GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-V EXAMINATION – WINTER 2015

Sı Sı	Subject Code: 150403 Date:08/12/2015 Subject Name: Chemical Reaction Engineering		
T	ime:	10:30am to 1:00pmTotal Marks: 70	
In	struct	ions: 1. Attempt all questions. 2. Make suitable assumptions wherever necessary. 3. Figures to the right indicate full marks.	
Q.1	(a)	An irreversible elementary series reaction $A + B \rightarrow C$ is taking place in a constant volume batch reactor with rate expression $-r_A = kC_AC_B$. Derive an expression to determine kinetics of this reaction.	07
	(b)	Explain Arhenious theory of temperature dependency along with activation energy and temperature sensitivity of reaction.	07
Q.2	(a) 1)	In a homogeneous isothermal liquid polymerization 20% of the monomer disappears in 34 minute for initial monomer concentration of 0.04 and also for 0.8 mol/lit. What is rate expression for this polymerization reaction?	05
	2)	Define molecularity and order of reaction.	02
	(b)	Explain Reaction of shifting order with determination of its kinetics of reactions.	07
		OR	
	(b)	Explain Empirical rate equation of n th order method for determination of kinetics of reactions.	07
Q.3	(a)	Find the conversion after 1 hr in a batch reactor for	07
		A \longrightarrow R $-r_A = 3C_A^{0.5} \underline{\text{mol}}_{\text{lit.hr}}$ $C_{A0} = 1 \text{ mol / lit}$	
	(b)	Write short note on autocatalytic reactions.	07
		OR	
Q.3	(a)	Find the first order rate constant for the disappearance of A in the gas phase reaction $2A \rightarrow R$, if on holding pressure constant, the volume of the reaction mixture, starting with 80 % of A, decreases by 20 % in 3 minute.	07
	(b)	Write short notes on the qualitative discussion about product distribution for parallel reaction.	07
Q.4	(a) (b)	Define recycle reactor. Derive the performance equation of the recycle reactor. Explain Half life method for determination of kinetics of reactions.	07 07

OR

Q.4 (a) What do you understand by instantaneous fractional yield and overall fractional 07 yield of a product? Explain different contacting patterns for different concentration of reactant for non-continuous operations.

(b) A first order irreversible reaction A -→ B is carried out in plug flow reactor followed by equal size CSTR in series. The concentration of A in the feed is 1 kg mole/m³ and the residence time in each reactor is 3600 sec. The specific reaction rate constant for the reaction is 1/3600 sec⁻¹. Find the conversion of A at the exit of the system.

Q.5	(a)	Derive design equation for Steady State Plug Flow Reactor.	07
	(b)	Write short note on quantitative product distribution.	07

OR

Q.5 (a) Write a short note on optimum temperature progression.
(b) Give Classification of reactors based on criteria-Geometry of reactors, heat effects and flow conditions.
07
