

Total No. of Questions : 6]

P1385

SEAT No. :

[Total No. of Pages : 2

TE/Insem/APR-34

T.E. (Chemical Engineering)
CHEMICAL REACTION ENGINEERING - I
(2012 Pattern)

Time : 1½ Hour]

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

[Max. Marks : 30

Q1) a) Differentiate between molecularity and order of reaction. [5]

b) Differentiate between elementary and non-elementary reactions. [5]

OR

Q2) a) A certain reaction has a rate given by

$$-r_A = 0.005 C_A^2, \text{ mol/cm}^3 \cdot \text{min}$$

If the concentration is expressed in mol/lit and time in hours, what would be the value and unit of rate constant? [6]

b) Explain the kinetic model for non-elementary reaction. [4]

Q3) a) What is meaning of Autocatalytic reaction? Draw and explain the X_A vs t and $-r_A$ vs C_A/C_{A0} curves for autocatalytic reactions. [4]

b) Derive integrated rate expression for first order reaction $A \rightarrow \text{Product}$ With variable volume system which is as follows. [6]

$$-\ln(1-X_A) = -\ln\left(1 - \frac{\Delta V}{\epsilon_A V_0}\right)$$

OR

Q4) Aqueous A at a concentration $C_{A0} = 1 \text{ mol/lit}$ is introduced into a batch reactor where it reacts away to form product R according to stoichiometry $A \rightarrow R$. The concentration of A in the reactor is monitored at various times as shown below. [10]

t (min)	0	100	200	300	400
C_A (mol/m ³)	1000	500	333	250	300

For $C_{A0} = 500 \text{ mol/m}^3$, find the conversion of reactant after 5 hours in batch reactor.

Q5) Derive performance equation of Mixed Flow Reactor. [10]

OR

Q6) Deduce the performance equation for recycle reactor. [10]

