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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech. II Year II Semester Regular & Supplementary Examinations March/April-2026

LINEAR CONTROL SYSTEMS

(Electronics and Communication Engineering)

Time: 3 Hours **Max. Marks: 70**

PART-A

(Answer all the Questions **10 x 2 = 20** Marks)

1	a	What is Control Systems? Define Closed loop control system.	CO1	L1	2M
	b	Discuss about the feedback	CO1	L1	2M
	c	How the system was classified depending on the value of the damping?	CO2	L1	2M
	d	Name the test signals used in control systems.	CO2	L1	2M
	e	Describe the characteristic equation.	CO3	L2	2M
	f	What is the necessary condition for stability in S domain?	CO3	L1	2M
	g	What is frequency response?	CO5	L2	2M
	h	List the frequency domain specifications.	CO5	L1	2M
	i	What is state diagram?	CO6	L1	2M
	j	What is the state model of linear time invariant system?	CO6	L1	2M

PART-B

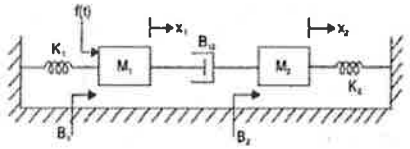
(Answer all Five Units **5 x 10 = 50** Marks)

UNIT-I

2	a	Compare open loop and closed loop control systems based on different aspects.	CO1	L2	5M
	b	Explain control systems with any one example.	CO1	L4	5M

OR

3		Determine the transfer function, $\frac{X1(s)}{F(s)}$ and $\frac{X2(s)}{F(s)}$ for the system shown in fig.	CO1	L5	10M



UNIT-II

4		List out the time domain specifications and derive the expressions for Rise time, Peak time and Peak overshoot.	CO2	L2	10M

OR

5		Find all the time domain specifications for a unity feedback control system whose open loop transfer function is given by $G(s) = \frac{25}{s(s+5)}$	CO2	L2	10M

UNIT-III

6		With the help of Routh's stability criterion find the stability of the following systems represented by the characteristic equations: $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0.$ $s^4 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0.$	CO5	L2	10M

OR

7		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 oscillationsin the closed loop system and what is the corresponding oscillation Frequency.	CO5	L5	10M

UNIT-IV

8		Develop the Bode plot for the following transfer function and determine the system phase and gain cross over frequencies. $G(s) = \frac{10}{S(1+0.4S)(1+0.1S)}$	CO5	L4	10M

OR

9	a	Given ξ = 0.7 and ωn = 10 rad/sec. Find resonant peak, resonant frequency and bandwidth.	CO3	L5	5M
	b	Define and derive the expression for resonant frequency.	CO3	L1	5M

UNIT-V

10		Diagonalize the following system matrix $A = \begin{pmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{pmatrix}$	CO6	L3	10M

OR

11		Determine the Solution for Homogeneous and Non homogeneous State equations.	CO6	L1	10M

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