Course Code: 23ES4T09

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE

(AUTONOMOUS)

II - B.Tech II-Semester Regular Examinations (BR23), Apr/May - 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)

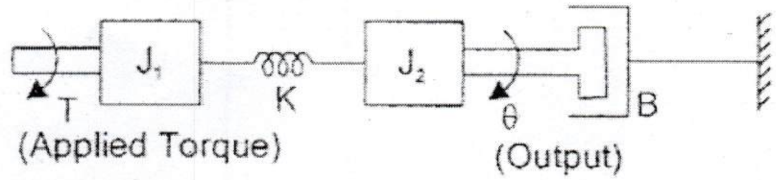
		Marks	CO	BL
1. a)	Write the force balance equation of ideal spring?	(2M)	CO1	BL2
b)	Explain how feedback effects on Overall gain of the system.	(2M)	CO1	BL2
c)	List out the Time domain specifications	(2M)	CO2	BL2
d)	Write the masons gain formula.	(2M)	CO2	BL2
e)	What are asymptotes? How will you find the angle of asymptotes?	(2M)	CO3	BL1
f)	What is the necessary condition for stability?	(2M)	CO3	BL1
g)	Write the expressions for resonant peak and resonant frequency	(2M)	CO4	BL2
h)	What is frequency response	(2M)	CO4	BL2
i)	Draw the block diagram representation of state model	(2M)	CO5	BL2
j)	State the condition for observability by kalman's method?	(2M)	CO5	BL2

PART–B (5X10 = 50M)

2a.	Explain armature controlled DC servomotor	5(M)	CO1	BL2
b	Illustrate open loop & closed loop control systems	5((M)	CO1	BL2

(OR)

3a.	Determine the transfer function for the given mechanical rotational system	5(M)	CO1	BL3



b	Write Torque balance equations for idealized elements	5(M)	CO1	BL2
4a.	Find the over all transfer function of the given signal flow graph	10(M)	CO2	BL3

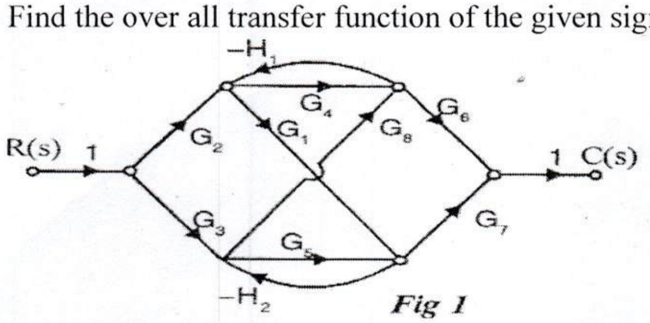


Fig 1

(OR)

5a.	Explain in detail about time domain specifications.	5(M)	CO2	BL2

b	For unity feedback control system the open loop transfer function $G(s)=10(s+2)/s^2(s+1)$, a)find the position, velocity and acceleration error constants. b) find the steady state error when the input is $R(s)=\frac{3}{s}-\frac{2}{s^2}+\frac{1}{3s^3}$	5(M)	CO2	BL3
6a.	Determine the range of K for stability of unity feedback system whose open loop transfer function is $G(s) = \frac{K}{s(s+1)(s+2)}$	5(M)	CO3	BL3
b	Explain angle of departure and angle of arrival	5(M)	CO3	BL2
	(OR)			
7a.	ketch the root locus for the unity feedback control system whose open loop transfer function $G(s)=K/s(s+4)(s^2+4s+20)$.	10(M)	CO3	BL3
8a.	Draw the Bode Plot for a System having $G(s)=100/s(1+0.5s)(1+0.1s)$ and $H(S)=1$. Determine Gain cross-over frequency and corresponding phase margin.	10(M)	CO4	BL3
	(OR)			
9a.	Draw the Nyquist plot for the system whose open loop transfer function is $G(s)H(s)=K/s(s+2)(s+10)$. Determine the range of K for which the closed loop system is stable.	10(M)	CO4	BL3
10a	Explain PID Controllers with necessary expressions	5(M)	CO5	BL2
b	Explain the Concepts of Controllability and Observability with an example	5(M)	CO5	BL2
	(OR)			
11a	Discuss about the properties of state transition matrix.	5(M)	CO5	BL2
b.	Consider a system with state model given below: $x = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -5 & -1 \end{bmatrix} X + \begin{bmatrix} 0 \\ 5 \\ -24 \end{bmatrix} u; \quad y = [1\ 0\ 0]x + [0]u$ Verify the system is observable and controllable.	5(M)	CO5	BL3

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