

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 2160407

Date: 27/11/2018

Subject Name: Instrumentation and Control for Bioengineering

Time: 02:30 PM TO 05:00 PM

Total Marks: 70

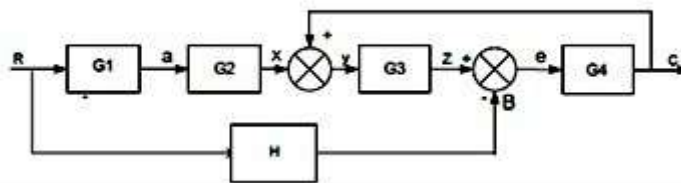
Instructions:

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

		Marks
Q.1	(a) Define first order and second order system.	03
	(b) What is damping parameter? Discuss its physical significance	04
	(c) Discuss in details different Static and Dynamic Characteristics of an Instrument.	07
Q.2	(a) Derive Laplace transform of Unit Step Function.	03
	(b) Discuss different forcing functions in brief.	04
	(c) Solve the following differential equation by Laplace transform.	07
	$\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + x = 1 \quad x(0) = x'(0) = 0$	
	OR	
	(c) Find the inverse of the following functions.	07
	(A) $f(s) = \frac{1}{s(\tau s + 1)}$ (C) $x(s) = \frac{1}{s(s^2 - 2s + 5)}$	
Q.3	(a) Write essential elements of a control system.	03
	(b) Derive transient response of a first order system to a unit step change in input.	04
	(c) Derive transfer function of a U-tube manometer.	07
	OR	
Q.3	(a) Define servo and regulator mechanism control mechanism with one example of each.	03
	(b) Differentiate between negative and positive feedback systems.	04
	(c) Derive the transfer function for Mercury in glass thermometer clearly indicating the assumption made.	07
Q.4	(a) What are parts of a measuring instrument?	03
	(b) Explain with example feedback and feed forward control system.	04
	(c) Determine the stability of the system having the open loop transfer function	07

$$G(s) = \frac{K_c(s+1)}{s(s+2)(s+3)}$$

- Q.4** (a) What is a final control element? **03**
(b) Find C/R for the given control system. **04**



- (c) Discuss in details about P, PI, PD and PID controllers. **07**
- Q.5** (a) What is thermal well? Why is it used? **03**
(b) Explain the construction and working of Bimetallic thermometer. **04**
(c) With neat sketch discuss principle construction and working of a bourdon tube pressure gauge. **07**

OR

- Q.5** (a) List different types of a pyrometer. **03**
(b) Describe various level measurement methods? **04**
(c) Explain the construction and working of Rotameter. Write its advantages over Venturimeter. **07**

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