

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VIII (OLD) - EXAMINATION – SUMMER 2017****Subject Code:180501****Date:04/05/2017****Subject Name: Chemical Reaction Engineering II****Time:10:30 AM to 01:00 PM****Total Marks: 70****Instructions:**

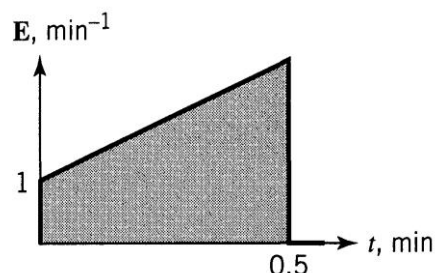
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain the step input method and impulse input method for determining C, E, and F curves in non-ideal chemical reactors. **07**
- (b) Write down the integral and discrete equations for calculating mean residence time and variance from C and E curve. **07**
- Q.2** (a) A liquid macro fluid reacts according to $A \rightarrow R$ as it flows through a vessel. Find the conversion of A for the flow patterns and kinetics as shown below, **07**
- (1)

$$C_{A0} = 2 \text{ mol/liter}$$

$$-r_A = kC_A^2$$

$$k = 2 \text{ liter/mol} \cdot \text{min}$$

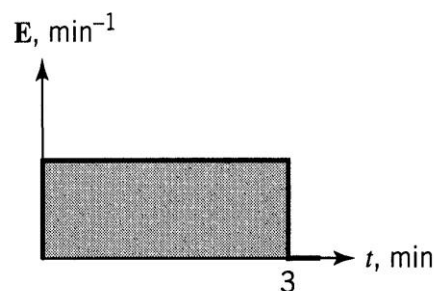


(2)

$$C_{A0} = 6 \text{ mol/liter}$$

$$-r_A = k$$

$$k = 3 \text{ mol/liter} \cdot \text{min}$$



- (b) Show graphically a method to convert E curve to F curve obtained from impulse input. **07**
- OR**
- (b) Show graphically a method to convert F curve to E curve obtained from step input. **07**
- Q.3** (a) Derive Residence Time Distribution Function (RTD) for Tank-in Series model for N-number of CSTR in series. **07**
- (b) Write a short note on the Dispersion Model. For dispersion model with chemical reaction, derive the second order differential equation relating the dispersion number and conversion for **07**
- OR**
- Q.3** (a) For fluid-fluid reactions, enlist the eight cases for mass transfer and reaction with neat sketch. **07**
- (b) Define Enhancement factor and Hatta Modulus for fluid-fluid reactions. **07**
- Q.4** (a) Describe the shrinking core model for spherical particles of unchanging size. **07**

- (b) Derive the time-conversion-radius relationship for shrinking-core model for spherical particles of unchanging size when chemical reaction controls. **07**

OR

- Q.4** (a) Give two examples of fluid-solid chemical reactions obeying shrinking-core model. **07**
(b) Derive the time-conversion-radius relationship for shrinking-core model for spherical particles of unchanging size when gas film diffusion controls. **07**
- Q.5** (a) Define catalyst effectiveness factor? Derive a relationship between effectiveness factor and Thiele Modulus for first order reaction. **07**
(b) Discuss various resistances encountered in catalytic reactions. **07**

OR

- Q.5** (a) Differentiate between Physical Adsorption and Chemisorption. **07**
(b) Discuss the reactors used for finding the rate of catalytic reactions. **07**
