CBCS SCHEME

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18BT52

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
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 an Integrated rate equation for bimolecular irreversible second order reaction. **(10 Marks)**

b. Define the following:
(i) Order and molecularity.
(ii) Law of mass action.
(iii) Elementary and non elementary reaction. **(10 Marks)**

OR

2 a. Derive temperature dependency term from transition state theory and Arrhenius law. **(12 Marks)**

b. At 500 K, the rate of a bimolecular reaction is ten times the rate at 400 K. Find the activation energy for this reaction, using (i) Arrhenius law (ii) From collision theory. **(08 Marks)**

Module-2

3 a. Derive design equations for steady state plug flow reactor with graphical representation for general case and constant density system. **(12 Marks)**

b. In an Isothermal Batch reactor, the conversion of liquid reactant is 70% in 13 minutes. Find space time and space velocity necessary to affect this conversion in a MFR and PFR. **(08 Marks)**

OR

4 a. Derive the performance equation for batch reactor. **(12 Marks)**

b. Define space time and space velocity. **(04 Marks)**

c. A homogenous gas phase reaction $A \rightarrow 3R$, proceeds with $-r_A = 10^{-2} e_A^{0.5}$. Determine τ required for MFR to attain 80% conversion. **(04 Marks)**

Module-3

5 a. Derive expressions for batch reactor and plug flow reactor with respect to conversion of first order reaction. **(10 Marks)**

b. Derive an expression for RTD in CSTR. **(10 Marks)**

OR

6 a. Write short notes on the following:
(i) Characteristic features of tracer.
(ii) State of aggregation. **(08 Marks)**

b. Derive an equation for RTD and exit age distribution for measuring. Residence time distribution from pulse input experiment. **(12 Marks)**

Module-4

7 a. Derive equation for Micheli's Menton kinetics and add a note on significance of K_m. (12 Marks)

b. What is the ratio of substrate concentration for a reaction proceeding at 90% and 10% of V_{max} respectively. (08 Marks)

OR

8 a. Explain in detail about the types of enzyme specificities. (10 Marks)

b. Derive equations for, (i) Double reciprocal plot and (ii) Single reciprocal plot (10 Marks)

Module-5

9 a. Explain substrate and product inhibition on cell growth and product formation. (10 Marks)

b. Describe in detail the thermal death kinetics of microorganisms. (10 Marks)

OR

10 a. Discuss about the monod model and Leudeking piret model of growth rate of microorganisms. (10 Marks)

b. Write short notes on Carbon and nitrogen source required for media preparation. (10 Marks)

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