Code.No: **RR410802** | **RR** | **SET-1**

**IV B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010**
**CHEMICAL REACTION ENGINEERING**
**(CHEMICAL ENGINEERING)**

**Time: 3hours** **Max.Marks:80**

**Answer any FIVE questions**
**All questions carry equal marks**

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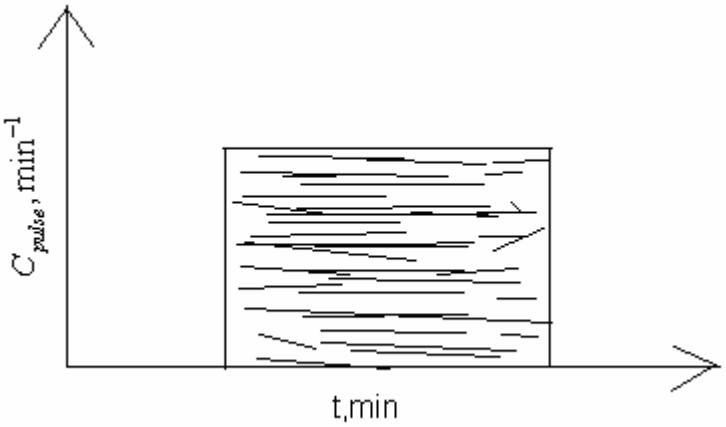
1. The dispersed noncoalescing droplets are reacting as they pass through a contactor with an initial concentration 2 mol/lit. The corresponding kinetics are $A \rightarrow R$, $-r_A = KC_A^2$, K = 0.5 lit/mol.min.
   Find the average concentration of A remaining in the droplets leaving the contactor if their RTD is given by the fig. [16]




2. Calculate the conversion using the following vessels for first order reaction($A \rightarrow B$) is carried out in a 10cm diameter tubular reactor of 6.36 m in length. The reaction rate is $-r_A = KC_A$, K = 0.25 $min^{-1}$. The results of the tracer test carried out in this reaction are as follows.

| T(sec) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cmol/lit | 0 | 1 | 5 | 8 | 10 | 8 | 6 | 4 | 3 | 2 | 1 | 0.5 | 0 |

   a) Using the closed vessel dispersion model
   b) Using the Tanks in series model [8+8]

3. Derive the expression for conversion of a macro fluid in two equal size mixed flow reactors in series for a zero order reaction. If conversion is 99% for the micro fluid what is it for a macro fluid having the same reaction rate? [16]

4. Two small samples of solids are introduced in to a constant environment oven and kept there for one hour. Under these conditions 4 mm particles are 58% converted and 2 mm particles are 87.5% converted. Find the rate controlling mechanism for the conversion of solids and the time needed for complete conversion of 1 mm particles. [16]

5. a) Explain the progressive conversion model and unreacted shrinking core model with the help of concentration profiles for spherical particles. Give some industrial examples of this nature.
   b) Write the differences between the above two models. [10+6]

6. If a fluid reaction is taking place by A(gas) + bB(liquid) $\rightarrow$ Product
   Derive the rate equation for an instantaneous reaction of any order between A and B, and sketch the concentration profiles assuming a two film theory. [16]

7. a) What are various factors responsible for catalyst deactivation.
   b) Explain decay reactions and write the expressions for rate of reaction and rate of deactivation for various decay reactions. [8+8]

8. Develop an expression for rate equation for the solid catalyzed reaction
   $A + B \rightleftharpoons R+S$, if surface reaction is controlling the overall reaction. All species are chemisorbed [16]

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