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Question Paper Code: 56902A

B.E./B.Tech. DEGREE EXAMINATION, AUGUST 2021

Sixth Semester

Chemical Engineering

15UCH602 – CHEMICAL REACTION ENGINEERING-I

(Regulation 2015)
PART – A (10 X 2 =20 Marks)
ANSWER ANY TEN QUESTIONS

1.	Difference between elementary and non-elementary reactions.	R	CO1
2.	Define rate of reaction.	R	CO1
3.	List out the methods that are used to analyse the kinetic data	U	CO1
4.	What situations recycle reactors are used?	Ap	CO2
5.	Give the size comparison equation for an n^{th} order reaction.	U	CO2
6.	Justify what happens to the conversion when CSTRS connected in parallel	U	CO2
7.	Define yield and selectivity.	U	CO3
8.	What are parallel reactions? give examples	R	CO3
9.	Give the expression for overall fractional yield for N mixed flow reactors in series	U	CO3
10.	Why optimum progression should be known for a reaction?	R	CO4
11.	Compute K_y at 10 atm if K_p at this pressure is 0.00381 atm^{-1} for the ammonia synthesis reaction from hydrogen and nitrogen at 500 ^{o} C	Ap	CO4
12.	Define optimum temperature progression.	R	CO4
13.	On what aspects a non ideal flow will occur in the reactor – Explain?	R	CO5

14. List out the characteristics of tracer. U CO5

15. What is meant by C curve? R CO5

PART – B (3 X 10 =30 Marks)
ANSWER ANY THREE QUESTIONS

1 Determine an expression for rate of reaction interms of concentration and conversion for first order reaction using integral method of analysis. AP CO1

2 A liquid phase reaction with stoichiometry A→R is carried out in a plug flow reactor whose rate versus concentration data is given below is studied. Determine the size of the plug flow reactor required to achieve 80%conversion of a feed stream of 1000 mol A/hr at C_{AO}= 1.5 mol/l Ap CO2

C_A , mol/l	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0	1.3	2.0
$-r_{A,}$ (mol/l .min)	0.1	0.3	0.5	0.6	0.5	0.25	0.10	0.06	0.05	0.045	0.042

3 Reactant A in the liquid phase reacts to produce R and S by the following reactions in parallel:

A→R

A→S AP CO3

Both these reactions of first order. A feed with C_{AO}= 1, C_{RO}=0 and C_{SO}= 0 enters in two mixed flow reactors (τ 1 = 2 min and τ 2=5 min) the composition within the first reactor is C_{A1}= 0.40, C_{R1}=0.40 and C_{S1}=0.2.find the composition of exit stream from the second reactor.

4 The first order irreversible liquid phase reaction is carried out in a mixed flow reactor. The density of the reaction mixture is 1.2g/cm^3 and the specific heat is 0.9cal/g.c. the volumetric flow rate is 200 cm^3/s and the reactor volume is 10lit. k = $1.8\times10^5 e^{-12000/RT}$. If the heat of reaction is -46000cal/mol and feed temperature is 293k (20^oC). What are possible temperature and pressure for stable, adiabatic operation for a feed concentration of 4mol/lit. Ap CO4

5	Derive the equation for residence time distribution in mixed flow reactor.	U	CO5