U.S.N.										

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

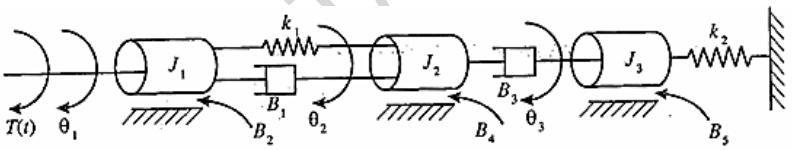
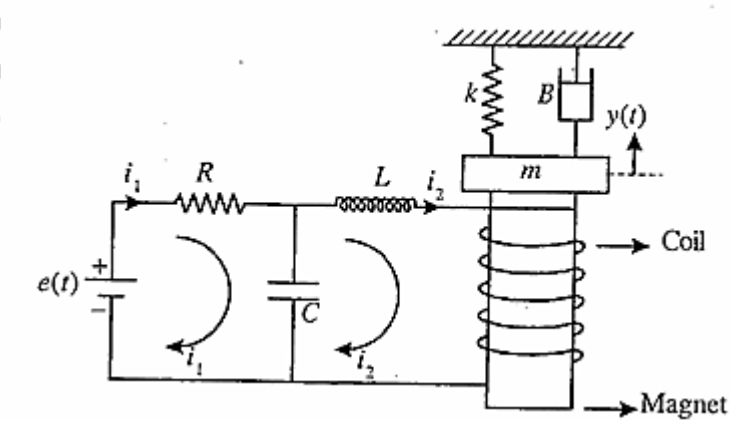
Autonomous Institute Affiliated to VTU

October 2024 Supplementary Examinations

Programme: B.E. **Semester: VI**
Branch: Mechanical Engineering **Duration: 3 hrs.**
Course Code: 22ME6PCCOE **Max Marks: 100**
Course: Control Engineering

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.

		UNIT - I	CO	PO	Marks
1	a)	Derive the expression for transfer function of an armature-controlled DC motor.	CO2	PO2	**08**
	b)	Discuss the requirements of a good control system.	CO1	PO1	**04**
	c)	Differentiate between open loop and closed loop control systems.	CO1	PO1	**08**
		OR			
2	a)	Write the differential equations for the system shown in Fig. 1  Fig. 1	CO2	PO2	**06**
	b)	Derive the transfer function Y(S)/ E(S) for the electromechanical system shown in Fig.2  Fig. 2	CO2	PO2	**14**
		UNIT - II			
3	a)	Discuss the various standard input signals used to predict system behavior.	CO3	PO2	**10**

		b)	A unity feedback system has open loop Transfer Function $$G(S) = \frac{10}{S^2 + 2S + 6}$$ For unit step input, determine: (i) Undamped natural frequency, (ii) Damping ratio, (iii) Peak Overshoot, (iv) Peak Time, (v) Settling Time.	*CO3*	*PO2*	**10**
			OR			
	4	a)	Determine the value of K applying Routh-Hurwitz criterion for the stability of the system, $2S^4 + 3S^3 + 4S^2 + S + K = 0$.	*CO4*	*PO2*	**10**
		b)	Deduce the positional, velocity and acceleration error constants.	*CO3*	*PO2*	**10**
			UNIT - III			
	5		Construct the Root Locus and determine the range of K for stability of unity feedback system with transfer function, $G(S) = \frac{K}{S(S+1)(S+2)(S+3)}$.	*CO4*	*PO2*	**20**
			UNIT - IV			
	6	a)	Draw Polar plot for the system with open loop transfer function as, $G(S) = \frac{12}{S^2(S+1)}$.	*CO4*	*PO2*	**08**
		b)	Sketch the Nyquist diagram and ascertain the stability of a system, for the transfer function, $G(S)H(S) = \frac{K}{(S+1)(S+2)(S+3)}$	*CO4*	*PO2*	**12**
			UNIT - V			
	7		Draw the Bode plot and determine gain margin, phase margin, gain cross over frequency and phase cross over frequency for a system having open loop transfer function, $G(S)\,H(S) = \frac{10.5}{(S+0.2)\,(S+0.8)(S+10)}$.	*CO4*	*PO2*	**20**

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