Q.P. Code: 19EE0212 **R19**

Reg. No:

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR

(AUTONOMOUS)

B.Tech III Year I Semester Supplementary Examinations July-2022

CONTROL SYSTEMS

(Common to EEE & ECE)

Time: 3 hours Max. Marks: 60

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

UNIT-I

1 Write the differential equation governing the mechanical system as shown in figure 1 and determine the transfer function **L1 12M**

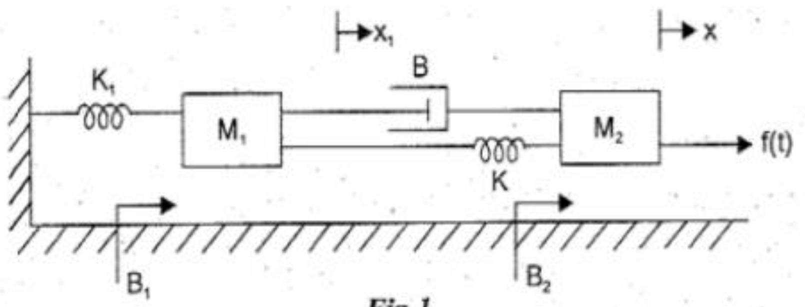

Fig 1.

OR

2 **a** Give the block diagram reduction rules to find the transfer function of the system. **L4 8M**

b List the properties of signal flow graph. **L4 4M**

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) = 25/S(S+5)** **L1 12M**

OR

4 Define steady state error? Derive the static error components for Type 0, Type 1 & Type 2 systems? **L1 12M**

UNIT-III

5 With the help of Routh's stability criterion find the stability of the following systems represented by the characteristic equations **L5 12M**

i) s 4 + 8 s 3 + 18 s 2 + 16s + 5 = 0.

ii) s 6 + 2s5 + 8s4 + 12s3 + 20s2 + 16s + 16 = 0.

OR

6 Develop the root locus of the system whose open loop transfer function is G(s) H(s) =K/S(S+2) (S+4) **L3 12M**

UNIT-IV

7 Develop the Bode plot for the following Transfer Function **L3 12M**

G(s) H(s) =20(0.1S+1)/S^2(0.2S+1)(0.025S+1) ; From the bode plot determine

(i) Gain Margin (ii) Phase Margin (ii) Comment on the stability

OR

8		Sketch the Polar plot for the following Transfer Function G(s) H(s) =1/S(1+S)(1+2S)	**L5**	**12M**

UNIT-V

9		A state model of a system is given as: $\dot{X} = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{pmatrix} X + \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$ U and $Y = (1 \ \ 0 \ \ 0)X$ Determine: (i) The Eigen Values. (ii) The State Transition Matrix.	**L2**	**12M**

OR

10	**a**	Explain the properties of STM.	**L2**	**4M**
	b	For the state equation: $\dot{X} = \begin{pmatrix} \mathbf{1} & \mathbf{0} \\ \mathbf{1} & \mathbf{1} \end{pmatrix} \mathbf{X} + \begin{pmatrix} \mathbf{0} \\ \mathbf{1} \end{pmatrix} \mathbf{U}$ when, $\mathbf{X(0)} = \begin{pmatrix} \mathbf{1} \\ \mathbf{0} \end{pmatrix}$. Find the solution of the state equation for the unit step input.	**L1**	**8M**

*** END ***