Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER • 2014

Subject Code: 151301 Date: 11-06-2014

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)** Give detailed classification of different types of chemical reactions. **07**

(b) Explain: (i) Collision theory (ii) Transition state theory **07**

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

(b) i) Explain half life of a reaction. **03**

ii) Which are the main factors that play important role in reactor design? **04**

OR

(b) The decomposition of NO_2 follows a second order rate equation. The reaction is $2NO_2 \rightarrow 2NO + O_2$. Data at different temperatures are as follows: **07**

T (^{0}C)	319	330	354	378.5	383
k (cm^3/gmol.sec)	522	755	1700	4020	5030

Calculate the activation energy.

Q.3 **(a)** Make a material balance for ideal batch reactor. **07**

(b) Differentiate between series and parallel reaction with proper example. **07**

OR

Q.3 **(a)** The reaction A $\rightarrow$ B is carried in a batch reactor. The initial concentration is C_{A0} = 2.0 mol/L. The conversion is 90%. Find the time required if the reaction is: **07**

(i) first order reaction, k = 0.01 s^{-1}.

(ii) second order reaction, k = 0.01 L mol^{-1}s^{-1}.

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

Q.4 **(a)** (i) Differentiate between space time and space velocity. **08**

(ii) What are the essential properties of a tracer?

(b) Write a short note on autocatalytic reactors. **06**

OR

Q.4 **(a)** (i) What do you understand by a non-ideal reactor? **08**

(ii) Discuss the design requirements for polymerization reactions?

(b) Explain in brief a fluidized bed reactor. **06**

Q.5 **(a)** Explain tank-in-series model. **07**

(b) State the difference between step input and pulse input for RTD measurement. **07**

OR

Q.5 **(a)** Discuss Dispersion number and its significance. **07**

(b) Explain the relationship between F and E curves. **07**

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