

Total No. of Questions : 10]

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SEAT No. :

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B.E. (Chemical Engineering)

PROCESS MODELING AND SIMULATION

(2015 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or 10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Explain the terms - Lumped parameter system and distributed parameter system. Give example of each. [5]

b) Develop modeling equation of continuity for fluid flow operation. [5]

OR

Q2) a) Explain in short, the four different phases of model building. [5]

b) Define Process model? Give the classification of model with examples.[5]

Q3) a) Develop the modeling equation for the double pipe heat exchanger. [5]

b) Derive the model equation for laminar flow in narrow slit. [5]

OR

Q4) a) Develop the mathematical model for triple effect evaporator. [5]

b) Derive the model equation of flow through packed bed column. [5]

Q5) a) Develop the modeling equation for the batch distillation column. [8]

b) Draw a model to show a stage extraction and write all notations, assumptions and important parameters need to consider during modeling of extractor. [8]

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OR

Q6) a) Develop a model for Flash distillation column. [8]

b) Derive the model equation for continuous binary distillation in tray column. [8]

Q7) a) Develop the modeling equation for the following Plug Flow Reactor by considering axial position. [9]

b) As semi-batch reactor is run at constant temperature by varying the rate of addition of one of the reactants "A". The irreversible exothermic reaction is first order in reactants "A" & "B". The tank is initially filled to its 40% level with pure reactant "B" at a concentration  $C_{B0}$ . Maximum cooling water flow is begun, and reactant "A" is slowly added to the perfectly stirred vessel. Write the equations describing the system. Without solving the equations, try to sketch the profiles of  $F_A$ ,  $C_A$ , &  $C_B$  with time during the batch cycle. [9]

OR

Q8) a) Derive a mathematical model for the batch reactor in which the first order consecutive reactions  $A \rightarrow B \rightarrow C$  ( $k_1$ ,  $k_2$ ,  $k_3$  rate constant) takes place to get the product B. [9]

b) Derive the model equation for Bio-chemical reactor. [9]

Q9) a) Write short notes on use of numerical methods to solve the differential equations. [8]

b) Give the scope of process simulation with an example. [8]

OR

Q10) a) Derive the model equation for effluents treatment reactor. [8]

b) Explain utilization of HYSIS Software in modeling and simulation in detail. [8]

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