Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER • 2015

Subject Code: 153501 **Date: 02/05/2015**

Subject Name: Process Instrumentation, Dynamics and Control

Time: 02.30pm-05:00pm **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)**	Derive response equation for a mercury-in-glass thermometer system subjected to unit step function.	**07**
	(b)	Define Laplace transform. Explain transform of following simple function: (i) step function (ii) exponential function	**07**
Q.2	**(a)**	Define 'Stability' and find the stability of the system using Routh stability criterion having characteristic equation: $3S^4 + 10S^3 + 5S^2 + 5S + 2 = 0$	**07**
	(b)	Define first order system. Derive transfer function of mixing tank with assumptions.	**07**
		OR	
	(b)	Derive a transfer function relating inlet and outlet flowrates of a liquid level system with linear resistance.	**07**
Q.3	**(a)**	A thermometer with time constant 10 seconds and showing steady state temperature 35°C is suddenly immersed in an oil bath at 135°C. Find a) Temperature reading on thermometer after 10 sec? b) Time required for 80% response.	**07**
	(b)	Define process dynamics. What are the differences between open and closed loop system?	**07**
		OR	
Q.3	**(a)**	Write short note on distributed control system.	**07**
	(b)	Discuss the transfer function for P, PI and PID controller.	**07**
Q.4	**(a)**	What is the order of the U-tube manometer system? Derive the transfer function for U-tube manometer.	**07**
	(b)	What are Bode diagrams? Explain the graphical rules for Bode diagrams.	**07**
		OR	
Q.4	**(a)**	Derive the equation of unit step response for critically damped second order system.	**07**
	(b)	Explain Pneumatic control valve.	**07**
Q.5	**(a)**	Mention various temperature measurement devices and explain pressure spring thermometers.	**07**
	(b)	Explain bubbler system for liquid level measurement	**07**
		OR	
Q.5	**(a)**	Explain the principle, construction and working of rotameter.	**07**
	(b)	Mention various pressure measurement devices and explain any one in detail.	**07**

****