Q.P. Code: 16EE216 **R16**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year I Semester Supplementary Examinations December-2021

LINEAR CONTROL SYSTEMS

(Common to EEE & ECE)

Time: 3 hours Max. Marks: 60

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

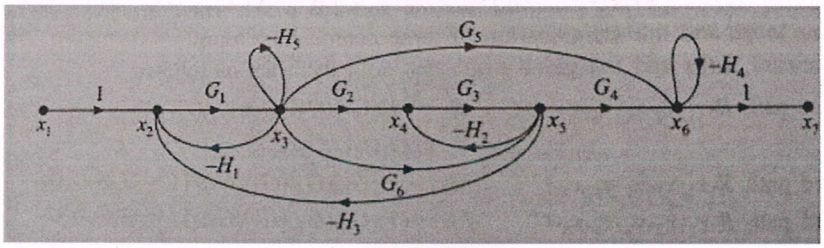
UNIT-I

1 **a** Deduce the transfer function for Armature controlled DC servo motor with neat diagram? **8M**

b Distinguish between Block diagram Reduction Technique and Signal Flow Graph? **4M**

OR

2 Obtain the transfer function of the system whose signal flow graph is shown below. **12M**



UNIT-II

3 Find all the time domain specifications for a unity feedback control system whose open loop transfer function is given by $G(S) = \frac{25}{S(S+5)}$. **12M**

OR

4 **a** A For servo mechanisms with open loop transfer function given below what type of input signal give rise to a constant steady state error and calculate their values. **6M**

$$G(S)H(S) = \frac{20(S+2)}{S(S+1)(S+3)}$$

b Consider a unity feedback system with a closed loop transfer function $\frac{C(S)}{R(S)} = \frac{KS+b}{(S^2+aS+b)}$. **6M**

Determine open loop transfer function G(s). Show that steady state error with unit ramp input is given by $\frac{(a-k)}{b}$.

UNIT-III

5 **a** The open loop transfer function of a unity feedback system is given by $G(S) = \frac{K(S+1)}{(S^3+aS^2+2S+1)}$. Determine the value of 'K' and 'a' so that the system oscillates at a frequency of 2 rad/sec. **8M**

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**

$$G(S)H(s) = \frac{K}{S(S+4)(S^2+4S+20)}$$

UNIT-IV

7 **a** Band width is directly proportional to ω_n. Justify. **4M**

b Draw the Bode plot for the system having the following transfer function **8M**

$$G(S) = \frac{15\,(S+5)}{S(S^2+16S+100)}$$

OR

8 Obtain the transfer function of Lead Compensator, draw pole-zero plot and write the procedure for design of Lead Compensator using Bode plot. **12M**

UNIT-V

9 **a** State the properties of State Transition Matrix. **6M**

b Diagonalize the following system matrix A $= \begin{pmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{pmatrix}$ **6M**

OR

10 Obtain a state model for the system whose Transfer function is given by **12M**

$$\frac{Y(s)}{U(S)} = \frac{(7S^2+12S+8)}{(S^3+6S^2+11S+9)}$$

*** END ***