Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – WINTER 2013

Subject Code: 151301 **Date: 27-11-2013**

Subject Name: Elements of Chemical Engineering

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)** Classify different types of chemical reactions based on different parameters. **07**

(b) Explain collision theory and transition state theory. **07**

Q.2 **(a)** Explain the essential features of a CSTR along with the basic equations with a neat sketch. **07**

(b) List the advantages and disadvantages of a batch reactor. **07**

OR

(b) In a catalytic decomposition of hydrogen peroxide the concentration changes with time as follows: **07**

Time, hr	0	10	20	30
Concentration, kmole/kL	25.4	13.4	7.08	3.81

Determine the order of reaction and rate constant.

Q.3 **(a)** Define: i) Molecularity, ii) Space velocity, iii) mean residence time, iv) Dispersion number. **08**

(b) Milk is pasteurized if it is heated to 63^0C for 30 min, but if it is heated to 74°C it only needs 15 s for the same result. Find the activation energy of this sterilization process. **06**

OR

Q.3 **(a)** Write short notes on: i) fluidized bed reactor and ii) fixed bed reactor. **08**

(b) Explain half life approach for estimating reaction order. **06**

Q.4 **(a)** Discuss the various parameters to be considered for reactor design. **07**

(b) Make a material balance for a steady state tubular reactor. **07**

OR

Q.4 **(a)** Give detailed analysis of different parallel irrereversible reactions. **07**

(b) Write a short note on design of mixed flow reactors in steady state. **07**

Q.5 **(a)** Discuss the various methods of measurement of RTD. **07**

(b) Explain RTD in a single CSTR. **07**

OR

Q.5 **(a)** Explain the relationship between F and E curves. **07**

(b) Describe Tank-in-series model to represent non-ideal flow. **07**

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