U.S.N.										

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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Program: B.E. **Semester: VI**

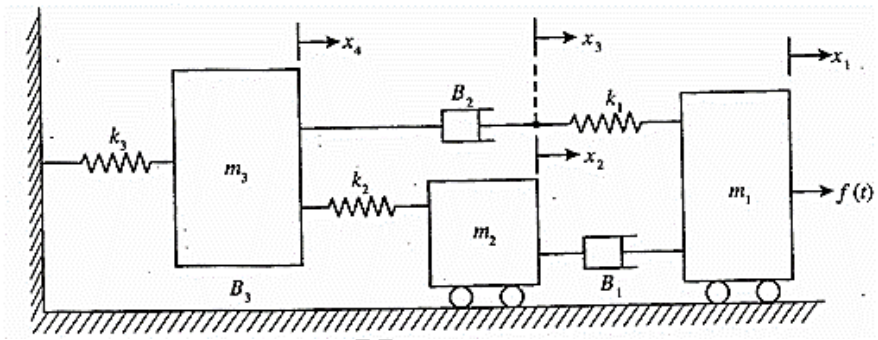
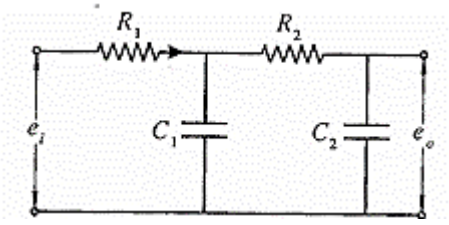
Branch: Mechanical Engineering **Duration: 3 hrs.**

Course Code: 20ME6DCCOE **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)	For the system shown in Fig.1, write the differential equations  Fig. 1		*CO2*	*PO2*	**10**
	b)	What are the different types of control systems? Discuss in detail.		*CO1*	*PO1*	**10**
		OR				
2	a)	Obtain the transfer function $\frac{E_o(s)}{E_i(s)}$ of the circuit shown in Fig. 2  Fig.2		*CO2*	*PO2*	**10**
	b)	Derive the expression for Transfer Function of armature-controlled DC motor.		*CO2*	*PO2*	**10**
		UNIT – II				
3	a)	Determine the value of K applying Routh Hurwitz criterion for the stability of the system $s^4 + 5\,s^3 + 5s^2 + 4s + K = 0$		*CO3*	*PO2*	**10**
	b)	Discuss any four standard test input signals used in control system.		*CO3*	*PO2*	**10**

			OR			
	4	a)	The open loop transfer function of a negative unity feedback control system is $G(s) = \frac{25}{S(S+5)}$. Obtain Maximum overshoot, Peak Time, Rise Time, Settling Time	*CO4*	*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**
			UNIT - III			
	5		Construct the Root Locus and determine the range of K for stability of unity feedback system with transfer function $G(S) = \frac{K}{s(s^2+5s+6)}$.	*CO4*	*PO2*	**20**
			OR			
	6		Construct the Root Locus and determine the range of K for stability of unity feedback system with transfer function $G(S) = \frac{K}{s(s^2 + 4s + 7)}$.	*CO4*	*PO2*	**20**
			UNIT - IV			
	7	a)	Draw Polar plot for system with open loop transfer function $G(S) = \frac{1}{s^2(s+1)}$	*CO4*	*PO2*	**08**
		b)	Sketch the Nyquist diagram and determine the nature of stability of a system with open loop transfer function $G(s)H(s) = \frac{12}{s(s+1)(s+2)}$.	*CO4*	*PO2*	**12**
			OR			
	8	a)	Draw Polar plot for system with open loop transfer function $G(s) = \frac{12}{s^2(s+1)(s+2)}$	*CO4*	*PO2*	**08**
		b)	Sketch the Nyquist diagram and determine the nature of stability of a system with open loop transfer function $G(s)H(s) = \frac{100}{(1+2s)}$.	*CO4*	*PO2*	**12**
			UNIT - V			
	9		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, $G(s)H(s) = \frac{10}{s(1+s)(1+0.02s)}$.	*CO4*	*PO2*	**20**
			OR			

	10		Construct 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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