T. E - V Sem - Chem

Chemical Reaction Engineering-I



CHEM. / CBGS CRE-I

(3 Hours)

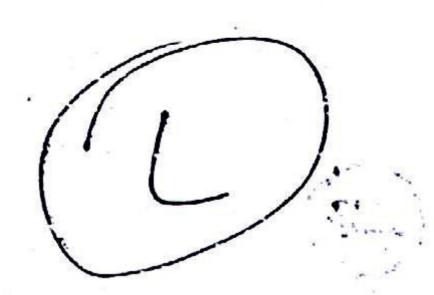
[Tota! Marks : 80

Question no 1 is compulsory
Attempt any three questions from remaining five questions
Assume suitable data if needed & justify

Define: Elementary and Non elementary reaction Define: Molecularity and order of reaction Derive complete Design equation for Mixed Flow Reactor. Write short note on integral method of analysis of rate data.	04 04 06
$A+A \leftrightarrow A+A*$	06
A* -→ Product	08
Obtain the overall rate equation. State the conditions when the reaction order will be first and when it will be second?	
Find the first-order rate constant for the disappearance of A in the gas reaction $2A \rightarrow R$ if, on holding the pressure constant, the volume of the reaction mixture, starting with 80% A, decreases by 20% in 3 min.	12
Write short note on Homogeneous catalyzed reactions.	08
Use the half life method to determine the order and rate constant of the reaction using following information	12
(SEC) 0 100 200 300 400	
(1) (month) (month)	

Can (mol/lit) 4.4 3.5 2.9 2.6 2.3

TURN OVER



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After 8 minutes in a batch reactor, reactant (C_{AO} =1 mol/liter) is 80% 08 converted; after 18 minutes, conversion is 90%. Find a rate equation to represent this reaction.

- A liquid reactant stream (1 mol/liter) passes through two mixed flow 12 reactors in series. The concentration of A in the exit of the first reactor is 0.5 mole/liter. Find the concentration in the exit stream of the second reactor. The reaction is second order with respect to A and V₂/V₁ = 2.
- Q5 a. Assuming a stoichiometry $A \rightarrow R$ for a first order gas phase reaction, the 12 size of plug flow reactor for 99% conversion of pure A is calculated to be 32 liters. In fact however the reaction stoichiometry is $A \rightarrow 3R$. With this corrected stoichiometry, what is the required volume of the reactor?
- Q5 b. Write a short note on Recycle reactors.

08

Between 0°C and 100°C determine the equilibrium conversion for the 20 elementary aqueous

Reaction. A Z R

 $\Delta G_{298}^{-14130 \text{ J/mot}}$, $\Delta H_{298}^{0} = 75300 \text{ J/mot}$ $\Delta G_{298}^{0} = -14130 \text{ J/mot}$, $\Delta H_{298}^{0} = 75300 \text{ J/mot}$ $\Delta H_{298}^{0} = -75300 \text{ J/mot}$ $\Delta H_{298}^{0} = -75300 \text{ J/mot}$

Present the results in the form of a plot of temperature versus conversion. What restrictions should be placed on the reactor operating isothermally if we are to obtain a conversion of 75% or higher?