U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

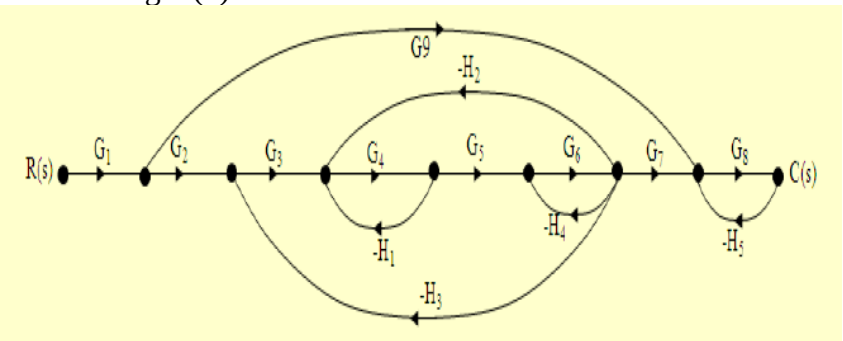
Autonomous Institute Affiliated to VTU

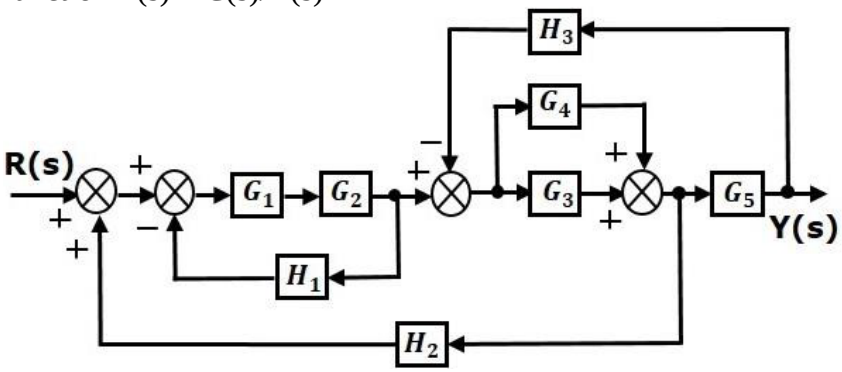
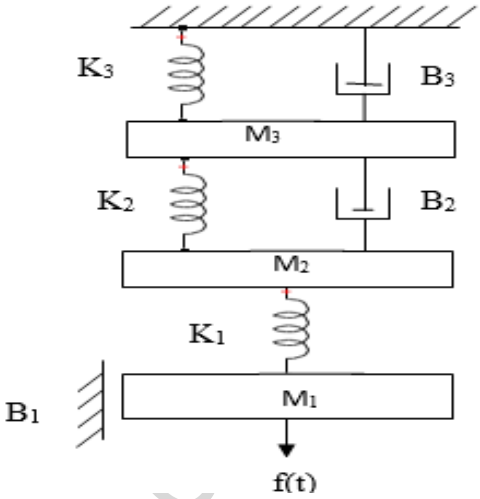
February 2025 Semester End Main Examinations

Programme: B.E. **Semester: IV**
Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**
Course Code: 23EE4ESCTH **Max Marks: 100**
Course: Control Theory

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

				CO	PO	Marks
			UNIT - I			
1	a)		Distinguish between open-loop and closed-loop control systems.	CO1	PO1	**04**
	b)		State the properties of non-linear systems and explain the classification of non-linear systems.	CO1	PO1	**06**
	c)		Explain any five applications of linear control systems.	CO1	PO1	**10**
			OR			
2	a)		Describe on Linearization of non-linear system with an example and explain about Discrete time and Continuous time.	CO1	PO1	**10**
	b)		Explain the following terms with an example i) Linear systems ii) Dynamic systems iii) Dead-zone iv) Saturation	CO1	PO1	**10**
			UNIT - II			
3	a)		Explain (i) Lead compensator (ii) Lag compensator.	CO1	PO1	**10**
	b)		Obtain C(s)/R(s) using Mason's Gain Formula of the system shown in fig.3.(b)  fig.3.b	CO2	PO2	**10**
			OR			

	4	a)	Reduce the block diagram shown in Fig 4(a) and obtain transfer function T(s) = C(s)/R(s)  Fig 4(a)	*CO2*	*PO2*	**10**
		b)	Draw the F-V & F-I analogous circuits for the given mechanical system shown in Fig.4(b) and starting from the basics write the equations for both systems.  Fig.4(b)	*CO2*	*PO2*	**10**
			UNIT - III			
	5	a)	Explain the necessity of controller and with a block diagram discuss on PID controller.	*CO2*	*PO2*	**07**
		b)	A control system with transfer function as G(s)H(s)=$\frac{15(s+4)(s+7)}{s(s+3)(s+6)(s+8)}$ Find the static error coefficients and steady state error of the system when input given by r(t) = 4+t+t^2.	*CO2*	*PO2*	**08**
		c)	Explain the Transient response specifications.	*CO2*	*PO2*	**05**
			OR			
	6	a)	A unity feedback system is characterized by open-loop transfer function G(s)=$\frac{K}{s(s+10)}$ Find the value of K so that the system will have a damping ratio of 0.5. For this value of K determine the settling time, peak overshoot and time to peak overshoot for unit step input.	*CO2*	*PO2*	**07**
		b)	Define the following i) Rise Time	*CO2*	*PO2*	**08**

			ii) Delay Time iii) Peak Time iv) Settling time			
		c)	Explain PI and PD controller with a block diagram.	*CO2*	*PO2*	**05**
			UNIT - IV			
	7	a)	Sketch the root locus diagram of a control system having G(s)H(s)= $\frac{K}{s(s+4)(s^2+4s+20)}$	*CO3*	*PO4*	**12**
		b)	What is Root-locus? Explain different rules to be followed for obtaining root-locus of the given transfer function.	*CO3*	*PO4*	**08**
			OR			
	8	a)	Sketch the Root locus for the open loop transfer function of unity feedback control system given below. $$G(s) = \frac{k}{s(s^2 + 4s + 13)}$$	*CO3*	*PO2*	**12**
		b)	Explain the concept of stability and discuss on RH criterion with an example.	*CO3*	*PO2*	**08**
			UNIT - V			
	9	a)	Sketch Bode plot and determine stability of the system for a unity feedback system with G(s)= $\frac{242(s+5)}{s(s+1)(s^2+5s+121)}$	*CO3*	*PO3*	**10**
		b)	Discuss on different types of frequency domain specifications and define Gain Margin and Phase Margin.	*CO3*	*PO2*	**10**
			OR			
	10	a)	Plot the Bode diagram for the open-loop transfer function of a unity feedback system given below. G(s) = $4/(0.1S+1)^2(0.01S+1)$. Comment on the stability of the system.	*CO3*	*PO5, PO10*	**10**
		b)	Define the following in Bode plot point of view, i. Gain cross-over frequency. ii. Phase cross-over frequency. iii. Gain Margin. iv. Phase Margin.	*CO3*	*PO2*	**10**

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