Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Fifth Semester

Electrical and Electronics Engineering

EE3503 - Control Systems

Regulations - 2021

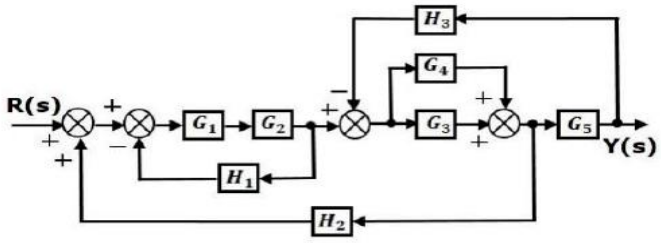
Duration : 3 Hrs *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	List the basic elements in control systems.	RE	1	2
2.	What is a block diagram? State its components.	RE	1	2
3.	How is the centroid of the asymptotes found in the root locus technique?	RE	2	2
4.	Classify type and order of the system.	UN	2	2
5.	Recall the approximate polar plot for a Type 0 second order system.	RE	3	2
6.	Show the shape of polar plot for the transfer function $K/ s (1+sT_1)(1+sT_2)$	UN	3	2
7.	Sketch the block diagram representation of a state model.	UN	4	2
8.	Tell the advantages of state space analysis.	RE	4	2
9.	Relate the lead compensator using R and C network components.	UN	5	2
10.	Compare Lag and Lead compensator	UN	5	2

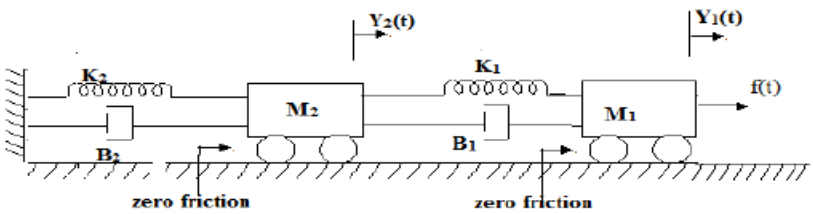
*PART – B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)*

Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a	Apply block diagram reduction rules and obtain the transfer function of the following system.	AP	1	13



Or

	b	Construct the differential equations governing the mechanical translational system shown in fig. Draw the electrical equivalent analogy circuit.	AP	1	13



12.	a	Derive the expression for the unit step response of the following second order systems.(i) Critically damped system (ii) Over damped system	UN	2	13
		Or			
	b	Construct the root locus for the system having G(s)= $\frac{K(S+3)}{S(S+1)(S+2)(S+3)}$	UN	2	13
13.	a	Construct bode plot for the system whose open loop transfer function is given below and evaluate (i) Gain margin (ii) Phase margin and (iii) closed loop stability $G(s)=\frac{100}{s(s+1)(s+2)}$	UN	3	13
		Or			
	b	Draw the bode plot of the following system and estimate the gain crossover frequency. G(s)=$\frac{10}{(0.1s+1)(0.01s+1)}$	UN	3	13
14.	a	Formulate the expression for the state space model for the continuous system and also draw the state diagram for it.	AN	4	13
		Or			
	b i	Derive the transfer function model for the following state space system. $A=\begin{bmatrix}0 & 1\\ -6 & -5\end{bmatrix}; B=\begin{bmatrix}1\\0\end{bmatrix}; C=\begin{bmatrix}1 & 0\end{bmatrix}; D=\begin{bmatrix}0\end{bmatrix}$	AN	4	7
	ii	Find the state transition matrix for the state model whose system matrix A is given by $A=\begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix}$	AN	4	6
15.	a	Determine the procedure for lag lead compensator using bode plot in detail.	EV	5	13
		Or			
	b i.	Prove the limitations and effects of PID Controller.	EV	5	7
	ii.	Justify the condition in which PID Controller cannot be used successfully.	EV	5	6

*PART – C (Marks 1*15 = 15)*

Q.No		*Questions*	*BLT*	*CO*	*Marks*
16.	a	A unity feedback control system has the open loop transfer function G(s)=$\frac{K}{(s+A)\,(s+2)}$Evaluate the values of K and A so that the damping ratio is 0.707 and the peak time for unit step response is 1.8 sec.	AP	2	15
		Or			
	b	The open loop transfer function of a unity feedback system is given by G(s)=$\frac{1}{s2(1+s)(1+2s).}$Sketch the polar plot and determine the gain margin and phase margin.	AP	3	15