Code No: **19EET405** **R19**

II B. TECH II SEMESTER REGULAR EXAMINATIONS, AUGUST 2021
CONTROL SYSTEMS
(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 60

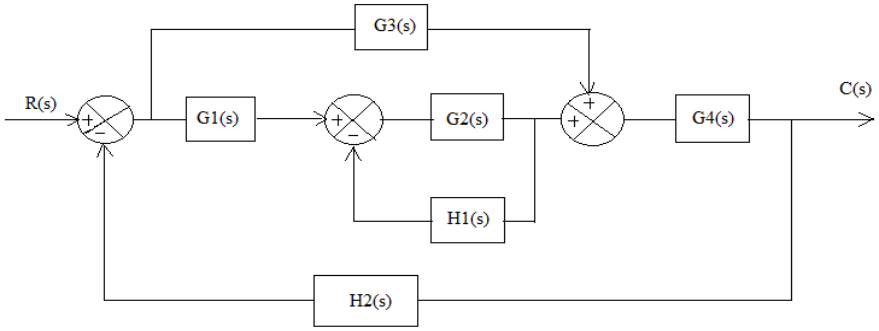
Note: Answer **ONE** question from each Unit (**5 × 12 = 60 Marks)**

UNIT - I

1. a) When is a control system said to be robust? Explain with suitable example. [6M]
   b) Give any two real time examples for open loop and closed loop control systems and develop its block diagrams. [6M]

(OR)

2. a) What is feedback? Explain the effects of feedback [4M]
   b) Using block diagram reduction technique, determine the transfer function C(s)/ R(s) for the following system. [8M]



UNIT – II

3. a) A Unity feedback control system has $G(s) = \frac{1}{S(S+2)}$. The input to the System is given by $r(t) = 2 + 3t + 2t^2$. Determine its error constants. [7M]
   b) Derive the transfer function of the field controlled DC servo motor. [5M]

(OR)

4. a) Describe a two phase AC servomotor and derive its transfer function. [6M]
   b) Derive the time response of second order underdamped system due to unit step input. [6M]

UNIT – III

5. a) What is stability? What are the types of systems based on stability? [4M]
   b) Sketch the root locus for $G(s)H(s) = \frac{K}{S(S+4)(S+11)}$. Also find range of 'K' for system to be stable. [8M]

(OR)

6. a) What is a Routh-Hurwitz criterion? Explain its stability predicting conditions. [4M]

b) Sketch the root locus of the system: $G(s) = \frac{K(S+3)}{S(S+6)(S^2+2S+2)}$) [8M]

i) Find marginal value of K

ii) Find the value of K for damping ratio of 0.5

UNIT –IV

7. Explain Frequency domain specifications in detail. Also write the comparison between time domain and frequency domain specifications. [12M]

(OR)

8. a) Using Bode plot or otherwise determine the gain margin and phase margin of the system with Open loop transfer function $G(s) = \frac{K}{S(5S+1)(S^2+2S+2)}$ [12M]

UNIT –V

9. a) What is the procedure to design lead compensation? [6M]

b) What is a lag compensator? Obtain the transfer function of lag compensator and draw pole-zero plot? [6M]

(OR)

10. a) Construct a State Model for a System characterized by a differential equation using canonical form. [7M]

$$\dddot{y} + 6\ddot{y} + 11\dot{y} + 6y = \dddot{u} + 8\ddot{u} + 17\dot{u} + 8u$$

b) Check for controllability and observability of the system characterized by the following state model [5M]

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ -2 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t);\ y = [1 \quad 0] \begin{bmatrix} X_1 \\ X_2 \end{bmatrix}$$

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