Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – WINTER • 2014

Subject Code: 162304 **Date: 05-12-2014**

Subject Name: Reaction Engineering and Rheology

Time: 02:30 pm - 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)** Define : homogenous reaction; order of reaction, rate constant; activation energy; : chemical kinetics; die swell; non elementary reaction **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**

Q.2 **(a)** What is Arrhenius Law ? Discuss its Significance **07**

(b) Discuss kinetics of Free Radical Polymerisation **07**

OR

(b) 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**

Q.3 **(a)** 1. Differentiate between Elementary and Non Elementary Reactions. **07**
2. Differentiate between Single and Multiple Reactions

(b) Discuss in detail about Non Newtonian fluids. Give suitable examples. **07**

OR

Q.3 **(a)** Discuss about Batch Reactor **07**

(b) What is Die Swell? Discuss in detail. **07**

Q.4 **(a)** Discuss Maxwell Model in detail **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 Relaxation and Retardation.

OR

Q.4 **(a)** What is Molecularity and Order of Reaction? Differentiate. On doubling the concentration of reactant, the rate of reaction triples. Find out the reaction order. **07**

(b) Write a short note on Rate of Chemical reaction. **07**

Q.5 **(a)** What are the different methods used for determining molecular weights of polymers? Explain in detail the sedimentation method indicating its limitations. **07**

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

OR

Q.5 **(a)** What is a rate constant ? The rate constants of a certain reaction are 1.6×10^{-3} and 1.625×10^{-2} $(s)^{-1}$ at 10 deg.C and 30 deg c. Calculate the activation Energy. **07**

(b) A reaction 2HI(g) ---→H2(g)+ I2(g) is studied over a range of temperatures. The results obtained are as tabulated below: **07**

Temp.degK	633	666	697	715	781
Rate const K, l/(mol.s)	1.7×10^{-5}	1.07×10^{-4}	5.01×10^{-4}	1.05×10^{-3}	1.51×10^{-3}

(i) **Find out the value of activation energy graphically using the given data.**

(ii) Determine by what factor the rate increases when temperature rises from 300K to 310K.

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