Code No: OR410856 **OR**

IV B.Tech I Semester Supplementary Examinations, April/May 2005
CHEMICAL REACTION ENGINEERING-II
(Chemical Engineering)

Time: 3 hours **Max Marks: 70**

Answer any FIVE Questions
All Questions carry equal marks

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1. The flow through a reactor is 10 m^3/min. and a pulse test gave the following concentration measurements at the outlet:

t(min)	c x 10^5	t(min)	c x 10^5
0	0	15	238
0.4	329	20	136
1.0	622	25	77
2	812	30	44
3	831	35	25
4	785	40	14
5	720	45	8
6	650	50	5
8	523	60	1
10	418	-	-

   (a) If the reactor is modeled as tanks in series, how many tanks are needed to represent this reactor? What is the conversion (k =0.1 min^{-1})?

   (b) If the reactor is modeled by a dispersion model, what is the Peclet number? What is the conversion (k =0.1 min^{-1})?

2. A pulse test on a piece of reaction equipment gave the following results: The output concentration rose linearly from zero to $0.5\mu mol/m^3$ in 5 min, then fell linearly to zero in 10 min after reaching the maximum value.

   (a) Calculate in tabular form the values of E(t) and F(t) at 1 min intervals.

   (b) If the reactor were plug flow with the same flow and volume, what would be the conversion ?

3. (a) Derive the general equation for determining conversion for macro fluid in mixed reactors.

   (b) Deduce the above equation for a first order reaction and show that the degree of segregation has no effect on conversion for first order system.

4. Discuss the methods of determination of the rate-controlling step for non-catalytic fluid-particle reactions and explain how the required data is obtained.

5. A feed consisting 30% of 50 micron radius particle 40% of 100 micron radius particles 30% of 200 micron radius particles is to be fed continuously in a thin layer on to a moving grate cross current to a flow of reactant gas. For the planned operating condition the time required for complete conversion is 5,10 and 20 min for the three sizes of particles. Find the conversion of solids for a residence time of 8 min in the reactor.

6. Derive a rate equation for fast reaction with a second-order rate between A and B, fluid-fluid reaction
   $A(gas) + bB(liquid) \rightarrow product$
   And sketch the concentration profiles assuming a two film theory.

7. Write short notes on:

   (a) Packed bed reactors

   (b) Fluidized bed reactors

   (c) Auto thermal reactors

8. (a) The first order isomerization A $\longrightarrow$B is being carried out isothermally in a batch reactor on a catalyst that is decaying as a result of aging. Derive an equation for conversion as a function of time.

   (b) Explain about the following terms in catalyst deactivation.

      i. deposited poisons
      ii. chemisorbed poisons
      iii. selectivity poisons
      iv. stability poisons
      v. diffusion poisons.

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