

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VIII • EXAMINATION – SUMMER 2014

Subject Code: 180501**Date: 05-06-2014****Subject Name: Chemical Reaction Engineering-II****Time: 10:30 am TO 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)** A sample of tracer was injected as a pulse to a reaction vessel and the effluent concentration was measured as a function of time resulting in following data **07**

T(Min)	0	1	2	3	4	5	6	7	8	9	10	12	14	15
Conc. (gm/m ³)	0	1	5	8	10	8	6	4	3	2.2	1.5	6	0	0

If the reaction vessel is used to carry out liquid decomposition reaction with rate $-r_A = kC_A$ $k = 0.310 \text{ min}^{-1}$, Find the fraction converted.

- (b)** Discuss Dispersion model **07**

- Q.2 (a)** Show that for n tanks in series the exit age distribution is given as **07**

$$E = \frac{t^{n-1}}{(n-1)! T^n} e^{-t/T}$$

- (b)** Experimental response measurement on a continuous flow tubular reactor gives the following information for a step input **07**

θ	0	0.5	0.7	0.875	1.0	1.5	2.0	2.5	3.0
F	0	0.10	0.22	0.40	0.57	0.84	0.94	0.98	0.99

Assuming Dispersion model fits the above data, obtain Dispersion no.

OR

- (b)** From the first principle prove that for a back mix reactor **07**
 (i) $E_\theta = e^{-\theta}$ and (ii) $F_\theta = 1 - e^{-\theta}$

- Q.3 (a)** Derive the expression for fractional conversion for the reaction between solid and fluid when particles of solid are changing in size and Diffusion through Gas film controls. **07**

- (b)** Experiment shows that the progress of conversion can be represented by 'Chemical Reaction controlling' for un reacted core model and that the time for complete conversion of 4 mm particle is 4 hr. What is time needed for complete conversion when particle size are (i) 2 mm, (ii) 1 mm ? **07**

OR

- Q.3 (a)** Discuss the determination of 'Rate controlling step' for fluid- Particle reaction. **07**

- (b)** In a uniform environment 4 mm solid particles are 87.5 % converted to product in 5 minutes. If Ash diffusion controls for unchanging particle size, what mean conversion is attainable in a moving bed reactor operating with same environment but using the feed consisting of equal mass of 2 mm and 1 mm particles. The mean residence time of solids in this reactor is 30 min. **07**

- Q.4 (a)** What is Ellutriation constant? What are the parameters that affect the Ellutriation constant? Discuss. **07**

- (b) A batch of 60 kg A and 40 kg B is fluidized. The air velocity used is rather high and solids blown from the bed are trapped in a cyclone and are immediately returned to the bed. At steady state 36 kg of A and 8 kg of B per hour are blown out and returned. Continuous operation is to be carried out using the above results where 100 kg of mixture of A and B will be fed per hr continuously to the bed of 100 kg of solids. The air velocity is identical to that of batch run and entrained solids are not returned to the bed. Find the mean residence time of solids A & B in the continuous flow fluidized bed. **07**

OR

- Q.4** (a) Discuss the various resistances encountered in Catalytic reaction. **07**
(b) Discuss the reactors used for finding the rate for Catalytic reaction. **07**

- Q.5** (a) Discuss various Catalytic reactors used in Industry **07**
(b) Discuss various kinetic regimes in Fluid-Fluid reaction. **07**

OR

- Q.5** (a) Discuss method of preparing Catalysts. **07**
(b) Describe construction and working of Double Mixed Reactor. Explain how you can find parameter using that. **07**
