Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(NEW) • EXAMINATION – WINTER 2016

Subject Code:2171710 **Date:25/11/2016**

Subject Name: Process Dynamics and Control

Time:10.30 AM to 1.00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks**

Q.1	**(a)**	Explain different methods of controlling pressure in a distillation column.	**07**
	(b)	Compare different control strategies for heat exchangers with suitable diagrams.	**07**
Q.2	**(a)**	Discuss control of overhead and bottom composition control for a distillation column.	**07**
	(b)	Explain countercurrent type exchangers with necessary dynamic equations.	**07**
		OR	
	(b)	A mercury-in-steel thermometer sometimes shows an inverse response. The reading drops momentarily when the bulb is immersed in hot water, because the shell expands more rapidly than the mercury. How complex a model is needed to explain this behavior? Can inverse response be obtained if the wall and internal capacities are lumped?	**07**
Q.3	**(a)**	Compare batch, continuous and packed-bed reactors. Also discuss stability issues associated with each in brief.	**07**
	(b)	Explain single and two element control strategies for boiler. Discuss limitations of each.	**07**
		OR	
Q.3	**(a)**	Explain three element control strategy and it's limitations for boiler. Discuss advantages of it over single and two element control strategies.	**07**
	(b)	Compare black, white and gray box models for process control problems with suitable examples.	**07**
Q.4	**(a)**	Discuss the need of control scheme development for Waste-Water Treatment plant.	**07**
	(b)	Explain the unit operations used in food and pharmaceutical industries with suitable process flow diagram.	**07**
		OR	
Q.4	**(a)**	Gases A and B are fed continuously to a tank with a volume 20 ft^3. The normal tank conditions are 20 psia and 70 Degree Fahrenheit, and the normal flow rates are F_A=30 and F_B=20 cfm measured at tank conditions if the flow of B is suddenly increased to 22 cfm, when does the concentration of B reach 95 percent of the new steady-state value? Also explain the response of two element interacting system.	**07**
	(b)	Discuss the importance of system identification for petrochemical and fertilizer industries.	**07**

Q.5	**(a)**	Explain different factors which are governing the reaction of chemical reactors.	**07**
	(b)	Explain the unit operations of paper industry with suitable process flow diagram.	**07**

OR

Q.5	**(a)**	What is frequency response for distillation column? Explain importance of it with necessary equations.	**07**
	(b)	What are shrinking and swelling effect in boiler? Explain dynamic compensation of it.	**07**