Code No: **20EE4T04** **R20**

II B. TECH II SEMESTER REGULAR EXAMINATIONS, JUNE - 2022
CONTROL SYSTEMS
(ELECTRONICS AND COMMUNICATION ENGINEERING)

Time: 3 hours Max. Marks: 70

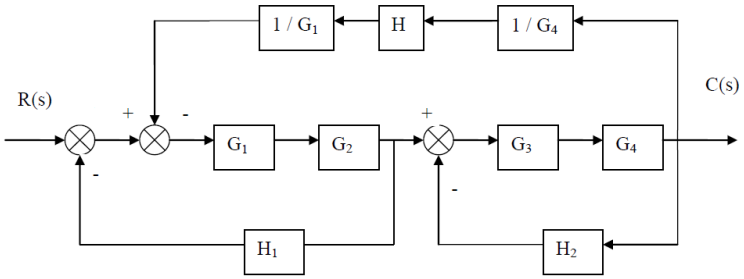
Note: Answer **ONE** question from each unit **(5 × 14 = 70 Marks)**

UNIT-I

1. a) Explain translatory and rotary elements of mechanical systems. [7M]
   b) Describe the open loop and closed loop control system. [7M]

(OR)

2. a) Discuss electrical analogous of mechanical rotational systems. [7M]
   b) Using Block diagram reduction technique, obtain the transfer function for the system shown in the figure. [7M]



UNIT-II

3. a) A Unity Feedback Control System has G(s) = 1 / [s(s+2)]. The input to the System is given by r(t) = 2+3t+2t^2. Determine its Error Constants. [7M]
   b) Derive the time response of second order underdamped system due to unit step input. [7M]

(OR)

4. a) Describe a two phase a.c. servomotor and derive its transfer function. [7M]
   b) Obtain the time response of first order system for unit step and unit ramp inputs? [7M]

UNIT-III

5. a) How RH Stability criterion can be used to study the relative stability? [4M]
   b) Sketch the root-locus for a Unity Feedback Control System given by [10M]

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

(OR)

6. a) Find the range of 'K' for the stability of the system with characteristic equation $S^4+3S^3+3S^2+2S+K=0$ by Routh-Hurwitz criterion. [7M]

   b) Explain the effects of adding poles and zeros to G(s) H(s) on the root loci by considering one the example. [7M]

UNIT-IV

7. a) Sketch the Bode Plot and hence find Gain Cross Over Frequency, Phase cross over frequency, Gain margin and Phase margin for the System given by [7M]

   $G(s) = 10(1+0.1s)/[s(1+0.01s)(1+s)]$

   b) By Nyquist Stability Criterion determine the stability of Closed Loop System, whose Open Loop Transfer function is given by [7M]

   $G(s)\,H(s) = (s+2) / [(s+1)(s-1)]$

(OR)

8. a) Define [4M]
   i) Minimum phase transfer function
   ii) Non minimum phase transfer function.

   b) Sketch the Bode plots for a system [10M]
   $G(s) = 15(s+5)/ s(s^2+16s+100)$ Hence determine the stability of the system.

UNIT-V

9. a) What is the need of lead compensator? Derive its transfer function and also draw the bode plot. [7M]

   b) Find the state transmission matrix for the following matrix, [7M]

$$A = \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$$

(OR)

10. a) Explain the design procedure of lag compensator [7M]

    b) The state equation of a linear- time invariant system is given as, [7M]

$$\dot{X} = \begin{bmatrix} 0 & 5 \\ -1 & -2 \end{bmatrix} X + \begin{bmatrix} 1 \\ 1 \end{bmatrix} U$$

$$Y = [1 \quad 1]X$$

Find the transfer function?

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