

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III(NEW) EXAMINATION – SUMMER 2023****Subject Code:3132301****Date:26-07-2023****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.

		MARKS
Q.1	(a) Define: (i) Functionality (ii) Glass transition temperature (iii) Homopolymer	03
	(b) Identify the functionality of following monomers: (i) $\text{H}_2\text{NCH}_2\text{COOH}$ (ii) $\text{CH}_2=\text{CH}_2$ (iii) $\text{C}_6\text{H}_5\text{NH}_2$ (iv) $\text{HOOC}\text{C}_6\text{H}_2(\text{OH})_3$	04
	(c) Give classification of Polymerization. Explain free radical polymerization steps using suitable example.	07
Q.2	(a) Give difference between Step and Chain Polymerization.	03
	(b) Draw the structures of following Polymers: PS, PVC, PAN, and ABS.	04
	(c) Explain Ring opening Polymerization with suitable example.	07
	OR	
	(c) Discuss Polydispersity and Molecular weight distribution in polymers.	07
Q.3	(a) Give difference between Crystalline and Amorphous polymers.	03
	(b) Explain cationic polymerization.	04
	(c) Calculate M_n , M_w and Polydispersity Index (PDI) for a polymer consisting of three fractions with molecular weights, 200000, 300000 and 500000. The mole fractions of each of these fractions are found to be 0.3, 0.4 and 0.3 respectively.	07
	OR	
Q.3	(a) Explain Bulk polymerization technique.	03
	(b) Explain various factors affecting glass transition temperature with suitable examples.	04
	(c) Differentiate between Bulk, Solution, Suspension and Emulsion polymerization techniques.	07
Q.4	(a) Give T_g of Nylon 6, PS and PP.	03
	(b) Calculate the Glass transition temperature of a copolymer of vinyl chloride and Vinyl acetate containing 10 wt% vinyl acetate. Given, T_g of PVC = 87°C and T_g of Poly vinyl acetate = 32°C .	04
	(c) Explain Polyaddition Polymerization with suitable example.	07
	OR	
Q.4	(a) Define Degree of polymerization (DP) and 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 3000.	03

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| | (b) | Explain Isotactic, Syndiotactic and Atactic polymers. | 04 |
| | (c) | Explain Number average (M_n) and weight average molecular weight (M_w) concept for Polymers. | 07 |
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| Q.5 | (a) | Describe following polymer reactions (i) Aminolysis Hydrogenation | 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 Specific volume v/s temperature graph for highly crystalline, amorphous and partially crystalline polymers. | 07 |
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| OR | | | |
| Q.5 | (a) | Give name of any three Initiators and Inhibitors. | 03 |
| | (b) | Explain Geometric Isomerism with suitable examples. | 04 |
| | (c) | Explain factors affecting polymer crystallinity. | 07 |
