Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER • 2015

Subject Code: 150403 **Date: 11/05/2015**

Subject Name: Chemical Reaction Engineering

Time:02.30pm-05.00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	i) Define rate of reactions in different useful ways.	**05**
		ii) Define: molecularity, Order of reaction	**02**
	(b)	Briefly describe representation of non elementary reactions.	**07**
Q.2	**(a)**	The irreversible reaction A+B→AB has been studied kinetically, and the rate of formation of product has been found to be well correlated by the following rate equation: $r_{AB} = kC_B^2$,. . . independent of C_A. What reaction mechanism is suggested by this rate expression if the chemistry of the reaction suggests that the intermediate consists of an association of reactant molecules and that a chain reaction does not occur?	**07**
	(b)	Derive expressions to determine kinetics by integral method for bimolecular type second order reaction A+B→R with $-r_A = kC_AC_B$	**07**
		OR	
	(b)	Derive the C_{Rmax} and t_{Rmax} for the first order reactions given below: $A \xrightarrow{k1} R \xrightarrow{k2} S$	**07**
Q.3	**(a)**	Explain Arhenious theory of temperature dependency.	**07**
	(b)	Derive expression to determine kinetics using half life time of reaction method.	**07**
		OR	
Q.3	**(a)**	Write short note on Optimum Temperature Progression profile.	**07**
	(b)	Explain various ideal reactors with its characteristics.	**07**
Q.4	**(a)**	Derive Performance equation for Mixed Flow Reactor.	**07**
	(b)	Enzyme E catalyzes the fermentation of substance A (the reactant) to product R. Find the size of Mixed flow reactors need for 95% conversion of reactant in a feed stream (υ_0= 25 Lit/min) and reactant (C_{A0}= 2 moles/Lit) and enzyme. The kinetics of fermentation at this enzyme concentration are given by A→R $-r_A = 0.1\ C_A/(1+0.5C_A)$ moles /Lit Minute	**07**
		OR	
Q.4	**(a)**	Derive design equation for recycle reactor.	**07**
	(b)	Explain Qualitative product distribution for series reaction.	**07**
Q.5	**(a)**	Explain the term instantaneous fractional yield and overall fractional yield of a product. Give its advantages in product distribution.	**07**
	(b)	Consider a feed C_{A0} = 100, C_{B0}= 200, C_{i0} = 100 to a steady flow reactor. The isothermal gas phase reaction is A+ 3B→ 6R. Find X_A, X_B, and C_B. (C_A= 40).	**07**
		OR	
Q.5	**(a)**	Explain Quantitative product distribution for mixed flow reactors for the reaction A →R →S.	**07**
	(b)	Write short note on integral & differential method of analysis.	**07**

****