Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VIII (NEW) EXAMINATION – WINTER 2023

Subject Code:2180503   **Date:01-12-2023**
Subject Name: Process Modeling, Simulation & Optimization
Time:02:30 PM TO 05:00 PM   **Total Marks:70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Describe in detail the principles of formulation of mathematical models.	**03**
	(b)	What is simulation? Explain linear system analysis.	**04**
	(c)	Give a detail classification of models.	**07**
Q.2	**(a)**	Explain the meaning of following terms for optimization: feasible solution, feasible region and optimum solution.	**03**
	(b)	Describe any one chemical process simulator and its salient features.	**04**
	(c)	Discuss the degree of freedom analysis with suitable example.	**07**
		OR	
	(c)	A poster is to contain 300 cm^2 of printed matter with margin of 6 cm at the top and bottom and 4 cm at each side. Find the overall dimensions that minimize the total area of poster.	**07**
Q.3	**(a)**	List out various equations of motion for process modeling.	**03**
	(b)	Discuss Distributed V/S Lumped Parameter models.	**04**
	(c)	Explain partitioning and tearing with example.	**07**
		OR	
Q.3	**(a)**	Differentiate sequential modular approach and simultaneous modular approach.	**03**
	(b)	Explain algorithm of Golden section method.	**04**
	(c)	Find the volume of the largest right circular cylinder that can be inscribed inside a sphere of radius R.	**07**
Q.4	**(a)**	Enlist important model building steps for a process.	**03**
	(b)	If you borrow $100,000 from a lending agency at 10 percent yearly interest and wish to pay it back in 10 years in equal installments paid annually at the end of the year, what will be the amount of each yearly payment? Compute the principal and interest payments for each year.	**04**
	(c)	Develop the equations for the series of isothermal, variable holdup CSTRs. List all the assumptions with their justifications.	**07**
		OR	
Q.4	**(a)**	Differentiate between deterministic and stochastic models.	**03**
	(b)	Explain the application of optimization in fitting vapor-liquid equilibrium data.	**04**
	(c)	Explain in detail black-box model, white-box model and gray model.	**07**
Q.5	**(a)**	Explain the uses of mathematical models.	**03**
	(b)	Explain Simplex algorithm for linear programming.	**04**
	(c)	Discuss the optimization of a pipe diameter.	**07**
		OR	
Q.5	**(a)**	Enlist various equations for the chemical kinetics used in process modeling.	**03**
	(b)	Write short note on decomposition of networks.	**04**
	(c)	Discuss six steps procedure to solve optimization problem.	**07**

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