BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – B.Tech.(EE)]-2021
Course Name – Control System Design
Course Code - PE-EE701A
(Semester VII)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Control System is described as

a) Control system is a system in which the output is controlled by varying the input

b) Control system is a device that will not manage or regulate the behaviour of other devices using control loops

c) Control system is a feedback system that can be both positive and negative

d) Control System is a system in which the input is controlled by varying the output

(ii) Identify the following that are not characteristics of the closed loop systems

a) It does not have the ability to control the system transient response

b) It does not involve I/O measurements

c) It reduces the sensitivity of plant-parameter variations

d) It does not compensate for disturbance

(iii) Determine the poles of the given transfer function

$$G(s)=\frac{s(s+2)(s+4)}{s(s+3)(s+4)}$$

a) s=0, -3, -4

b) s=0, -2, -4

c) s=0, -1, -4

d) s=-3, -4

(iv) The characteristic equation of a feedback control system is s^3+Ks^2+9s+18. When the system is marginally stable,compute the frequency of the sustained oscillation:

a) 1
b) 1.414
c) 1.732
d) 3

(v) Choose with regard to the filtering capacity the lead compensator and lag compensator are respectively:

a) Low pass and high pass filter
b) High pass and low pass filter
c) Both high pass filter
d) Both low pass filters

(vi) The characteristic equation of a control system is given by s^2 +4s+13=0. Identify the system is:

a) Critically damped
b) Overdamped
c) Underdamped
d) Unstable

(vii) For a second-order system with damping ratio ζ=0.5, identify the nature of the response to a step input will be:

a) Underdamped with oscillations
b) Critically damped without oscillations
c) Overdamped without oscillations
d) Undamped with sustained oscillations

(viii) Identify general characteristics equation is given by

a) 1+G(s)H(s) = 0
b) G(s)H(s) = 0
c) 1- G(s)H(s) = 0
d) 1/1+G(s)H(s) = 0

(ix) Identify if a pole is located at origin, it get represented on the magnitude plot of

a) -10 log (ω) dB
b) -20 log (ω) dB
c) -40 log (ω) dB
d) -60 log (ω) dB

(x) Tell if the OLTF contains one zero in right half of s-plane then

a) Open loop system is unstable
b)]Close loop system is unstable
c) Close loop system is unstable for higher gain
d) Close loop system is stable

(xi) Mention the term describes a system's behavior where small changes in system parameters cause drastic changes, such as moving from stable to oscillatory behavior.

a) Chaos
b) Stability
c) Bifurcation
d) Resonance

(xii) In a second-order system, identify if a damping ratio ζ less than 1 then result in

a) Overdamped response
b) Critically damped response
c) Underdamped response with oscillations
d) Unstable system

(xiii) Identify the methods is best suited for designing a controller for a system with multiple inputs and outputs:

a) Root Locus
b) Frequency Response
c) State-Space
d) PID Tuning

(xiv) If the gain of the open loop system is doubled, identify that the gain of the system is :

a) Not affected
b) Doubled
c) Halved
d) One fourth of the original value

(xv) Identify in a bode magnitude plot, slopes would be exhibited at high frequencies by a 4th order all-pole system:

a) -80dB/decade
b) -40 dB/decade
c) 40 dB/decade
d) 80 dB/decade

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Define first order and second order system. (3)
3. Express the Transfer Function of RLC electrical circuits. (3)
4. Explain about the cause of using PID control industrial applications. (3)

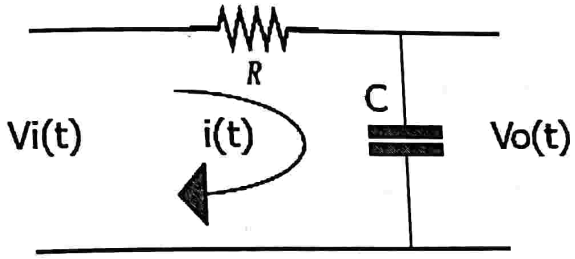
5. Explain about anyone type of controller. (3)
6. Explain peak-overshoot and peak time. (3)

OR

Explain Settling time and maximum peak overshoot. (3)

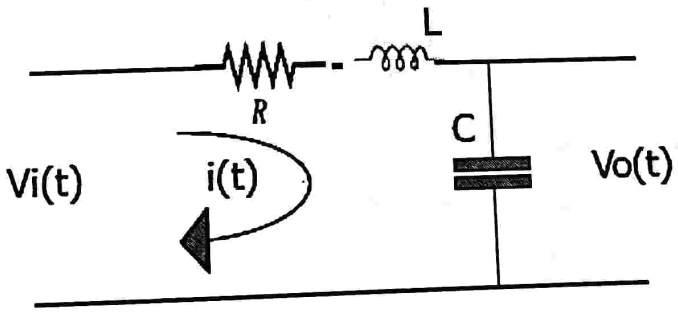
Group-C
(Long Answer Type Questions) 5 x 6=30

7. Explain about lag compensator. (5)
8. Evaluate the value of zeta for the given transfer function. G(s)= 100/s(s+5), H(s)=1 Also show the nature of output response. (5)
9. Develop a PD controller. (5)
10. With suitable diagram explain gain crossover frequency and GM. (5)
11. Predict the effects of adding pole and zero on the root locus. (5)
12. Evaluate the transfer function of (5)



OR

Evaluate the transfer function of (5)



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