

## II B. TECH II SEMESTER REGULAR EXAMINATIONS, AUGUST 2021 CONTROL SYSTEMS

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 60

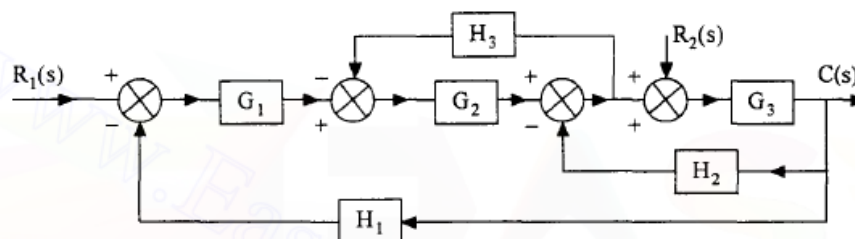
Note: Answer **ONE** question from each Unit (**5 × 12 = 60 Marks**)

### UNIT - I

1. a) Discuss about open loop system with an example. [3M]
- b) Derive an expression for the transfer function of an armature controlled DC servo motor. [9M]

(OR)

2. a) Find the transfer function  $C(s)/R_1(s)$  and  $C(s)/R_2(s)$  for the figure shown below using signal flow graph technique and assuming that only one input is present in each case. [8M]



- b) Compare the block diagram and signal flow graph methods. [4M]

### UNIT – II

3. a) Derive the expression for time response of second order under damped system for unit step input and also draw the response curve. [6M]
- b) The open loop transfer function of a unity feedback system is  $G(s) = \frac{10}{s(s+4)}$ . [6M]  
Determine the nature of response of the closed loop system for a unit step input.

(OR)

4. A unity feedback system has  $G(s) = \frac{10}{s(s+2)}$ ; find the generalized error constants and steady state error. [12M]

### UNIT – III

5. a) Explain the Routh's criteria with an example. [6M]
- b) A system has  $G(s)H(s) = \frac{K}{s(s+2)(s+4)(s+8)}$  where K is positive. Determine the range of K for stability. [6M]

(OR)

6. a) Sketch the complete root locus for a system with an open loop transfer function [8M]

$$G(s)H(s) = \frac{K}{s^2 + 2s + 2}.$$

- b) Briefly explain the difficulties in Routh-Hurwitz criterion and how to overcome. [4M]

UNIT –IV

7. Obtain magnitude and phase angle Bode plots for the system [12M]

$$G(s) = \frac{20(0.1s + 1)}{s^2(0.2s + 1)(0.02s + 1)}$$

(OR)

8. Briefly discuss about the characteristics of lag and lead compensators using necessary equations. [12M]

UNIT –V

9. a) Define controllability and observability and explain how to investigate them. [6M]

- b) Determine the state model of the system whose transfer function is [6M]

$$(s^3 + 2s^2 + 3s + 1)Y(s) = U(s).$$

(OR)

10. a) What is state transition matrix? Give the properties of state transition matrix. [6M]

- b) Obtain the solution of the state equation, [6M]

$$\dot{X} = \begin{pmatrix} 0 & 1 \\ -1 & -2 \end{pmatrix} X + \begin{pmatrix} 0 \\ 1 \end{pmatrix} u; \quad Y = [0 \ 1]^T \text{ and } u \text{ is a unit step input.}$$

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