22512

23242

3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

Marks

1. Attempt any FIVE of the following : **10**

(a) Write the names of any two variables affecting the rate of reaction.

(b) List the names of methods available for analyzing the kinetic data of Batch Reactor.

(c) Give the names of different types of reactor (Any 4 names).

(d) Define the molecularity of the reaction.

(e) Give any two advantages of MFR.

(f) Define Promoters. Write any one example of it.

(g) Define Zero Order Reaction.

2. Attempt any THREE of the following : **12**

(a) Differentiate between molecularity and order of reaction.

(b) Derive the integrated rate equation for n^{th} order reaction using integral method.

(c) Explain semi batch reactor with a neat sketch.

(d) Give the relation between C_A and x_A for constant volume system & variable volume system. Explain the terms used.

3. Attempt any THREE of the following : **12**

(a) Explain the precipitation method used for catalyst preparation.

(b) Give the rate equation (rate expression) for parallel & series reaction.

(c) Derive the integrated rate expression for irreversible unimolecular first order reaction.

(d) How feed should be admitted when PFR's are connected in parallel ?

4. Attempt any THREE of the following : **12**

(a) Define space time & space velocity. Give its unit.

(b) Write the general procedure for differential method of analysis of data.

(c) Derive the integrated rate expression for constant volume zero order reaction in terms of concentration. Give the graphical representation also.

(d) Compare MFR & PFR. (4 points)

(e) Explain the method to find conversion when MFR's of different sizes are arranged in series.

5. Attempt any TWO of the following : **12**

(a) Derive the temperature dependency of rate constant from transition state theory.

(b) Explain the different methods of catalyst regeneration. (6 points)

(c) Define fractional conversion (X_A) & derive relation $C_A = C_{AO} (1 - X_A)$.

6. Attempt any TWO of the following : **12**

(a) Derive the performance equation for Ideal Batch Reactor for Constant Volume System.

(b) A homogeneous gas phase reaction $A \rightarrow 3R$ proceeds with $-V_A = 10^{-1} C_A$ (mol/l.s.) at 200°C. Find the space time required to achieve 80% conversion of 50 mole % A and 50 mole % inerts fed to a PFR operating at 200°C and 5 atm pressure. The initial concentration of A is 0.0625 mol/l.

(c) A homogeneous liquid phase reaction $A \rightarrow R$, $-V_A = k C_A^2$ takes place with 50% conversion in MFR. Find the conversion if the reactor is replaced by PFR of equal size. All else remaining unchanged.
