Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – WINTER 2015

Subject Code: 172602 **Date: 07/12/2015**

Subject Name: Polymer Kinetics

Time: 10:30am to 1:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **All notations used have conventional meaning.**
3. **Make suitable assumptions wherever necessary.**
4. **Figures to the right indicate full marks.**

Q.1 **Answer the following** **14**

(a) **Differentiate single and multiple reactions with example.**

(b) **Define Rate of Reaction. Write the variables affecting it.**

(c) **Give relation between r_B ,r_D, and r_T for reaction:**

$$B+2D \rightarrow 3T$$

(d) **Write a note on molecularity and order of reaction.**

(e) **List any two ways to determine the extent of reaction at various times.**

(f) **Write the general procedure for Integral method of Analysis of data.**

(g) **What is the fractional change in volume of the isothermal gas-phase reaction $A \rightarrow 4R$ with 50% inerts at the start?**

Q.2 **(a)** **Derive the general expression which relates the total pressure of the system to partial pressure of reactants.** **07**

(b) **A reaction $2HI(g) \rightarrow H_2(g) + I_2(g)$ is studied over a range of temperatures. The results obtained are tabulated as below:** **07**

Temperature (^0K)	633	666	697	715
Rate costant (L/mol.sec)	$1.7X10^{-5}$	$1.07X10^{-4}$	$5.01X10^{-4}$	$1.05X10^{-3}$

Find the value of activation energy graphically using given data.

OR

(b) **Derive the integral rate expression for bimolecular type second order reaction for constant volume batch reactor.** **07**

Q.3 **(a)** **Discuss various types of ideal reactors.** **04**

(b) **Define the terms space time and space velocity.** **02**

(c) **Explain the holding time and space time for flow reactors.** **03**

----P.T.O.------

(d) The first order reversible liquid reaction 05

$$A \rightleftarrows R, \quad C_{A0} = 0.5 \text{ mol/liter}, C_{R0} = 0$$

takes place in a batch reactor. After 8 minutes, conversion of A is 33 % while equilibrium conversion is 66.7 %. Find the rate equation for this reaction.

OR

Q.3 (a) Derive the performance equation of steady state plug flow reactor for first order unimolecular irreversible reaction. 07

(b) Pure gaseous reactant A (C_{A0} = 100 millimol/liter) is fed at a steady rate into a mixed flow reactor(V= 0.1 liter) where it dimerizes ($2A \rightarrow R$). For different gas feed rates the following data are obtained: 07

Run number	1	2	3	4
υ_0 liter/hr	10.0	3.0	1.2	0.5
C_{Af}, millimol.liter	85.7	66.7	50.0	33.4

Find a rate equation for this reaction.

Q.4 (a) Explain the kinetics of anionic polymerization. 08

(b) What is meant by heterogeneous reaction? Give the complication of the rate equation with example. 06

OR

Q.4 (a) What is meant by chain transfer constant? List the parameters on which it depends. 03

(b) Describe telomerization with suitable example. 04

(c) Discuss the block and graft copolymerization of chemical modification of rubber with suitable example. 07

Q.5 (a) Write a note on sedimentation. 07

(b) Discuss the method to determine the viscosity average molecular weight. 07

OR

Q.5 (a) Explain the practical significance of polymer molecular weight. 04

(b) If the polymer sample has population as: 06

No. of molecules	10	15	20	30
Mass of each molecule	5000	7500	11000	15000

Calculate the number average and weight average molecular weight.

(c) Write about the addition reaction. 04

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