U.S.N.										

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

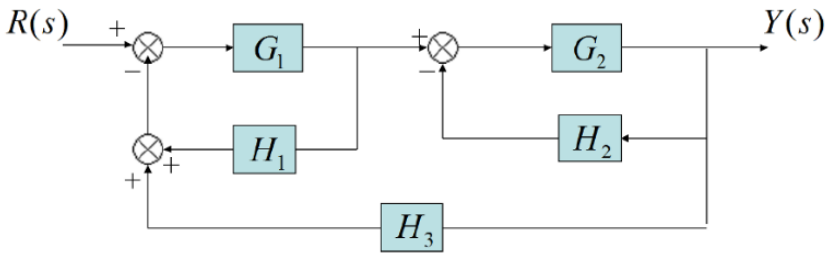
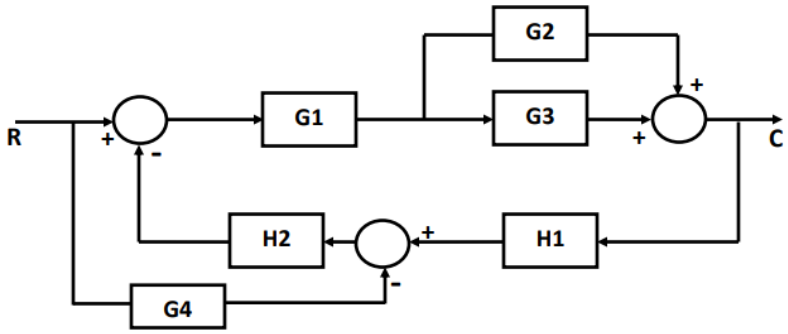
Autonomous Institute Affiliated to VTU

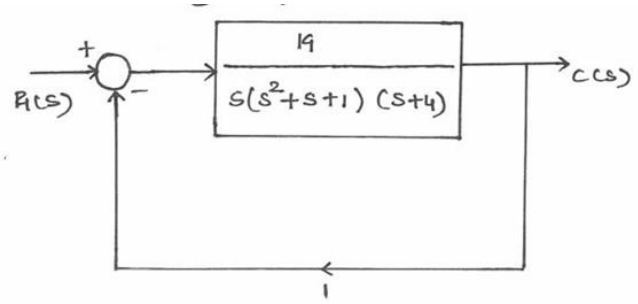
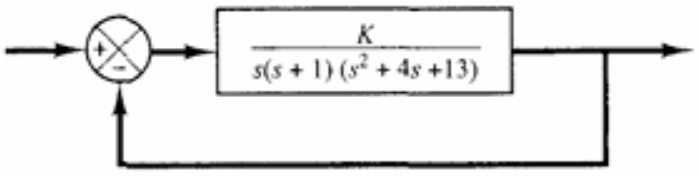
August 2024 Semester End Main Examinations

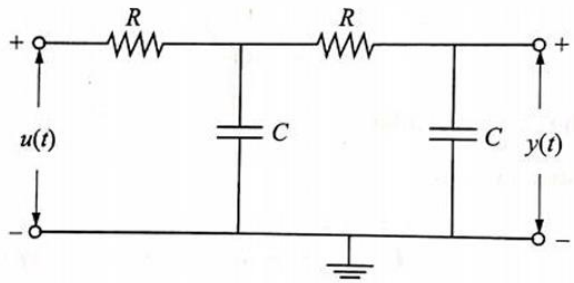
Programme: B.E. **Semester: IV**
Branch: ES CLUSTER (EC / ET / EI) **Duration: 3 hrs.**
Course Code: 23ES4ESCST **Max Marks: 100**
Course: Control Systems

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)	Reduce the given block diagram and find the transfer function 	CO 1	PO1	10
	b)	Find C/R for the system shown below using signal flow graph technique. 	CO 1	PO1	10
		UNIT – II			
2	a)	Explain the steady state error and static error constant with relevant equations	-	-	10
	b)	A unity feedback system is characterized by open loop transfer function $G(S) = k / (s^2+10s+k)$ Determine the gain k, so that the system will have a damping ratio of 0.5. Also find the settling time for 5% tolerance and rise time for unit step input.	CO 2	PO2	10

			UNIT - III			
	3	a)	Sketch the root locus for the open loop transfer function and find the value of 'k' for stability $G(s) = \frac{K(s+1)}{s^2(s+10)}$; $H(s) = 1$	***CO*** 2	***PO2***	**10**
		b)	Find the range of K for stability using RH criterion. 	***CO*** 2	***PO2***	**10**
			OR			
	4	a)	The open loop Transfer function of a unity feedback system is given by $G(s) = \frac{K(s+3)}{s(s^2+2s+3)(s+5)(s+6)}$ Find the value of 'K' of which the closed loop system is stable	***CO*** 2	***PO2***	**10**
		b)	Sketch the root locus for the system shown in below figure. 	***CO*** 2	***PO2***	**10**
			UNIT – IV			
	5	a)	Consider a unity feedback control system under proportional control. $G(s) = \frac{5}{s(s+1)(s+5)}$ Draw the polar plot for the function shown.	***CO*** 2	***PO2***	**8**

		b)	A system with unity feedback and open loop gain function is given as $$G(S) = \frac{k}{S(S+2)(S+4)}$$ Draw the Bode plot and find k for gain margin=20dB	***CO*** 2	***PO2***	**12**
			OR			
	6	a)	An open loop gain function of is given as $$G(S) = \frac{14400(5+S)}{S^2(20+S)(100+S)}$$ Draw the Bode plot and find gain crossover frequency, phase crossover frequency, gain margin and phase margin.	***CO*** 2	***PO2***	**12**
		b)	Discuss the rules for drawing Nyquist plots with a simple example	***CO*** 1	***PO1***	**8**
			UNIT – V			
	7	a)	Obtain the state model for an electrical system shown in below figure 	***CO*** 2	***PO2***	**10**
		b)	Represent the differential equation given below in a state model $$\frac{d^3y}{dt^3} + \frac{d^2y}{dt^2} + 6\frac{dy}{dt} + 7y = 2u(t)$$	***CO*** 2	***PO2***	**10**

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