Q.P. Code: 20EE0214 **R20**

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech II Year II Semester Regular Examinations October-2022

CONTROL SYSTEMS

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 60

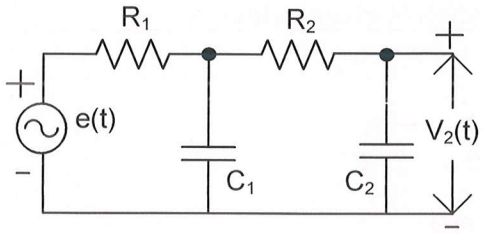
(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

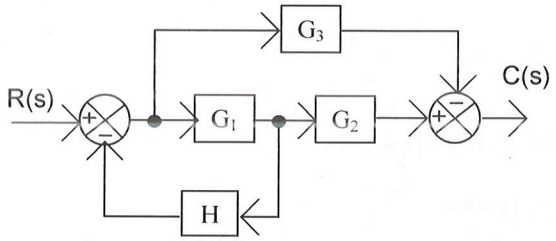
1	a	Compare open loop and closed loop control systems based on different aspects.	L2	6M
	b	Distinguish between block diagram reduction technique and signal flow graph.	L4	6M

OR

2	a	Find the transfer function for the electrical system shown in the below figure	L3	6M



	b	Convert the block diagram as shown in below figure to signal flow graph. Also, determine the transfer function C(S)/R(S).	L3	6M



UNIT-II

3	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.	L4	6M
	b	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. $$G(s)\,H(s) = \frac{10}{s^2(s+1)(s+2)}$$	L2	6M

OR

4	a	Define steady state error. Derive the static error components for Type 0 system.	L2	6M
	b	Derive the static error components for Type 1 and Type 2 systems.	L2	6M

UNIT-III

5		The open loop transfer function of a unity feedback control system is given by $G(s) = \frac{K}{(s+2)(s+4)(s^2+6s+25)}$ Determine the value of K which will cause sustained oscillations in the closed loop system. What is the corresponding oscillation frequency.	L4	12M

OR

6	a	Determine the stability of the following system represented by the characteristic equation using Roth's stability criterion. $$s^5 + s^4 + 2s^3 + 2s^2 + 3s + 5 = 0$$	L2	6M
	b	Determine the stability of the following system represented by the characteristic equation using Roth's stability criterion. $$9s^5 - 20s^4 + 10s^3 - s^2 - 9s - 10 = 0$$	L3	6M

UNIT-IV

7	a	Define and derive the expression for resonant frequency.	L1	6M
	b	Determine the transfer function of Lag compensator and draw pole-zero plot.	L3	6M

OR

8		Develop the bode plot for the system having the following transfer function and determine the phase margin and gain margin. $$G(s) = \frac{75(1 + 0.2s)}{s(s^2 + 16s + 100)}$$	L3	12M

UNIT-V

9	a	Find the state model of the differential equation is given below. $$\dddot{y} + 2\ddot{y} + \dot{y} + 4y = u$$	L1	6M
	b	Diagonalize the following system matrix $$A = \begin{pmatrix} 4 & 1 & -2 \\ 1 & 0 & 2 \\ 1 & -1 & 3 \end{pmatrix}$$	L3	6M

OR

10	a	Explain the properties of STM.	L2	6M
	b	For the state equation: $$\dot{X} = \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix} X + \begin{pmatrix} 0 \\ 1 \end{pmatrix} U$$ when, $X(0) = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ Find the solution of the state equation for the unit step input.	L1	6M

*** END ***