Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2018

Subject Code:2150504 **Date:20/11/2018**

Subject Name:Instrumentation & Process Control

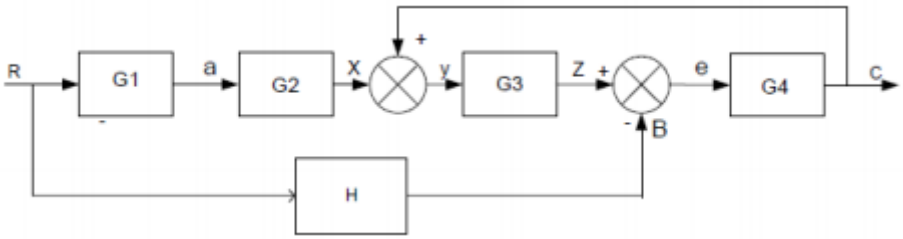
Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

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

Q.1	**(a)**	State and Prove final and initial Value theorem.	**03**
	(b)	Derive the transfer function of U-tube manometer system.	**04**
	(c)	Derive the equation of unit step response for critically damped second order system.	**07**
Q.2	**(a)**	What do you mean by transportation lag?	**03**
	(b)	What is first order system? Describe dynamic response of first order lag system to unit step change.	**04**
	(c)	Derive the transfer function of mercury thermometer. Determine the response of mercury thermometer for step function and also mention the important features of step response.	**07**
		OR	
	(c)	A thermometer having a first order dynamic with a time constant 1 min is place in a temperature bath at 100°F. After the thermometer reaches steady state it is suddenly placed in a bath at 110°F at t = 0 and left there for 1 min, after which it is immediately returned to the bath at 100°F. Calculate the thermometer reading at 2 min.	**07**
Q.3	**(a)**	Explain Servo and Regulator control with suitable examples.	**03**
	(b)	Solve the following by using Laplace Transforms: $\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + x = 1 \quad x(0) = 0 \quad x'(0) = 0 \quad x"(0) = 0$	**04**
	(c)	Derive overall transfer function for two tanks connected in series Non-interacting system.	**07**
		OR	
Q.3	**(a)**	With neat sketch explain the importance of transfer function.	**03**
	(b)	Draw the general block diagram of a simple control system with positive feedback and explain each term.	**04**
	(c)	Solve the following by using Laplace Transforms: $\frac{d^3x}{dt^3} + 2\frac{d^2x}{dt^2} - \frac{dx}{dt} - 2x = 4 + e^{2t}\ ;\ x(0) = 1 \quad x'(0) = 0 \quad x"(0) = -1$	**07**
Q.4	**(a)**	Draw the P and I diagram of distillation column.	**03**
	(b)	Discuss the transfer function for PID controller.	**04**
	(c)	Sketch the Root locus diagram for the control system. G(s) = Kc / s(s+1)(s+2)	**07**
		OR	
Q.4	**(a)**	Discuss the transfer function for P controller.	**03**
	(b)	What are Bode diagrams? Explain the graphical rules for Bode diagrams.	**04**

(c) Find C/R of the following closed loop control systems. **07**



Q.5 **(a)** Explain Bellow Pressure gauge for the Pressure measurement. **03**

(b) Describe the bubbler system for liquid level measurement with neat sketch. **04**

(c) Explain working and construction of bimetallic thermometers. **07**

OR

Q.5 **(a)** Classify the pressure measuring instruments. **03**

(b) Explain any two Static and dynamic characteristics of an instrument. **04**

(c) Explain principle, construction and working of rotameter. **07**

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