Q.P. Code: 18EE0211 **R18**

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year I Semester Regular Examinations Feb-2021

CONTROL SYSTEMS

(Common to EEE & ECE)

Time: 3 hours Max. Marks: 60

PART-A

(Answer all the Questions **5 x 2 = 10** Marks)

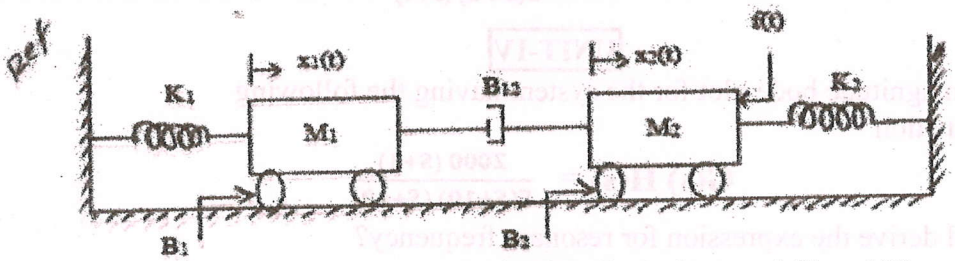
1	a	What is feedback? What type of feedback is employed in control systems?	2M
	b	How the system is classified depending on the value of damping ratio?	2M
	c	Explain BIBO stability.	2M
	d	What are the frequency domain specifications?	2M
	e	What is Diagonalize matrix?	2M

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

2 a For the mechanical system shown in Fig, determine the transfer function **X1(s)/F(s)** 5M

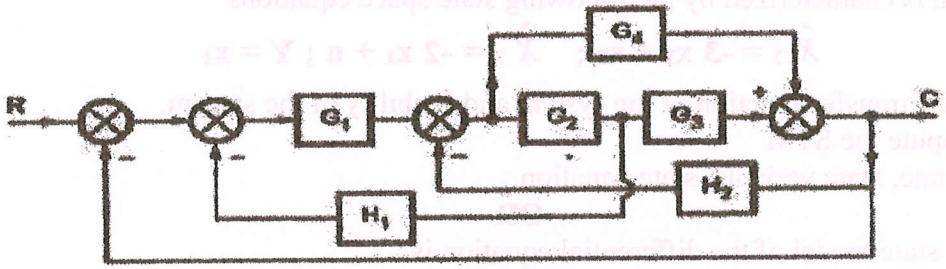


b Distinguish between Block diagram Reduction Technique and Signal Flow Graph. 5M

OR

3 a Give the block diagram reduction rules to find the transfer function of the system. 5M

b Using Block diagram reduction technique find the Transfer Function of the system. 5M



UNIT-II

4 a Measurements conducted on a servo mechanism, show the system response to be $c(t) = 1+0.2e^{-60t} - 1.2e^{-10t}$ When subject to a unit step input.Obtain an expression for closed loop transfer function, determine the undamped natural frequency, damping ratio? 5M

b For servomechanisms with open loop transfer function given below what type of input signal give rise to a constant steady state error and calculate their values? 5M

$$G(s)H(s)=\frac{10}{S^2(S+1)(S+2)}$$

OR

5 a For a unity feedback control system the open loop transfer function 5M

$$G(S) = \frac{10(S+2)}{S^2(S+1)}$$

Determine the position, velocity and acceleration error constants?

b The steady state error when the input is 5M

$$R(S) = \frac{3}{S} - \frac{2}{S^2} + \frac{1}{3S^3}$$

UNIT-III

6 a With the help of Routh's stability criterion find the stability of the following systems represented by the characteristic equation $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$ 5M

b With the help of Routh's stability criterion find the stability of the following systems represented by the characteristic equation $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$. 5M

OR

7 a Explain the procedure for constructing root locus? 6M

b Sketch the root locus of the system whose open loop transfer function is 4M

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

UNIT-IV

8 a Draw the magnitude bode plot for the system having the following transfer function 6M

$$G(s)\,H(s) = \frac{2000\,(S+1)}{S(S+10)(S+40)}$$

b Define and derive the expression for resonant frequency? 4M

OR

9 a Obtain the transfer function of Lead Compensator and draw pole-zero plot. 5M

b Write the procedure for design of Lead Compensator using Bode plot. 5M

UNIT-V

10 a A system is characterized by the following state space equations 5M

$$\dot{X}_1 = -3x_1 + x_2 \; ; \quad \dot{X}_2 = -2x_1 + u \; ; \; Y = x_1$$

(i)Find the transfer function of the system and Stability of the system.
(ii) Compute the STM

b Define state, state variable, state equation. 5M

OR

11 a Find the state model of the differential equation is 5M

$$\dddot{y} + 2\ddot{y} + 3\dot{y} + 4y = u$$

b Obtain a state model for the system whose Transfer function is given by 5M

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

END