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**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING
MID TERM EXAMINATION - APR 2023**

Semester : Semester IV - 2021

Course Code : EEE2007

Course Name : Sem IV - EEE2007 - Control Systems Engineering

Program : EEE

Date : 13-APR-2023

Time : 9.30AM - 11.00AM

Max Marks : 50

Weightage : 25%

Instructions:

- (i) Read all questions carefully and answer accordingly.
 - (ii) Question paper consists of 3 parts.
 - (iii) Scientific and non-programmable calculator are permitted.
 - (iv) Do not write any information on the question paper other than Roll Number.
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PART A

ANSWER ALL THE QUESTIONS

(5 X 2 = 10M)

1. A transfer function represents the relationship between the output signal of a control system and the input signal, for all possible input values The transfer function is applicable only to -----
a) Linear and time-variant systems (CO1) [Knowledge]
b) Linear and time-invariant systems
c) Non-linear systems
d) None of the above
2. An open-loop control system utilizes an actuating device to control the process directly without using feedback. In contrast to an open-loop control system, a closed-loop control system utilizes the feedback mechanism to compare the actual output with the desired output response. An electric toaster in the kitchen is an example of-----.
a) Closed loop system (CO1) [Knowledge]
b) Open loop system
c) Feedback control system
d) All the above

3. The performance characteristics of a control system are specified in terms of the transient response to unit step input. The transient response of a practical control system exhibits damped oscillations before attaining the steady state. The parameters, those are used to specify the transient response are _____
- Undamped natural frequency, Damping ratio and damped frequency. (CO2) [Knowledge]
 - Delay time, Rise time, Peak time, settling time and Maximum peak overshoot.
 - Resonant frequency, Band Width, Maximum peak
 - Resonant frequency, Damping ratio and Maximum peak overshoot.
4. Steady state error is a measure of system accuracy. It depends on two factor, nature of the reference input and type of the system. The position and velocity errors of type 2 system are -----,-----
- constant, constant (CO2) [Knowledge]
 - constant, infinity
 - zero, constant
 - zero, zero
5. Time response for a second order control system depends on value of ξ . If $\xi > 1$ then the system is called -----
- undamped system (CO2) [Knowledge]
 - under damped system.
 - over damped system.
 - critically damped system.

PART B

ANSWER ALL THE QUESTIONS

(2 X 10 = 20M)

6. An automobile shock absorber can be represented with single mass, damper and spring with an external force F acting on mass which produces a displacement of x . List the various forces acting on the system and obtain its transfer function
- (CO1) [Comprehension]
7. An input signal $r(t) = (5 + 2t + \frac{1}{2}t^2)$ is applied to a unity negative feedback control system with $G(s) = \frac{5(s+4)}{s^2(s+1)(s+20)}$. Evaluate the steady state error.

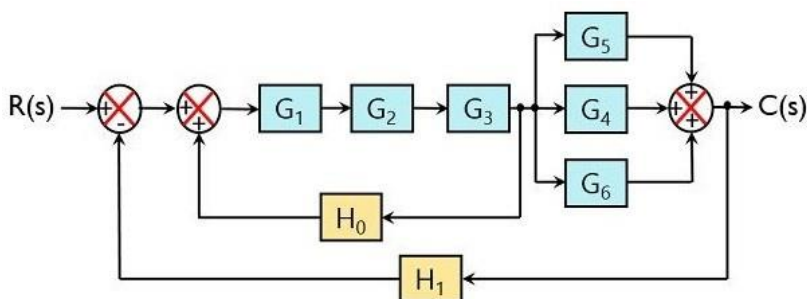
(CO2) [Comprehension]

PART C

ANSWER THE FOLLOWING QUESTION

(1 X 20 = 20M)

8. Using Block diagram reduction techniques, reduce the block diagram given below and obtain the transfer function



(CO1) [Application]

