

Reg. No: 

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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)

**B.Tech III Year I Semester Supplementary Examinations August-2021**

**LINEAR CONTROL SYSTEMS**

(Common to EEE & ECE)

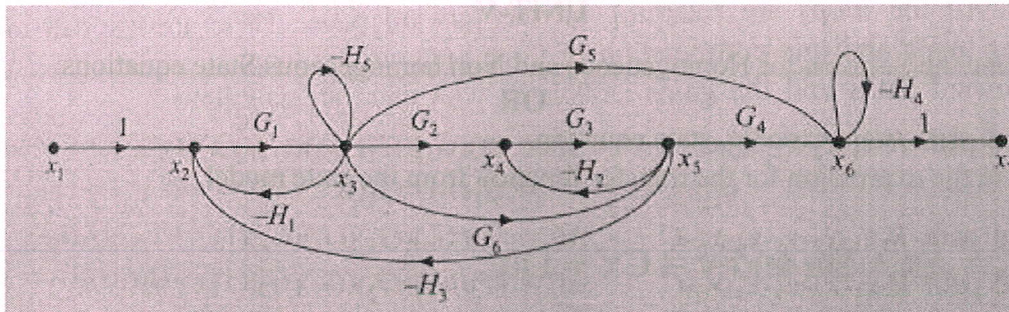
Time: 3 hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

**UNIT-I**

- 1 a Derive the transfer function for A.C servo motor with neat diagram. **6M**
  - b Distinguish between Block diagram Reduction Technique and Signal Flow Graph. **6M**
- OR**
- 2 Obtain the transfer function of the system whose signal flow graph is shown below. **12M**



**UNIT-II**

- 3 List out the time domain specifications and derive the expressions for Rise time, Peak time and Peak overshoot. **12M**
- OR**
- 4 a What is the characteristic equation? List the significance of characteristic equation. **4M**
  - b The following system with unity feedback where K & T are constant. **8M**

$$\frac{K}{s(1+st)}$$

Determine the factor by which gain 'K' should be multiplied to reduce the overshoot from 75% to 25%? system has

**UNIT-III**

- 5 a The open loop transfer function of a unity feedback system is given by **8M**
- $$G(s) = \frac{K(s+1)}{(s^3 + as^2 + 2s + 1)}$$
- Determine the value of K and "a" so that the system oscillates at a frequency of 2rad/sec
- b Explain the effect of adding poles and zeros to characteristic equation on stability of the root loci. **4M**

**OR**

- 6 Sketch the root locus of the system whose open loop transfer function is **12M**

$$G(s) H(s) = \frac{K(s+1.5)}{s(s+1)(s+5)}$$

UNIT-IV

- 7 Draw the Bode plot for the following Transfer Function 12M

$$G(s)H(s) = \frac{36(0.15s+1)}{s^2(0.2s+1)(0.02s+1)}$$

From the bode plot determine (a) Gain Margin (b) Phase Margin (c) Comment on the stability

OR

- 8 Draw the Nyquist plot for the system whose open loop transfer function is, 12M

$$G(s)H(s) = \frac{K}{s(s+2)(s+10)}$$

Determine the range of K for which closed loop system is stable.

UNIT-V

- 9 Determine the Solution for Homogeneous and Non homogeneous State equations. 12M

OR

- 10 a Define state, state variable, state equation. 6M  
b Derive the expression for the transfer function from the state model. 6M

$$\dot{X} = Ax + Bu \text{ and } y = Cx + Du$$

\*\*\* END \*\*\*