Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2020

Subject Code:2172607 **Date:21/01/2021**

Subject Name:Polymer Kinetics

Time:10:30 AM TO 12:30 PM **Total Marks: 56**

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Classify multiple reaction with suitable examples.	**03**
	(b)	The activation energy of chemical reactions is 17982 cal/mole in the absence of a catalyst and 11980 cal/mole with a catalyst. By how many times will the rate of the reaction will grow in the presence of a catalyst, if a reaction proceeds at 23°C?	**04**
	(c)	Explain the factors affecting the rate of reactions.	**07**
Q.2	**(a)**	For the chemical reaction A → B, the initial concentration of A is 2.50 mole/liter. The concentration of A after 2 hours is 1.50 mole/liter. What is average rate of reaction?	**03**
	(b)	Differentiate molecularity and order of reaction.	**04**
	(c)	With labeled diagram, explain the classification of reactors.	**07**
Q.3	**(a)**	Compare integral method of analysis with differential method of analysis.	**03**
	(b)	Liquid A decomposes by first order kinetics, and in batch reactor 50% of A is converted in 5 minute run. How much longer would it take to reach 75% conversion?	**04**
	(c)	Develop integral rate expression for bimolecular type second order reaction 2A→ products for variable volume batch reactor.	**07**
Q.4	**(a)**	Explain the term 'space time' with suitable example. Also give it's unit.	**03**
	(b)	A zero order homogeneous gas reaction with stoichiometry A→ rR proceeds in a constant volume bomb, $\pi = 1$ when $t = 0$ and $\pi = 1.5$ when $t = 1$. If the same reaction, same feed composition and initial pressure proceeds in constant pressure set up. Find out the volume.	**04**
	(c)	Develop the performance equation of ideal plug flow reactor with necessary assumptions. Also derive it for first order constant volume system	**07**
Q.5	**(a)**	Define the term 'kinetic chain length'. Also give its relationship with degree of polymerization.	**03**
	(b)	Develop integral rate expression for non-catalyzed polycondensation reaction.	**04**
	(c)	Explain the kinetics of cationic polymerization.	**07**
Q.6	**(a)**	List out the methods used to determine reactivity ratio. Also write on any one.	**03**
	(b)	Develop integral rate expression for acid catalyzed polycondensation reaction.	**04**
	(c)	Explain the kinetics of free radical polymerization.	**07**
Q.7	**(a)**	Which method is used to determine the chain transfer constant?	**03**
	(b)	In the particular samples of polymer, 100 molecules have molecular weight 10^3 each, 200 molecules have molecular weight 10^4 each and 200 molecules have molecular weight 10^5 each. Identify the number average and weight average molecular weight respectively.	**04**
	(c)	Explain the viscometry method to determine the viscosity average molecular weight.	**07**

Q.8	**(a)**	Define the term chain transfer constant. List the factors on which it depends? Which chain transfer agent is used during synthesis of Styrene Butadiene Rubber?	**03**
	(b)	A sample of high polymer contains 20 percent by weight of macromolecules of molecular weight 10,000 and 80 percent by weight macromolecules of 1,00,000.Indentify the number average and weight average molecular weight respectively.	**04**
	(c)	Explain the osmotic pressure method to determine the polymer molecular weight.	**07**

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