

Printed Pages : 3



ECH-701

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 151701**

Roll No.

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**B. Tech.**(SEM. VII) (ODD SEM.) THEORY  
EXAMINATION, 2014-15**PROCESS MODELLING AND SIMULATION**

Time : 3 Hours]

[Total Marks : 100

**1 Attempt any four parts : 5×4=20**

- a) What is mathematical model? Discuss its applications in unit operations.
- b) Classify different models. Differentiate simple and rigorous models.
- c) Discuss about the numerical software's available for mathematical modeling and simulation.
- d) Explain why modeling assumptions are important in the building of a model.
- e) With a suitable example discuss the application of total continuity equation and component continuity equation in developing a mathematical model.
- f) Briefly explain the principles of formulation of mathematical models.

**2** Attempt any two parts : **10×2=20**

- a) Consider a simple reactor with two components (biomass and substrate). The reactor is perfectly mixed. The biomass is nothing but the cells that consume the substrate. Let  $X_1$  be the biomass concentration and  $X_2$  be the substrate concentration. Derive the dynamic model by developing a material balance on the biomass and substrate.
- b) Develop a mathematical model of jacketed tubular reactor.
- c) Derive a model for absorber and state assumptions.

**3** Attempt any two parts : **10×2=20**

- a) Explain distributed parameter model for packed bed.
- b) Discuss the modeling of reactive separation processes.
- c) Write a numerical method of analysis to solve differential equations code for MATLAB software.

**4** Attempt any two parts : **10×2=20**

- a) Elaborate time dependent models and their applications.
- b) Describe model reduction through orthogonal collocation.
- c) i) An ice cube is dropped into a glass of water at room temperature and then stirred. Develop a model describing the time varying behavior of the system with all the required assumptions.

- ii) A tank is used to dissolve a solid into a liquid solvent. The tank is provided with an agitator. This tank acts as a batch system. Do the modelling with respect to liquid as well as solid phases.

**5** Attempt any two parts : **10×2=20**

- a) Explain the flow sheet simulation with a model as example.
  - b) Discuss about artitioning and tearing.
  - c) Write a review of thermodynamic procedures and physical property data banks.
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