

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 180501****Subject Name: Chemical Reaction Engineering II****Date: 10/05/2012****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) What are different non ideal patterns. Explain about E,F and C curves with their relations. **07**
- (b) Derive dispersion model for non ideal flow. **07**
- Q.2** (a) Discuss contacting patterns for two phase systems. **07**
- (b) From time V/S tracer concentration data in the reactor effluent stream, calculate fractional conversion for a first order chemical reaction whose rate constant is $5 \times 10^{-2} \text{ sec}^{-1}$. Also compare it with conversion in ideal plug flow reactor of the same size. **07**

| | | | | | | | |
|------------------------|---|-----|-----|-----|-----|------|-----|
| Time (sec) | 0 | 20 | 40 | 60 | 80 | 100 | 120 |
| Concentration (gm/lit) | 0 | 0.3 | 0.7 | 0.6 | 0.1 | 0.04 | 0 |

OR

- (b) For a pulse input vessel the following output signal is obtained **07**

| | | | | | | | | |
|----------------------------------|---|---|---|---|----|----|----|----|
| Time (min) | 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 |
| Concentration (Arbitrary) | 0 | 4 | 6 | 8 | 10 | 7 | 3 | 0 |

Using variance marking procedure and appropriate model, find number of tanks.

- Q.3** (a) Derive rate equation for fluid-fluid reaction. **07**
- (b) Derive the design equation for the tower for mass transfer with rapid chemical reaction. **07**

OR

- Q.3** (a) Discuss kinetic regimes for mass transfer and reaction for fluid-fluid reactions. **07**
- (b) What is film conversion parameter? State various criteria of it which is used in the study of fluid-fluid reactions. **07**

- Q.4** (a) A batch of solids of uniform size is treated by gas in a uniform environment. Solid is converted to give a flaking product, according to shrinking core model. Conversion is 7/8 for the reaction time of 1 hr, conversion is 100% in 2 hrs. Which mechanism is rate control ? **07**
- (b) For a diffusion through Gas layer controlling derive expression for relation, for time required and conversion, assuming unreacted core model for spherical particles of unchanging size. Also find time required for complete conversion. **07**

OR

- Q.4** (a) For a diffusion through Ash layer control, derive expression for relation for time required for unreacted core model for spherical particles of unchanging size. Also find time required for complete conversion. **07**
- (b) A batch of solids (25 kg A, 25 kg B, 50 kg C) are fluidized at high air velocity and entrained solid are removed and collected for analysis. After 10 min of operation an analysis of the entrained solids shows 20 kg A, 12 kg B and no C. **07**
- (i) Calculate the elutriation constant for these solids.
- (ii) If the entrained solids were collected in a cyclone and immediately returned to the bed. What would be entrainment rate of solids under these conditions?

- Q.5** (a) Discuss various resistance encountered in slurry reaction with help of diagram. **07**
(b) Discuss: physical adsorption and chemisorptions. **07**
- OR**
- Q.5** (a) Discuss: Bubbling bed model for fluidized bed. **07**
(b) Discuss: Poison and promoters in catalysts. **07**
