

22512

22232

3 Hours / 70 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
 - (2) Answer each next main Question on a new page.
 - (3) Illustrate your answers with neat sketches wherever necessary.
 - (4) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.
 - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. Attempt any FIVE of the following :

10

- (a) Enlist the factors affecting the rate of reactions. (Any two)
- (b) Write down the rate equation of a first order Irreversible unimolecular reaction.
- (c) Give the names of different types of reactors.
- (d) List down the advantages of a Batch Reactor.
- (e) Define : (i) Specificity of catalyst (ii) Activity of catalyst
- (f) Define the term Autocatalytic reaction.
- (g) Write down the relationship between C_A , X_A for a constant volume batch reactor.

2. Attempt any THREE of the following :

12

- (a) Differentiate between Elementary, Non-elementary chemical reactions.
- (b) Derive an integrated rate equation of zero order reaction for constant volume batch reactor.



- (c) Write down the design equation of a Mixed Flow Reactor. Also draw the graphical representation.
- (d) Compare Mixed Flow Reactor (MFR) with Plug Flow Reactor (PFR).

3. Attempt any THREE of the following :

12

- (a) Define the following terms :
- (i) Catalyst
 - (ii) Inhibitors
 - (iii) Promoters
 - (iv) Poisoning of a Catalyst
- (b) Describe the method of Isolation for analysing the kinetic data.
- (c) Derive the rate equation for zero order reaction using integral method.
- (d) Draw the diagram of PFR's connected in series – parallel combination.

4. Attempt any THREE of the following :

12

- (a) For the reaction $A \rightarrow \text{Products}$, the following data were obtained at 25 °C, in which the concentration of A is given at different intervals of time :

t, min	0	10	20	30	40
C_A, mol/lit	0.860	0.740	0.635	0.546	0.405

Calculate the rate constant.

- (b) Define the terms space time, space velocity. Also write their mathematical expressions.
- (c) Explain the Half-life method for determination of overall order of irreversible reaction.
- (d) Explain the procedure to determine best system for achieving desired conversion for different size MFRs in series.
- (e) Compare Batch Reactor V/s P.F.R.

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

- (a) Describe the temperature dependency of rate constant from collision theory.
- (b) Explain the precipitation methods of catalyst preparations.
- (c) Derive an integrated rate equation for second order reaction of type $A + B \rightarrow$ Products for constant volume batch reactor.

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

- (a) Explain Continuous Stirred Tank Reactor (CSTR) with a neat sketch.
 - (b) Derive the performance equation for Ideal batch reactor (Constant Volume System).
 - (c) Explain multiple reactor system for equal size MFR in series.
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