Question Paper Code: R22A31EE03

R22

ANURAG Engineering College

(An Autonomous Institution)

III B.Tech I Semester Regular Examinations, December – 2024

CONTROL SYSTEMS

(ELECTRONICS AND COMMUNICATION ENGINEERING)

Time: 3 Hours **Max. Marks: 60**

Section – A (Short Answer type questions) (10 Marks)

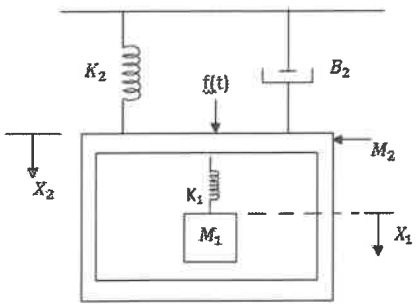
Answer All Questions

		Course Outcome	B.T Level	Marks
1.	What is feedback? What types of feedback is employed in control system?	CO1	L2	1M
2.	Write the force balance equations of ideal mass element, ideal dashpot and ideal spring.	CO1	L2	1M
3.	Define Step and Ramp Signal.	CO2	L2	1M
4.	What is stability?	CO2	L2	1M
5.	What are frequency domain specifications?	CO3	L2	1M
6.	What is Polar Plot?	CO3	L2	1M
7.	What is compensator?	CO4	L2	1M
8.	What is disturbance reduction?	CO4	L2	1M
9.	Define state and state equation.	CO5	L2	1M
10.	What are the different methods available for computing e^{At}?	CO5	L2	1M

Section B (Essay Questions)

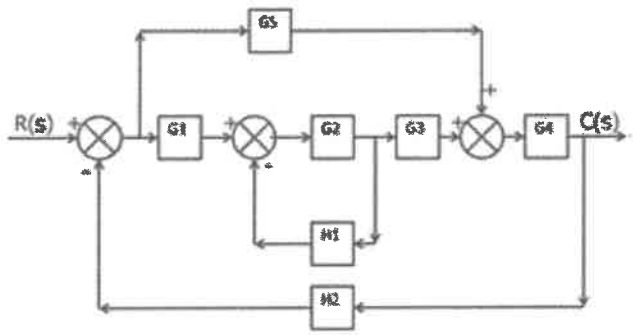
Answer all questions, each question carries equal marks. **(5 X 10M = 50M)**

11. A)	Obtain mathematical model for the mechanical system shown in fig.1.	CO1	L3	10M



OR

B)	For the block diagram shown in fig.2. Obtain transfer function.	CO1	L3	10M



12. A)	i) Derive the response of first order system for unit step response.	CO2	L3	5M
	ii) Examine the stability by routh criterion $S^4+6S^3+26S^2+56S+80 = 0$.	CO2	L3	5M

OR

B)	Draw the root locus plot for the system whose open loop transfer function is $G(s)H(s) = \frac{k}{s(s+1)(s+2)}$	CO2	L3	10M
13. A)	Draw the polar plot for type 0 and order 2 system and also type-1 and order 2 systems with the standard examples.	CO3	L3	10M
	OR			
B)	Sketch the Bode Plot for the open loop transfer function G(S)H(S) = 10/S(0.1S+1)(0.5S+1). Determine Gain and Phase margin.	CO3	L3	10M
14. A)	Explain the procedure for the design of Lag compensator using Bode Plot.	CO4	L2	10M
	OR			
B)	Explain the procedure for the design of lead compensator using Bode Plot.	CO4	L3	10M
15. A)	Construct a State Model for a system characterized by differential equation $\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} + 6y + U = 0$. Give the block diagram representation of the State Model.	CO5	L3	10M
	OR			
B)	Determine whether the system is completely Controllable for a given State Model. $\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\\ \dot{X}_3\end{bmatrix} = \begin{bmatrix}2 & -2 & 3\\ 1 & 1 & 1\\ 1 & 3 & -1\end{bmatrix}\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix} + \begin{bmatrix}11\\ 1\\ -14\end{bmatrix}u \quad Y = [-3 \quad 5 \quad -2]\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix}$	CO5	L3	10M