

**Test-3, 2020, Time-1 hour, Marks: 15**

**Reaction Engineering (CH31009)**

Q1. (a) A second order elementary reaction  $2A \rightarrow R$  is carried out in a mixed flow reactor. For 80% conversion, what is the Damkohler number(Da) for the process assuming no volume change during reaction. [3]

(b) Consider a gas-phase reaction  $2A = R + S$  with unknown kinetics. If a space velocity of  $1 \text{ min}^{-1}$  is needed for 90% conversion of a plug flow reactor, find the corresponding space-time and mean residence time or holding time of fluid in the reactor. [2]

Q2. Answer the following question:

(a) What are the advantages of using 'Recycle Reactor' instead of PFR?

(b) For the study of liquid phase elementary reaction  $A \rightarrow R$ , at what conversion of A the volume of mixed flow reactor needed twice the volume that of plug flow reactor under all identical conditions, i.e.  $C_{A0}$ , flow rate, rate kinetics. [2+3]

Q3. The following results were obtained for a pulse test in a reacting vessel.

The output concentration rose linearly from zero to  $1.0 \text{ } \mu\text{mol/L}$  in 5 min, fell linearly to zero in 15 min( after reaching a maximum value of  $1.0 \text{ } \mu\text{mol/L}$ ).

(a) Plot the C- Curve, E-Curve with a time interval  $\Delta t = 1 \text{ min}$

(b) Calculate the mean residence time and dispersion number [3+2]