7E 4181

Roll No. _____ [Total No. of Pages : 3

7E 4181

B.Tech. VII Semester (Main/Back) Examination - 2014

Chemical Engineering

7CH 1 Chemical Reaction Engg. - II

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **five** questions, selecting **one** question from each **unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Unit - I

1. a) Discuss BET Theory of multilayer adsorption. **(6)**

   b) Differenciate between physical and Chemical alesorption with examples. **(4)**

   c) Describe desorption as rate controlling steps. **(6)**

OR

1. a) Describe about catalyst: Promotors, Inhibitors and poisons. **(6)**

   b) Discuss the Kinetics of

      i) Unimolecular Surface reaction

      ii) Bimolecular Surface reaction in detail **(10)**

Unit - II

2. The reaction of H_2 and Br_2 to form HBr Occurs through the following sequence of elementary steps involving free radicals.

$$Br + H_2 \underset{K_{-1}}{\overset{K_1}{\rightleftharpoons}} HBr + H^{\cdot}$$

$$H^{\cdot} + Br_2 \underset{K_3}{\overset{K_2}{\rightleftharpoons}} HBr + Br^{\cdot}$$

$$Br_2 \rightleftharpoons 2Br^{\bullet}$$

Use the fact that bromine radical are in equilibrium with bromine Br_2 to determine a rate expression of the form:

$$r = \frac{\bar{\alpha}_1 \left[Br_2\right]^{1/2} \left[H_2\right]}{1 + \bar{\alpha}_2 \left(\frac{[HBr]}{Br_2}\right)}$$ **(16)**

OR

2. N_2O_5 decomposes as follows : $2N_2O_5 \rightleftharpoons 4NO_2 + O_2$ Experimentally, The rate of reaction was found to be : $r = \frac{d[O_2]}{dt} = K[N_2O_5]$ Show that the following sequence Can lead to a reaction rate expression that would be consistent with the experimental observations:

$$N_2O_5 \underset{K_{-1}}{\overset{K_1}{\rightleftharpoons}} NO_2 + NO_3$$

$$NO_2 + NO_3 \xrightarrow{K_2} NO_2 + O_2 + NO$$

$$NO + NO_3 \xrightarrow{K_3} 2NO_2$$ **(16)**

Unit - III

3. a) Find an expression for the overall effectiveness factor of a first order isothermal reaction in a flat plate calalyst pellet. rtuonline.com **(8)**

   b) Discuss the Thiele modulus. **(8)**

OR

3. a) What do you understand by non-isothermal effectiveness factors. **(4)**

   b) Write short notes on prater number **(4)**

   c) Discuss multiple steady states in heterogenous reaction. **(8)**

Unit - IV

4. Discuss in brief:

   a) Shrinking Care Model

   b) Progressive conversion Model. **(8+8)**

OR

4. a) Explain various controlling regimes with diagram. **(8)**

   b) Discuss the design of gas solid reactors in brief. **(8)**

Unit - V

5. a) Write about heat transfer and mixing in fluidized bed reactor. **(8)**

   b) Explain :

      i) Parametric sensitivity

      ii) Enhancement Factor. **(8)**

OR

5. a) Explain One-dimensional Model for the fixed - bed reactors. **(8)**

   b) Discuss the effect of diffusion on rate of reaction **(8)**
