Course Code: 23ES4T09

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE

(AUTONOMOUS)

II - B. Tech II-Semester Supplementary Examinations (BR23), Aug - 2025

LINEAR CONTROL SYSTEMS (ECE)

Time: 3 hours Max. Marks: 70

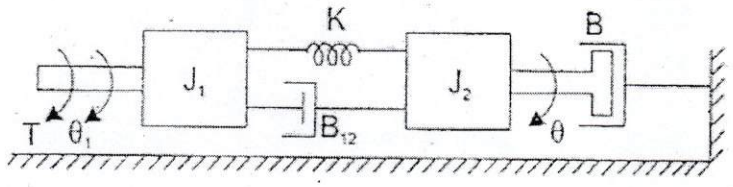
Question Paper consists of Part-A and Part-B
*Answer **ALL** the question in **Part-A and Part-B***

PART–A (10X2 = 20M)

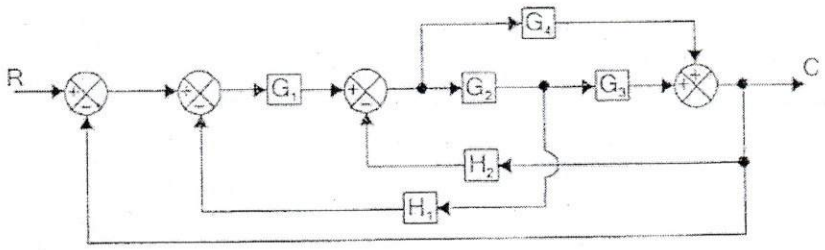
		Marks	CO	BL
1. a)	Discuss the merits and demerits of closed loop control systems	(2M)	CO1	BL2
b)	Explain how feedback effects on Overall gain of the system.	(2M)	CO1	BL2
c)	List out the Time domain specifications	(2M)	CO2	BL2
d)	What are the basic properties of signal flow graph?	(2M)	CO2	BL2
e)	Write short notes on the concept of stability	(2M)	CO3	BL1
f)	What are the limitations of Routh's criteria	(2M)	CO3	BL1
g)	List out the frequency domain specifications	(2M)	CO4	BL2
h)	List the advantages of Frequency response methods	(2M)	CO4	BL2
i)	Explain the concept of state, state model	(2M)	CO5	BL2
j)	Discuss about the properties of state transition matrix	(2M)	CO5	BL2

PART–B (5X10 = 50M)

2a.	Define open loop and closed loop systems and explain them with examples.	5(M)	CO1	BL2
b	List out the symbols used in mechanical translational systems and mechanical rotational systems.	5((M)	CO1	BL2
	(OR)			
3a.	Write the differential equations governing the mechanical system as shown below fig and determine the transfer function	5(M)	CO1	BL3



b	Write force balance equations for idealized elements	5(M)	CO1	BL2
4a.	Using block diagram reduction technique find the closed loop transfer function of the system.	10(M)	CO2	BL3



(OR)

5a.	Compare AC servo motor and DC servo motor	5(M)	CO2	BL2
b	Obtain the response of a first order system for a unit step input and plot its response	5(M)	CO2	BL2
6a.	Construct Routh array and determine the stability of the system represented by the characteristic equation, $s^5+s^4+2s^3+2s^2+3s+5=0$ Comment on the location of the roots of characteristic equation	5(M)	CO3	BL4
b	Construct Routh array (or) explain Routh Hurwitz criterion.	5(M)	CO3	BL3
	(OR)			
7a.	Sketch the root locus of the system whose open loop transfer function is $G(s)=K/s(s+2)(s+4)$. Find the value of K, so that the damping ratio is 0.5.	10(M)	CO3	BL3
8a.	Draw the Bode plot of the system having $G(s)=100/s(1+0.5s)(1+0.1s)$, and $H(s)=1$. Determine the gain cross over frequency and corresponding phase margin.	10(M)	CO4	BL3
	(OR)			
9a.	A unity feedback control system has an open loop transfer function $G(s)=K/ s(1+0.5s)(1+4s)$, sketch the polar plot and determine the value of K so that gain margin is 20dB	10(M)	CO4	BL3
10a	Explain Lag-Lead Compensation techniques	5(M)	CO5	BL2
b	Explain the Concepts of Controllability and Observability with an example	5(M)	CO5	BL2
	(OR)			
11a	Explain the concept of state, state model, state variable, and state space.	5(M)	CO5	BL2
b.	Obtain the state model of the system whose transfer function is given as $\frac{Y(s)}{U(s)} = \frac{10}{s^3+4s^2+2s+1}$	5(M)	CO5	BL3

****