U.S.N.										

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

Autonomous Institute Affiliated to VTU

August 2024 Semester End Main Examinations

Programme: B.E.
Branch: Electrical and Electronics Engineering
Course Code: 23EE4ESCTH
Course: Control Theory

Semester: IV
Duration: 3 hrs.
Max Marks: 100

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

		UNIT - I	*CO*	*PO*	**Marks**
1	a)	Define Transfer Function? Derive an expression for the Transfer Function of a negative feedback closed loop control system.	*CO1*	-	**05**
	b)	Explain the concept of open loop and closed loop control system with its advantages.	*CO1*	-	**05**
	c)	Describe on Linearization of non-linear system with an example and explain about Discrete time and Continuous time.	*CO1*	-	**10**
		UNIT - II			
2	a)	Draw the F-V & F-I analogous circuits for the given mechanical system shown in Fig.2(a) and starting from the basics write the equations for both systems.	*CO2*	*PO2*	**10**

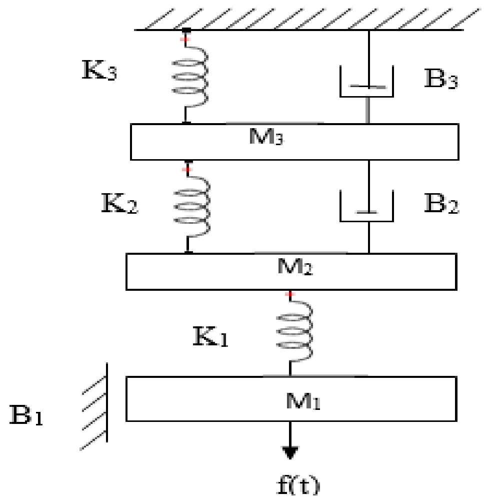
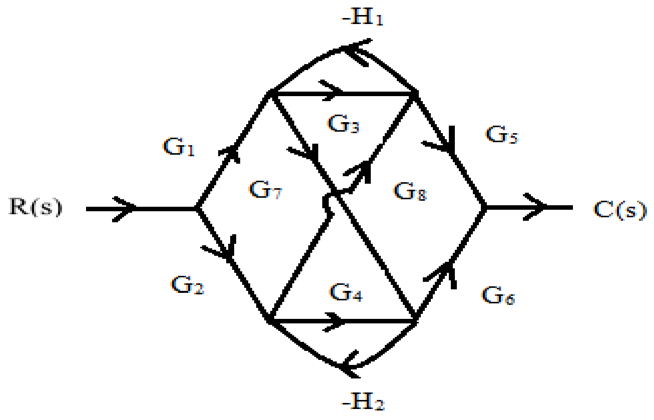
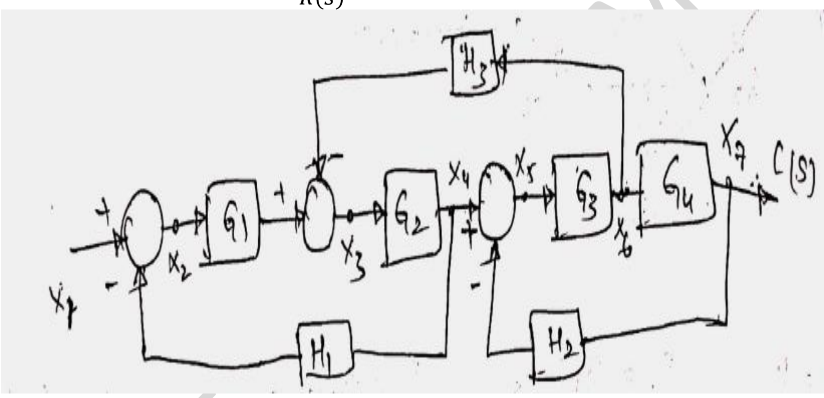
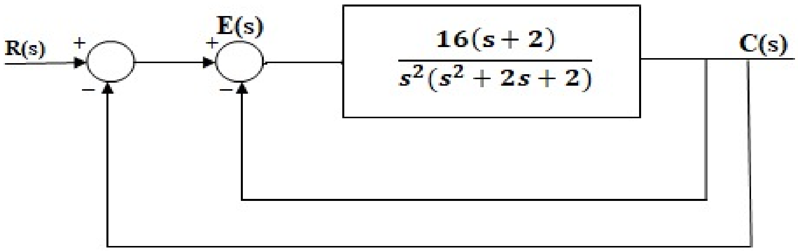


Fig.2(a)

		b)	Using Mason's gain formula, obtain the transfer function for the given Fig.2(b)  Fig.2(b)	*CO2*	*PO2*	**10**
			OR			
	3	a)	Draw the Signal Flow Graph for the given block diagram in Fig.3(a) and hence find $\frac{C(s)}{R(s)}$  Fig.3(a)	*CO2*	*PO2*	**10**
		b)	Draw the block diagram for the system described by following equations & hence find $\frac{C(S)}{R(S)}$ $E_1 = R(S) - C(S).H_3$; $E_2 = E_1 - E_4.H_1$; $E_3 = E_2.G_1 - C(S).H_2$; $E_4 = E_3.G_2$; $C(S) = E_4.G_3$.	*CO2*	*PO2*	**10**
			UNIT - III			
	4	a)	Starting from the fundamentals, derive an expression for time response of a second order control system under underdamped condition.	*CO2*	*PO2*	**10**
		b)	Open loop transfer function of Unity feedback control system $G(s)\,H(s) = \frac{64}{s(s+9.6)}$ Determine the following for unit step excitation: (i) t_r (ii) t_p (iii) % Maximum overshoot t_{ss} for 2% tolerance.	*CO2*	*PO2*	**10**

			OR			
	5	a)	For the system shown in Fig.5(a) find **(i)** $\frac{C(S)}{R(S)}$ & type represented by $\frac{C(S)}{E(S)}$ **(ii)** $\frac{C(S)}{R(S)}$ **(iii) K_P, K_V , Ka (iv)Steady State Values if r(t)=10 u(t) .**  Fig.5(a)	*CO2*	*PO2*	**10**
		b)	Discuss the effect of PI, PD & PID Controllers.	*CO2*	*PO2*	**10**
			UNIT - IV			
	6	a)	Sketch the complete Root Locus diagram for the unity feedback system having transfer function, $G(S)H(S) = \frac{K}{S(S+4)(S^2+4S+20)}$ from root locus diagram, find the following: (i) Range of K for Stability (ii) Value of gain K when the system is critically damped.	*CO3*	*PO4*	**10**
		b)	State and explain Routh- Hurwitz criterion. What are the limitations?	*CO3*	*PO4*	**05**
		c)	Determine the stability of a system for the given characteristic equation, $S^4+S^3+6S^2+10S+15=0$.	*CO3*	*PO4*	**05**
			UNIT - V			
	7	a)	Construct the bode plot and investigate the stability of a negative feedback control system whose open loop transfer function is given by GH(s) $= \frac{50}{S(0.5S+1)(0.05S+1)}$.	*CO3*	*PO4*	**10**
		b)	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*	*PO4*	**10**

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