Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VIII (NEW) EXAMINATION – WINTER 2020

Subject Code:2183607 **Date:25/01/2021**

Subject Name:Process Instrumentation, Dynamics & Control

Time:02:00 PM TO 04:00 PM **Total Marks: 56**

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Mention the importance of Laplace transform in process dynamics.	**03**
	(b)	Draw the block diagram of a control system mentioning various components present in it.	**04**
	(c)	Solve $\frac{d^3x}{dt^3} + 2\frac{d^2x}{dt^2} - \frac{dx}{dt} - 2x = 4 + 2e^{2t};\ x(0) = 1, x'(0) = 0, x''(0) = -1$	**07**
Q.2	**(a)**	Find the final value of a function having laplace transform $\frac{1}{s(s+1)^2}$	**03**
	(b)	State and prove Initial value theorem	**04**
	(c)	Stating the assumptions derive the transfer function of mercury in glass thermometer.	**07**
Q.3	**(a)**	Mention the characteristic features for response of a first order system for a step input	**03**
	(b)	A tank having a cross sectional area of $2m^2$ is operating in a steady state with an inlet flowrate of 2 m^3/min. The resistance of valve attached to tank outlet is 0.5 min/m^2. Find the transfer function relating to H(s)/Q(s)	**04**
	(c)	Derive the transfer function for the case of two tanks connected in series in a non-interacting manner.	**07**
Q.4	**(a)**	What is Transportation lag? Specify its importance in reference to control systems.	**03**
	(b)	Mention any four terms used to characterize an underdamped second order system.	**04**
	(c)	Derive the transfer function in a U tube manometer relating the applied pressure difference and manometer reading.	**07**
Q.5	**(a)**	State Nyquist Stability criterion.	**03**
	(b)	Describe the stability of linear systems.	**04**
	(c)	Show that for the case of a proportional controller for a change in set point offset decreases when the value of gain increases	**07**
Q.6	**(a)**	Derive the transfer function of a Proportional Integral Controller.	**03**
	(b)	Differentiate Positive feedback and Negative feedback systems. Which feedback system is most commonly used in process Industries	**04**
	(c)	Discuss various rules for plotting root locus of a closed loop feedback system.	**07**
Q.7	**(a)**	Mention various laws of thermoelectricity.	**03**
	(b)	How McLeod Vacuum Gauge is used to measure Vacuum pressure?	**04**
	(c)	Describe various Static & Dynamic Characteristics of measuring instruments.	**07**

Q.8	**(a)**	Write a short note on various pressure measurement systems mentioning the relationship between them.	**03**
	(b)	How air purge system is used for level measurements?	**04**
	(c)	With the help of a neat diagram explain how Venturimeter can be used to measure flow of liquids.	**07**

****