain Isotactic, syndiotactic and atactic polymers. 04
 (c) Calculate the Glass transition temperature (T_g) of a copolymer of vinyl chloride and Vinyl acetate containing 20 wt% vinyl acetate. 07
 Given, T_g of PVC= 87 °C, T_g of Poly vinyl acetate= 32 °C
- OR**
- Q.3** (a) Define: Glass transition temperature, Functionality, Monomer. 03
 (b) Calculate average functionality of (i) OHCH₂CH₂OH (ii) HC≡CH (iii) H₂NCH₂OH, (iv) H₂NCH₂CH(OH)COOH 04
 (c) Explain various factors affecting glass transition temperature with suitable examples. 07
- Q.4** (a) Explain Linear, Branched and crosslinked polymer structures. 03
 (b) The density of PET sample is 1.440 g/cm³. The density of PET crystalline phase is 1.550 g/cm³ and of the PET amorphous phase is 1.330 g/cm³. Calculate volume and mass crystallinity. 04
 (c) Explain various factors affecting polymer crystallinity. 07
- OR**
- Q.4** (a) Give catalyst used in cationic and anionic polymerizations. 03
 (b) Explain Emulsion polymerization technique and CMC. 04
 (c) Explain Polyaddition Polymerization with suitable example. 07
- Q.5** (a) Give definition of Degree of polymerization (DP). 03
 Calculate the molecular weight of a sample of polyethylene [(CH₂-CH₂)_n], which has number of repeating units i.e, DP is 4000.
 (b) Define Homochain Polymer and Heterochain Polymer and give an example of each. 04
 (c) What is PDI? Discuss Polydispersity and Molecular weight distribution in polymers. 07

OR

- Q.5** (a) Give Tg of: PE, PP, PS **03**
(b) Differentiate between Chain and Step polymerization. **04**
© Calculate Mn, Mw and Polydispersity Index (PDI) for a polymer consisting of three fractions with molecular weights, 20000, 40000 and 60000. The mole fractions of each of these fractions are found to be 0.2, 0.5 and 0.3 respectively. **07**
