

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 $2\text{ m}^3/\text{min}$. 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**

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