Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – WINTER 2013

Subject Code: 162304 Date: 06-12-2013

Subject Name: Reaction Engineering and Rheology

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.**

Q.1 **(a)** 1. Differentiate between Elementary and Non Elementary reactions. **07**
2. Differentiate between single and multiple reactions.

(b) 1. The pyrolysis of Ethane proceeds with an activation energy of about 75000 Cal. How much faster is the decomposition at 700 deg.C than at 550 deg.C? **07**
2. Define [any three] : Chemical kinetics ; Arrhenius law ; Rheology ; Apparent Viscosity; Newtonian fluid.

Q.2 **(a)** Explain Boltzman superposition principle **07**

(b) Discuss free volume concept **07**

OR

(b) What is Weissenberg effect? Discuss **07**

Q.3 **(a)** What is Molecularity and order of reaction? On doubling the concentration of reactant, the rate of reaction triples. Find out the reaction order. **07**

(b) 1. The rate constant of a reaction at 27 ^{0} C is 1.3 x $10^{-3}(s)^{-1}$. Determine the frequency factor. Take E (energy of activation)= 128170 cal/mol. **07**
2. Write a note on: The Power law.

OR

Q.3 **(a)** Discuss in detail about Non Newtonian fluids. Give suitable examples. **07**

(b) Explain kinetics of free radical chain polymerisation. **07**

Q.4 **(a)** Discuss Capillary rheometer. **07**

(b) At 500 K the rate of a bimolecular reaction is ten times the rate at 400 K. Find the activation energy for this reaction (a) from Arrhenius Law (b)from Collision theory. **07**

OR

Q.4 **(a)** What is tank reactor? Explain continuous stirred tank reactor (CSTR). **07**

Q.4 **(b)** What is chemical kinetics? Give detail classification of chemical reactions with suitable examples **07**

Q.5 **(a)** Explain die swell and melt fracture effect in polymer melt flow. **07**

(b) Discuss Maxwell Model in detail. **07**

Q.5 **(a)** Discuss Arrhenius Law . What is the significance of Activation energy. **07**

(b) 1. The activation energy of a chemical reaction is 17982 cal/mol in the absence of a catalyst and 11980 cal/mol with a catalyst. By how many times will the rate of the reaction will grow in the presence of a catalyst, if a reaction proceeds at 25 ^{0} C? **07**
2. Discuss WLF equation

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