

MASTER OF TECHNOLOGY (CHEMICAL ENGINEERING) (CBCS - 2015 COURSE)

M. Tech. (Chemical Engineering) Sem-II :SUMMER- 2022

SUBJECT : MODELING & SIMULATION OF CHEMICAL PROCESSES

Day : Tuesday
Date : 26-07-2022

S-14179-2022

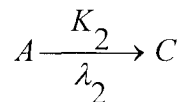
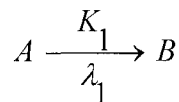
Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answer to both the sections should be written in **SEPARATE** answer book.
- 4) Assume suitable data **WHEREVER** necessary.
- 5) Draw neat and labeled diagram wherever necessary.

SECTION-I

Q.1 A plug flow reactor in which simultaneous first order reactions occurs with [10]
exothermic heat of reactions λ_1 & λ_2



- i) Write total continuity equation.
- ii) Write component continuity equations.
- iii) Write energy equation.

OR

Illustrate application of fundamental laws in formulation of models for [10]
chemical engineering system. Write the equations for following laws:

- i) Law of mass action
- ii) Equation of state
- iii) Equation of motion

Q.2 Postulate a mathematical model for single component vaporizer with [10]
following conditions.

- i) Steady state condition
- ii) Liquid phase dynamics
- iii) Liquid and vapor phase dynamics

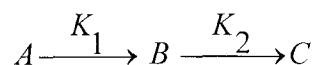
OR

Develop model equations for heat transfer with coil where in both modes on [10]
heat transfer are involved. Write assumptions with due justification.

Q.3 Develop a dynamic (time variant) model for the following system: [10]
n-stage gas absorption column in which components that enter the bottom of
column in gas feed stream are absorbed by the liquid stream entering from
top, so that the gas product stream leaving the top is more pure. Assume
linear equilibrium system. State assumptions clearly.

OR

A consecutive liquid phase isothermal first order reaction is carried out in [10]
plug flow reactor.



Postulate a model for this system considering axial dispersion in reactor.

P.T.O.

SECTION-II

Q.4 Elaborate the steps involved in integrating algorithm for simulation. **[10]**

OR

Write notes on: **[10]**

- i) Density functional theory.
- ii) Geometry optimization.

Q.5 Illustrate the solution methods for initial value and boundary value problems. **[10]**

OR

Discuss detail the solution strategies for distributed parameter models. **[10]**

Q.6 Elaborate the traditional tools used for simulation with suitable examples. **[10]**

OR

What is fuzzy logic? How it is applied in simulation of heat exchanger? **[10]**
Explain in detail.

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