Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III(New) • EXAMINATION – WINTER 2016

Subject Code:2133602 **Date:02/01/2017**

Subject Name:Polymer Chemistry

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.**

			MARKS
Q.1		**Short Questions**	**14**
	1	Define monomer	
	2	Draw the structure melamine	
	3	Draw the structure of any copolymer	
	4	Give two example of amorphous polymer	
	5	The tensile strain of a uniformly extending plastic specimen of initial length l_0 and extended length l is?	
	6	Weight average molecular weight can be determined by……	
	7	Give examples of engineering polymers and commodity polymers	
	8	Give examples of thermoplastics and thermoset polymers	
	9	Write the relationship between M_n, M_w and M_v	
	10	Write Mark Houwink Equation	
	11	What is functionality of terephthalic acid and glycerol	
	12	Draw the structure of nylon-610 and circle an amide linkage in the structure	
	13	Molecular weight of Polystyrene having a DP 100 is?	
	14	Write repeating formulas for: PP & PAN	
Q.2	**(a)**	Compare amorphous and crystalline polymer?	**03**
	(b)	State the characteristics of monomers used for addition and condensation polymerization. Give two examples of each polymer.	**04**
	(c)	Define functionality and average functionality of monomers. For a compound to undergo polymerization reaction it must be functionality≥2. Justify this statement	**07**
		OR	
	(c)	Explain with examples functionality and average functionality. Calculate average functionality for 4 mole of acrylonitrile, 3 mole of butadiene and 1 mole of styrene. Is it polymerization possible?	**07**
Q.3	**(a)**	What are the end uses of polymers? Explain	**03**
	(b)	Write repeating formulas for (a) Nylon-6; (b) Nylon-11; (c) Nylon-12; (d) Nylon-4,6	**04**
	(c)	Describe the method for determination of viscosity average molecular weight of polymers.	**07**
		OR	
Q.3	**(a)**	Draw the structure: (a) PET, (b) poly-caprolactam (c) PVC	**03**
	(b)	Explain glass transition temperature	**04**
	(c)	(i) What are the different components present in crude oil? Explain in detail (ii) What are the different ways of expressing molecular weight of a polymer? Give the formulas for expressing them	**07**
Q.4	**(a)**	Compare emulsion and suspension polymerisation	**03**
	(b)	Differentiate between thermoplastics and thermoset polymer	**04**

	(c)	How the following monomers are synthesized? (i) Vinyl Chloride (ii) Methacrylate	**07**
		OR	
Q.4	**(a)**	Compare bulk and solution polymerization	**03**
	(b)	Define with example the following: (i) Rate of reaction (ii) Repeating unit iii) polymerization (iv) elastomer	**04**
	(c)	How the following monomers are synthesized? Styrene, caprolactum	**07**
Q.5	**(a)**	A polymer solution is made by dissolving 5 g of polymer in 1000 ml of solvent. The flow time of the solvent and that of polymer solution between two appropriate marks in viscometer are 40 s and 60 s, respectively. Calculate the reduced viscosity (in dLg^{-1}) of polymer solution.	**03**
	(b)	Write short note on crystallinity in polymers. Calculate % crystallinity of polymer having amorphous area 7600 unit and total area 22500 unit (obtained from WXRD)	**04**
	(c)	Write detail note on the mechanism and kinetics of free radical polymerization	**07**
		OR	
Q.5	**(a)**	Distinguish between addition and condensation polymerization	**03**
	(b)	Write short note on: LCST & UCST	**04**
	(c)	Derive an expression for the rates of all the reactions involved in anionic polymerization. Also derive expressions for degree of polymerization in anionic polymerization	**07**

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