

Total No. of Questions : 8]

[Total No. of Printed Pages : 2

Roll No .....

## CM-7002-CBGS

### B.E. VII Semester

Examination, December 2020

## Choice Based Grading System (CBGS)

### Chemical Reaction Engineering-II

Time : Three Hours

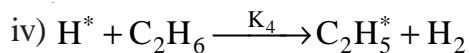
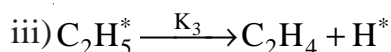
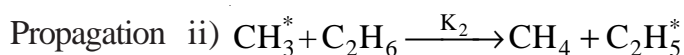
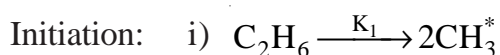
Maximum Marks : 70

**Note:** i) Attempt any five questions.

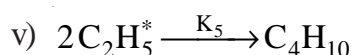
ii) All questions carry equal marks.

iii) Usage of calculator is permitted.

1. a) Differentiate between physisorption and chemisorption.  
b) Briefly discuss about classifications of catalyst.
2. The thermal decomposition of ethane to ethylene, methane, butane and hydrogen is believed to proceed in the following sequence:



Termination:



Use the PSSH to derive a rate law for the rate of formation of ethylene.

CM-7002-CBGS

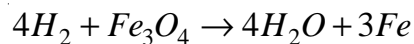
PTO

[2]

3. Write a short note on the following with neat sketch.
  - i) Effects of external transport processes on heterogeneous reactions.
  - ii) Poisoning
  - iii) Global reaction rate
4. Describe shrinking core model for catalyst regeneration.
5. Describe Effective Diffusivity. Describe Thiele modulus and derive

$$\phi_n^2 = \frac{K_n S_a \rho_c R^2 C_{AS}^{n-1}}{De}$$

6. Iron ore of density  $\rho_B = 4.6 \text{ g / cm}^3$  and size  $R = 5 \text{ mm}$  is reduced as per the following reaction:



Estimate the time required for 98% conversion of a particle from oxide to metal in a hydrogen environment at constant hydrogen pressure of 1atm and at 600°C. The rate is proportional to the concentration of hydrogen in gas stream. First-order reaction rate constant ( $k''$ ) is  $1.93 \times 10^5 e^{-12000/T} \text{ cm/s}$ , hydrogen diffusion coefficient in product layer  $D_e = 0.03 \text{ cm}^2/\text{s}$ , film diffusion coefficient ( $k_g$ ) = 10 cm/s and  $R = 82.06 \text{ (cm}^3 \cdot \text{atm) / mol.K}$ .

7.
  - a) Define Gas liquid and liquid-liquid reactions with example.
  - b) What is aerobic fermentations explain mechanism for it.
8.
  - a) Derive the rate expression for slow reaction with respect to mass transfer.
  - b) Explain overall effectiveness factor.

\*\*\*\*\*

CM-7002-CBGS