T.E. - V Sem - Chemical

Chemical Reaction Engineering

01/12/15

(1)

(29)

TE/V/CBGS/CHEM/CRE-I

Q.P. Code : 5665

(3 Hours) **[Total Marks : 80**

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

Q1 a.	What is Optimum Temperature progression? Explain with respect to different types of reactors.	10
Q1 b.	Differentiate Elementary vs Nonelementary Reaction?	03
Q1 c.	Write down the performance equation for recycle reactor?	02
Q1 d.	The activation energy of a biomoleecular reaction is about 9150 cal/mol. How much faster is this reaction at 500K than at 400K.	05
Q2 a.	The reaction between CO and NO_2 at low temperatures proceeds with a rate $-r_{O_2} = k * [NO_2]^2$ Suggest mechanism.	12
Q2 b.	In case of a first order reaction,show that the time required for 75% conversion is double the time required for 50% conversion in a batch reactor.	08
Q3 a	Calculate the first order rate constant for the disappearance of A as per the gas phase reaction A → 1.6 R if the volume of reaction mixture, starting with pure A, increases by 50% in 4 minutes . The total pressure of the system remains constant at 1.2 atm and the temperature is 25 deg C	08

TURNOVER

Q3 b. The initial rate of the reaction $2A + 2B \longrightarrow C + D$ is determined for different initial conditions, with the results listed in the following table: 12

Run	$[A]_o$, M	$[B]_o$, M	Initial rate, M/s
1	0.185	0.133	3.35×10^{-4}
2	0.185	0.266	1.35×10^{-3}
3	0.370	0.133	6.75×10^{-4}
4	0.370	0.266	2.70×10^{-3}

Find the rate law and rate constant for this reaction.

Q4 From steady state kinetic runs in a mixed flow reactor, we obtain the following data on the reaction A R. 20

? sec	C_{AO} mol/m^3	C_A mol/m^3
60	50	20
35	100	40
11	100	50
20	200	80
11	200	100

Find the space time needed to treat a feed of $C_{AO} = 100$ mol/m^3 to 80% conversion 1) in a plug flow reactor 2) in a mixed flow reactor.