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

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

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

CONTROL SYSTEMS

(Common to ECE & EEE)

Time: 3 hours Max. Marks: 60

PART-A

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

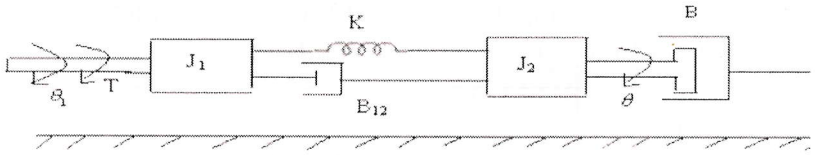
1	a	What is block diagram? What are the basic components of block diagram?	**2M**
	b	Define accelerating error constant.	**2M**
	c	What is the necessary condition for stability?	**2M**
	d	Define phase margin.	**2M**
	e	Define state variable and Write the state equation.	**2M**

PART-B

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

UNIT-I

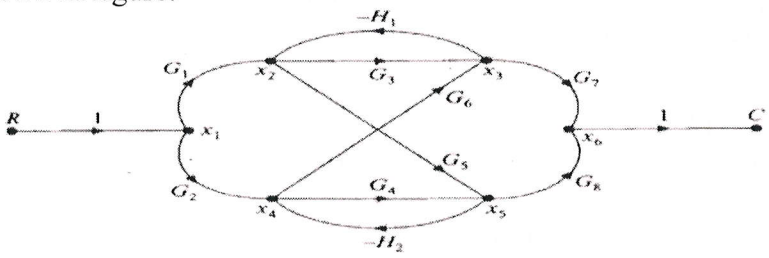
2	a	Write the differential equations governing the mechanical rotational system shown in the figure and find transfer function.	**5M**



	b	Compare open loop and closed loop control systems based on different aspects?	**5M**

OR

3	a	List the properties of signal flow graph?	**5M**
	b	Using mason gain formula find the transfer function **C/R** for the signal flow graph shown in figure.	**5M**



UNIT-II

4	a	List out the time domain specifications and derive the expressions for Rise time, Peak time and Peak overshoot?	**5M**
	b	Find all the time domain specifications for a unity feedback control system whose open loop transfer function is given by	**5M**

$$G(S) = \frac{25}{S(S+5)}$$

OR

5	a	Define steady state error. Derive the static error components for Type 0, Type 1 & Type 2 systems.	**5M**
	b	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?	**5M**

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

UNIT-III

6 a Determine the range of K for stability of unity feedback system whose open loop transfer function is given below using Routh's stability criterion. 5M

$$G(s)\,H(s) = \frac{K}{S(S+1)(S+2)}$$

b With the help of Routh's stability criterion find the stability of the following systems represented by the characteristic equation $9s^5 - 20s^4 + 10s^3 - s^2 - 9s - 10 = 0$. 5M

OR

7 a Sketch the root locus of the system whose open loop transfer function is 6M

$$G(s)\,H(s) = \frac{K}{S(S^2+4S+13)}$$

b Explain the procedure for constructing root locus. 4M

UNIT-IV

8 a Sketch the polar plot for the open loop transfer function of a unity feedback system is given below .Determine Gain Margin & Phase Margin. 6M

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

b Given $\xi = 0.7$ and $\omega n = 10$ rad/sec. Calculate resonant peak, resonant frequency and bandwidth. 4M

OR

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

b write the procedure for design of Lag Compensator using Bode plot? 5M

UNIT-V

10 a State the properties of State Transition Matrix. 5M

b Diagonalize the following system matrix 5M

$$A = \begin{pmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{pmatrix}$$

OR

11 a Find state variable representation of an armature controlled D.C.motor? 5M

b A state model of a system is given as: 5M

$$\dot{X} = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{pmatrix} X + \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} U \text{ and } Y = (1 \;\; 0 \;\; 0)X$$

Determine: (i) The Eigen Values. (ii) The State Transition Matrix.

END