Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2022

Subject Code:3153618 Date:09-01-2023

Subject Name:Process Instrumentation Dynamics & Control

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 the term: (i) Manipulated variable (ii) Controlled variable	**03**
	(b)	Write the mathematical representation of unit impulse function and derive its Laplace transform	**04**
	(c)	Derive transfer function of mixing process with assumption.	**07**
Q.2	**(a)**	State and prove final value theorem.	**03**
	(b)	Write down the type of second order system	**04**
	(c)	Explain the selection criteria for controllers.	**07**
		OR	
	(c)	Justify the statement — "Addition of Integral control action to a proportional controller eliminates offset".	**07**
Q.3	**(a)**	Explain the term: (i) Transfer function (ii) Deviation variable	**03**
	(b)	Differentiate Servo problem and regulator problem.	**04**
	(c)	Mention the procedure steps of Routh test used to check the stability of a control system	**07**
		OR	
Q.3	**(a)**	Enlist the assumption involved in mercury thermometer system.	**03**
	(b)	Mention the following terms relating to control system (i) set point tracking (ii) disturbance rejection	**04**
	(c)	Find the stability of system using routh stability criteria having characteristic equation: $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$	**07**
Q.4	**(a)**	Differentiate between P-Controller and On-Off Controller.	**03**
	(b)	Derive the step response of an underdamped second order system	**04**
	(c)	With neat sketch explain principle, working and function of radiation pyrometer.	**07**
		OR	
Q.4	**(a)**	Derive transfer function of PI-Controller.	**03**
	(b)	A Control system is subjected to a step change of magnitude 10. The transfer function of control system is expresses as $G(s) = \frac{6}{0.9s^2+0.3s+10}$. Calculate overshoot, Decay ration, ultimate value of response, maximum value of response	**04**
	(c)	Explain working and construction of bimetallic thermometers.	**07**
Q.5	**(a)**	How stability is mentioned for linear systems?	**03**
	(b)	With a neat figure explain the construction and working of Pneumatic Control Valve?	**04**

	(c)	Describe the working of any one vacuum measuring instrument with a neat sketch.	**07**

OR

Q.5	**(a)**	Comment of stability of having Laplace transform $\frac{1}{s^2+4s+4}$	**03**
	(b)	Explain the component of control system	**04**
	(c)	Describe bubbler system for liquid level measurement with neat sketch.	**07**

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