P P SAVANI UNIVERSITY

Seventh Semester of B. Tech. Examination

December 2021

SECH4050 Modeling, Simulation & CAD in Chemical Engineering

15.12.2021, Wednesday **Time: 09:00 a.m. To 11:30 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1 (a)	Define: Dynamics, Variables, Feedback control, Feedforward control, Stability.	**[05]**
Q - 1 (b)	State limitations of chemical process simulation.	**[05]**
Q - 2 (a)	Explain the types of model in detail.	**[05]**
Q - 2 (b)	Give an account of the process matrix method in terms of recycle.	**[05]**
Q - 3 (a)	Explain different types of feed arrangement of multiple effect evaporators and state the pressure and temperature relation of each effect in detail.	**[07]**
Q - 3 (b)	Explain: Information flow diagram.	**[03]**
	OR	
Q - 3 (a)	Explain the steps of the following matrix method with process matrix method. a. The process matrix method b. The stream connection matrix method c. The incidence matrix method d. The adjacency matrix method	**[05]**
Q - 3 (b)	Explain the steps to convert information flow diagram to process flow diagram.	**[05]**

SECTION – II

Q - 1	Derive a mass balance equation on solvent free basis for an absorber used to separate a binary gaseous mixture with a liquid solvent.	**[10]**
	OR	
Q - 1	Prove a mass balance equation for a single stage mixer-settler system used to separate binary mixtures with a solvent.	**[10]**
Q - 2 (a)	Explain the modelling of fluidized bed reactor.	**[05]**
Q - 2 (b)	Write in detail about non-adiabatic reactors.	**[05]**
Q - 3 (a)	Explain one of the two classes of reactions.	**[04]**
Q - 3 (b)	Solve mass and energy balance on a mixing vessel with reaction.	**[06]**

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SECTION – I

Q - 1 (a)	Define: Dynamics, Variables, Feedback control, Feedforward control, Stability.	**[05]**
Q - 1 (b)	Explain the uses of process simulators in chemical industry.	**[05]**
Q - 2 (a)	Derive Fick's Law from equation of continuity.	**[06]**
Q - 2 (b)	Explain recycle in the process matrix method.	**[04]**
Q - 3 (a)	Explain Mathematical Modelling Of Single Effect Evaporator.	**[07]**
Q - 3 (b)	Explain the steps to convert information flow diagram to process flow diagram.	**[03]**
	OR	
Q - 3 (a)	State the approach of Transport phenomena models and also explain subtypes of transport phenomenon model.	**[06]**
Q - 3 (b)	Write any two steps of the general strategy of analysis of complex processes.	**[04]**

SECTION – II

Q - 1	Design a multi stage distillation column used for separating binary component. Following designing section must be included: a. Feed tray b. Rectifying section c. Stripping Section.	**[10]**
	OR	
Q - 1	Derive a mass balance equation for a single stage mixer-settler system used to separate binary mixtures with a solvent.	**[10]**
Q - 2 (a)	Solve mass and energy balance on a mixing vessel without reaction.	**[05]**
Q - 2 (b)	Derive a mass balance equation on solvent free basis for an absorber used to separate a binary gaseous mixture with a liquid solvent.	**[05]**
Q - 3 (a)	Explain non adiabatic reactors in detail.	**[05]**
Q - 3 (b)	Develop the model for fluidized bed reactor.	**[05]**

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