Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – VIII.EXAMINATION – WINTER 2016

Subject Code: 180501 **Date: 22/10/2016**

Subject Name: Chemical Reaction Engineering II

Time: 02:30 PM to 05:00 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)** Derive and discuss dispersion model for non-ideal flow. **07**

(b) Discuss different parameters which are useful for determining rate controlling Step for fluid- Particle reaction. **07**

Q.2 **(a)** In a uniform environment 4 mm solid particles are 87.5% converted to product in 5 min. The solids are unchanged in size during reaction and ash diffusion step is known to be rate controlling. What mean conversion is obtainable in a fluidized bed reactor operating with same environment but using feed consisting of equal mass of 2 mm and 1 mm particles? The mean residence time of solids in this reactor is 30 minutes. **07**

(b) Discuss the reactors used for finding the rate for Catalytic reaction **07**

OR

(b) Discuss briefly about different types of adsorption processes **07**

Q.3 **(a)** Discuss various resistance encountered in slurry reaction with help of diagram **07**

(b) Explain E, F and C curves with their relation. **07**

OR

Q.3 **(a)** What is film conversion parameter? State various criteria of it which is used in the study of fluid-fluid reactions. **07**

(b) Describe with diagram various contacting patterns for two phase reacting system **07**

Q.4 **(a)** A sample of tracer is injected to get pulse response of reactor. The effluent concentration is measured with respect to time as per following table **07**

Time, min	0	1	2	3	4	5	6	7	8	9	10	12	14
Concentration gm/cc	0	1	1	5	8	10	8	6	4	3	2.2	1.5	0.6

i) Construct C & E curves

ii) Calculate average residence time.

iii) If reaction is I order and k= 0.307 min-1, find conversion of real reactor.

(b) Derive rate equation for fluid-fluid reaction. **07**

OR

Q.4 **(a)** For kinetics of fluid-solid catalytical reaction, write about “Adsorption isotherm”. **07**

(b) Discuss: Bubbling bed model for fluidized bed.

07

Q.5 **(a)** Reactant gas (u_o = 0.3 m/s, V_o = 0.311 m^3/s) passes upward through a 2 m diameter fluidized bed (u_{mf} = 0.028 m/s, E_{mf} = 0.48) containing 7 tons of catalyst (W= 7000 kg, ρ_s =2100 kg/m^3). Reaction proceeds as follows: **07**

$A \longrightarrow R$ $-r''' = k'''C_A$, $k''' = 0.8\ m^3 gas/m^3 cat.s.$

Calculate the conversion of reactant if C_{Ao} = 100 moles/m^3, $\Delta = 20\times10^{-6}\ m^2/s$, α = 0.33, d_b = 0.16 m

(b) Discuss about "Determination of Surface area for catalysts" **07**

OR

Q.5 **(a)** What is effectiveness factor? Derive a relationship between effectiveness factor and Thiele Modulus **07**

(b) Describe construction and working of Double Mixed Reactor. **07**

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