Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VIII (NEW) EXAMINATION – WINTER 2021

Subject Code:2180503 Date:01/12/2021

Subject Name:Process Modeling, Simulation & Optimization

Time:10:30 AM TO 01:00 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.**

			MARKS
Q.1	**(a)**	Explain partitioning.	**03**
	(b)	Describe fundamental laws for formation of Mathematical Models of Chemical Engineering Systems.	**04**
	(c)	Explain the application of optimization for optimal pipe diameter.	**07**
Q.2	**(a)**	Explain tearing.	**03**
	(b)	Write the various equations of motion for process modeling.	**04**
	(c)	Discuss six steps procedure to solve optimization problem.	**07**
		OR	
	(c)	Discuss various obstacles to optimization.	**07**
Q.3	**(a)**	Explain convexity with examples.	**03**
	(b)	Explain sequential modular approach.	**04**
	(c)	Explain modeling of ideal binary distillation column.	**07**
		OR	
Q.3	**(a)**	Explain concavity with examples.	**03**
	(b)	Explain simultaneous modular approach.	**04**
	(c)	Explain modeling of non-isothermal CSTR	**07**
Q.4	**(a)**	Define : feasible region, global minimum, local minimum	**03**
	(b)	A child's rectangular play yard is to be built next to the house. To make the three sides of the play yard, 24 feet of fencing are available. Formulate the problem to maximize the area of play yard.	**04**
	(c)	Define mathematical modeling and give detail classification of mathematical modeling.	**07**
		OR	
Q.4	**(a)**	Define : continuity of function, global maximum, local maximum	**03**
	(b)	It is required to design a close-topped rectangular tank whose total area is to be 110 m^2 . If a maximum volume is required then formulate the problem.	**04**
	(c)	Explain: black-box model, white box model, gray model.	**07**
Q.5	**(a)**	Explain the penalty methods for solving nonlinear programming with constraints.	**03**
	(b)	Explain Simplex algorithm for linear programming.	**04**
	(c)	Minimize $f(x) = x^2 - x$ using Newton method. Take initial	**07**

guess = 3

OR

Q.5	**(a)**	Classify the methods for unconstrained multivariable optimization problems.	**03**
	(b)	Explain algorithm of Golden section method.	**04**
	(c)	Minimize $f(x) = x^2 - x$ using Finite difference Newton method. Take initial guess = 3	**07**

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