

Fifth Semester B.E. Degree Examination, Dec.2024/Jan.2025

Chemical Reaction Engineering

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Derive temperature dependency from transition state theory and Arrhenius law. (12 Marks)
- b. Define the following :
- Elementary and non-elementary reaction
 - Molecularity and rate constant

(08 Marks)

OR

- 2 a. Derive an integrated rate equation for bimolecular second order irreversible reaction. (10 Marks)
- b. At 500K, the rate of a bimolecular reaction is ten times the rate at 400K. Find the activation energy for this reaction
- from Arrhenius law
 - from collision theory
 - What is the percentage difference in the rate of reaction at 600 K predicted by these two methods?

(10 Marks)

Module-2

- 3 a. Derive design equations for steady state plug flow reactor with graphical representation for general case and constant density system. (10 Marks)
- b. Derive expression for equal size CSTRs connected in series. (10 Marks)

OR

- 4 a. Derive the performance equation for batch reactor by considering constant density system. (10 Marks)
- b. Derive the performance equation for mixed flow reactor. (10 Marks)

Module-3

- 5 a. Derive an expression for batch reactor with respect to conversion of first order reaction. (10 Marks)
- b. Explain the method of step Input for measuring RTD. (10 Marks)

OR

- 6 a. Derive an expression for exitage distribution in CSTR. (10 Marks)
- b. Explain the following :
- State of aggregation of flowing fluid
 - Earliness and lateness of mixing

(10 Marks)



Module-4

- 7 a. Derive equation for Michelis – Menton kinetic. (12 Marks)
- b. Derive equation for
- (i) Lineweaver Burk plot
 - (ii) Eadie-Hofstee plot
- (08 Marks)

OR

- 8 a. Define uncompetitive inhibition and derive an equation for the same. (10 Marks)
- b. Explain in detail the different types of enzyme specificities. (10 Marks)

Module-5

- 9 a. Explain in detail the growth associated and non growth associated kinetics of filamentous organisms. (10 Marks)
- b. What are the constituents of simple and complex media? Differentiate them. (10 Marks)

OR

- 10 a. Describe Monod model and Leudeking-Piret model of growth rate of micro organisms. (10 Marks)
- b. Explain substrate and product Inhibition on cell growth and product formation. (10 Marks)

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