Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – WINTER 2013

Subject Code: 170501 **Date: 26-11-2013**

Subject Name: Chemical Reaction Engineering - I

Time: 10:30 TO 01:00 **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **All notations have conventional meaning.**

Q.1 **(a)** What is steady state approximation? Explain how this concept helps to test the suggested mechanism of reaction **07**

(b) Discuss various forms of rate equation **07**

Q.2 **(a)** Discuss and define Molecularity and order of reaction **07**

(b) List various methods for finding order of reaction, explain any one in detail. **07**

OR

(b) State various theories of temperature dependency, discuss any one in detail **07**

Q.3 **(a)** For a reaction A + B →Products, derive integrated rate expression. **07**

(b) For a particular reaction having following data show that the reaction is a first order reaction also calculate the value of rate constant. **07**

Data:

Time, min	0	1	2	3	4
Concentration mole/lit	0.16	0.113	0.08	0.056	0.040

OR

Q.3 **(a)** Show how rate constants are evaluated for irreversible reactions in parallel. **07**

(b) The rate of bimolecular reaction at 500° K is 10 times the rate at 400° K. Calculate the activation energy of reaction by Arrhenius law and collision theory. **07**

Q.4 **(a)** Derive performance equation for a CSTR. **07**

(b) A reaction A→Products is carried out in a batch reactor at different initial concentrations. The half-life for each run is noted. Evaluate order of reaction and rate constant from the half- life data as given in the following table: **07**

C_{A0} kmol/m^3	10	18.5	30
$t_{1/2}$, sec	100	54	33.3

OR

Q.4 **(a)** Derive performance equation for a Batch reactor **07**

(b) In a batch reactor the conversion of a liquid reactant A is 70% in 13 min. Find the space time required to effect this conversion in a plug flow reactor and a mixed flow reactor. Assume first order kinetics **07**

Q.5 **(a)** Write a short note on 'Heat of reaction from thermodynamics' **07**

(b) Discuss equal sized mixed flow reactors in series. **07**

OR

Q.5 **(a)** Discuss in detail about 'Searching for mechanism' **07**

(b) Write a brief note on 'Variable volume batch reactor' **07**

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