CBCS SCHEME

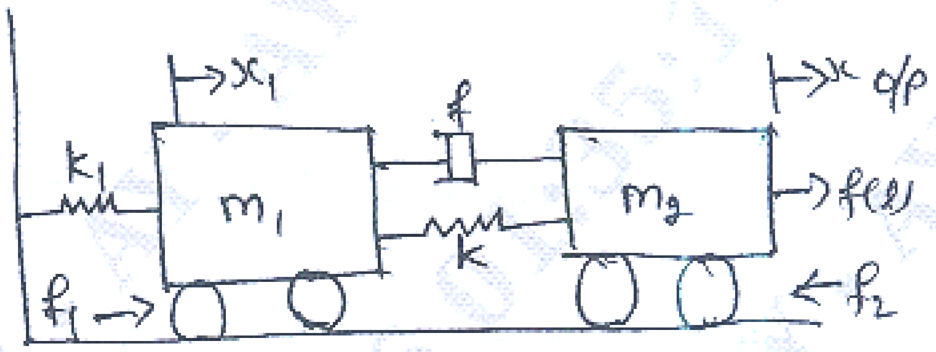
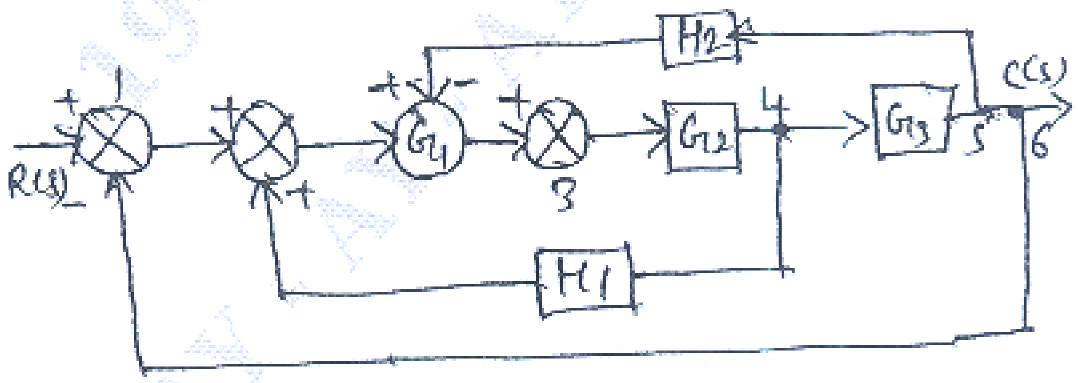
USN | | | | | | | | | |

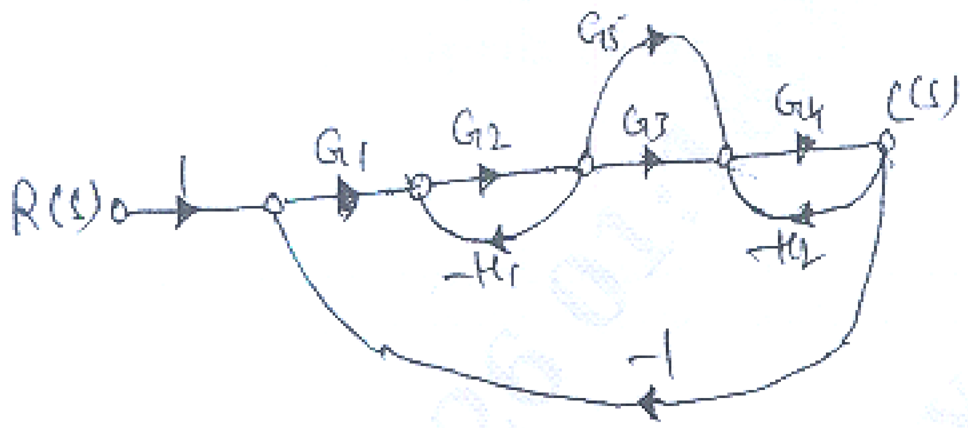
BME703

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Control Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Control System. List out the comparison between open loop and closed loop control system.	6	L1	CO1
	b.	Elaborate the concept of feedback control system with an example.	6	L1	CO1
	c.	Describe the requirements of an ideal control system.	8	L1	CO1
		OR			
Q.2	a.	Explain proportional plus integral controller action with the characteristics.	10	L1	CO1
	b.	Obtain the transfer function of the mechanical system shown in Fig.Q.2(b) writing the physical system equations.  Fig.Q.2(b)	10	L2	CO1
		Module – 2			
Q.3	a.	For the system shown in Fig.Q.3(a), use block diagram reduction technique to find $\frac{C}{R}$ equation.  Fig.Q.3(a)	10	L2	CO1

	b.	Find the overall transfer function by using Mason's gain formula for the signal flow graph shown in Fig.Q.3(b).  Fig.Q.3(b)	10	L3	CO2
		OR			
Q.4	a.	Explain in detail the types of system compensation with a neat sketch.	10	L3	CO2
	b.	Explain the following: i) Lag compensator ii) Lead compensator	10	L3	CO2
		Module – 3			
Q.5	a.	Elaborate the following terms with graph and equations: i) Step ii) Ramp input iii) Parabolic input iv) Impulse input	10	L2	CO3
	b.	Derive the expression for error constant and steady state errors and also define the steady state error.	10	L3	CO3
		OR			
Q.6	a.	Derive the expression for transient response of second order system for unit step input.	10	L2	CO5
	b.	For with feedback control system having open-loop transfer function: $G(s) = \frac{K(s+2)}{s(s^3+7s^2+12s)}$ Find: i) Type of system ii) Error coefficients iii) Steady state error for input of $\frac{R}{2}t^2$	10	L2	CO3
		Module – 4			
Q.7	a.	The characteristics equation of a system is given by $s^6+3s^5+4s^4+6s^3+5s^2+3s+2=0$ Determine the stability using RH criteria.	8	L2	CO4

	b.	By applying Routh criterion, discuss the stability of the closed loop system as a function of K for the following open loop transfer function. $$G(s)H(s)=\frac{k(s+1)}{s(s-1)(s^2+4s+16)}$$	12	L2	CO4
		OR			
Q.8		The loop transfer function of a unity feedback control system is $$G(s)=\frac{k(s+6)}{s(s+1)(s+2)}$$ Draw the root locus diagram for all values of K ranging from 0 to ∞ and mark the salient points on the root locus.	20	L2	CO4
		Module – 5			
Q.9	a.	Sketch the polar plot for the transfer function $$G(s)=\frac{1}{(1+s)(1+2s)}$$	6	L2	CO4
	b.	Using Nyquist criterion, investigate the stability of a system whose open loop transfer function is $$G(s)H(s)=\frac{K}{(s+1)(s+2)(s+3)}$$	14	L2	CO4
		OR			
Q.10		Construct the bode plot for a unity feedback system whose open loop transfer function is given by: $$G(s)H(s)=\frac{10}{s(1+s)(1+0.02s)}$$ From Bode plot determine: i) Gain and phase cross over frequencies ii) Gain and phase margin iii) Stability of the closed loop system	20	L2	CO4

* * * * *