Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(New) • EXAMINATION – WINTER 2016

Subject Code:2141306 **Date:18/11/2016**

Subject Name:Elements of Chemical Engg

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.**

MARKS

Q.1 **Answer the following questions in brief.** **14**

1 Define Molecularity.
2 What is the meaning of a zero order of reaction?
3 What is the unit of rate constant for a first-order reaction?
4 What is activation energy?
5 Define mean residence time.
6 $N_2 + 3H_2 \rightarrow 2NH_3$. is an example of elementary reaction (True/False).
7 What is the role of catalyst in a chemical reaction?
8 What are the main steps of a chain reaction?
9 Draw diagram of mix flow reactor.
10 Which are the types of ideal reactor?
11 How does temperature affect equilibrium for various reactions?
12 What is non-ideal flow?
13 What is the effect of pressure on reaction equilibrium?
14 What is the significance of Dispersion number?

Q.2 **(a)** Differentiate between elementary and non elementary reactions. **03**
(b) Write a short note on Arrhenius law. **04**
(c) Explain the essential features of a CSTR along with the basic equations with a neat sketch. **07**

OR

(c) Which are the different variables that affect the rate of reaction and how? **07**

Q.3 **(a)** What are the ways to control product distribution in parallel reaction? **03**
(b) Briefly explain collision theory. **04**
(c) Make a material balance for plug flow reactor. **07**

OR

Q.3 **(a)** Differentiate between space time and space velocity. **03**
(b) List the different types of batch reactor with short description. **04**
(c) The aqueous phase first order reaction A ➔ R proceeds as follows: **07**

t, sec	780	2080	3540	7200
x_A, %	11.2	25.7	36.7	55.2

Calculate the reaction rate constant. Also determine the time required for 50% conversion of A. Assume C_{A0} = 0.05 mol/lit.

Q.4 **(a)** Differentiate between series and parallel reaction with example. **03**
(b) Write about the advantages and disadvantages of a batch reactor. **04**
(c) Explain half life approach for estimating reaction order. **07**

OR

Q.4	**(a)**	What is transition state theory?	**03**
	(b)	Write short note on auto catalytic reactors.	**04**
	(c)	Make a material balance for Ideal batch reactor.	**07**
Q.5	**(a)**	What is fluidized bed reactor?	**03**
	(b)	List out the methods of RTD measurement.	**04**
	(c)	Explain the relationship between F and E curves.	**07**

OR

Q.5	**(a)**	What are the essential characteristics of a tracer?	**03**
	(b)	List the various parameters to be considered for reactor design.	**04**
	(c)	Explain Tank-in-series model to represent non-ideal flow.	**07**

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