



**NCD-003-1112001**      Seat No. \_\_\_\_\_

**M. Sc. (Sem. II) (CBCS) Examination**

**April / May - 2017**

**Industrial Chemistry : IC-201**

*(Reaction Engineering)*

**Faculty Code : 003**

**Subject Code : 1112001**

Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

- Instructions :**
- (1) All the Questions are compulsory.
  - (2) Each question carries 14 marks.
  - (3) Assume suitable data wherever necessary.

**1** Answer any seven out of the following ten questions :

- (1) Explain the term Residence Time Distribution (RTD).
- (2) Write a note on free radicals.
- (3) What are transition complex as a reaction intermediate ?
- (4) What is meant by homogeneous catalytic reaction? Give example.
- (5) What is meant by single reaction and multiple reactions?
- (6) What is meant by the term chemical reaction engineering?
- (7) Explain why molecularity of the reaction cannot be more than three.
- (8) Define with an example exothermic reaction.
- (9) Define rate of reaction based on unit volume of reacting fluid.
- (10) What do you mean by rate law?

**2** Answer any **two** from the following three questions :

- (1) Explain with the help of neat diagram mechanism of a catalytic reaction.
- (2) Explain the factors affecting rate of a chemical reaction.
- (3) Derive an equation for BET Theory.

3 Answer the following :

- (1) Explain mechanism of solid catalyzed gas phase reaction (L-H-H-W model).
- (2) What will be the initial rate of reaction if its rate constant is  $10^{-3} \text{ min}^{-1}$  and concentration of reactant is  $0.2 \text{ mol.dm}^{-3}$ ? What percentage conversion takes place after 200 minutes.

OR

3 Answer the following :

- (1) Explain with a neat diagram continuous stirred tank reactor.
- (2) The first order reaction is 20% complete in 10 minutes. Calculate the time required for 55% and 75% completion of the reaction.

4 Answer any two from the following three questions :

- (1) Explain the role of thermodynamics in the design of a chemical reactor.
- (2) Give difference between physical adsorption and chemical adsorption.
- (3) The half-life period for radioactive decay of  $^{14}\text{C}$  is 5730 years. An archeological artifact contained wood had only 80% of the  $^{14}\text{C}$  found in the living tree. Estimate the age of the sample.

5 Answer any two from the following four question :

- (1) Explain testing of a kinetic model and search for the correct mechanism for the following :

Consider  $2A + B \rightleftharpoons A_2B$ , the irreversible reaction proceeds by more than one step by formation of intermediate  $A^*$  and  $\text{Rate}_{(A_2B)} = (C_A^2 \cdot C_B) / (1 + 2C_A)$

- (2) Derive a differential rate equation for 1<sup>st</sup> order reaction. Give its half life time
- (3) Write the difference between order of reaction and molecularity.
- (4) Explain temperature dependency of a chemical reaction with the help of Arrhenius equation.