PVP 23

Code: 23ES1402

II B.Tech - II Semester – Regular Examinations - MAY 2025

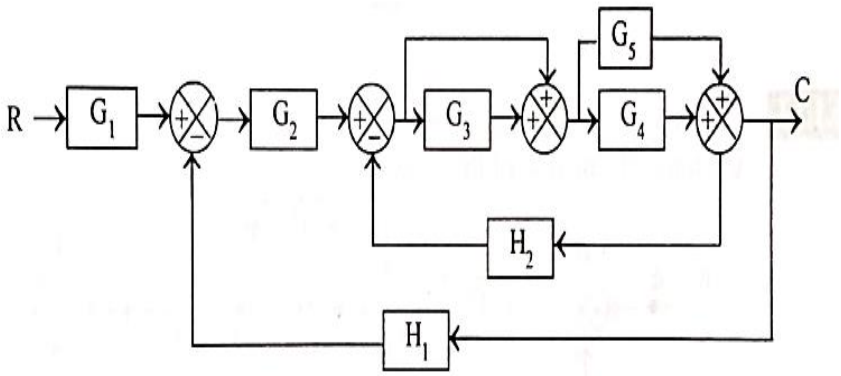
LINEAR CONTROL SYSTEMS
(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

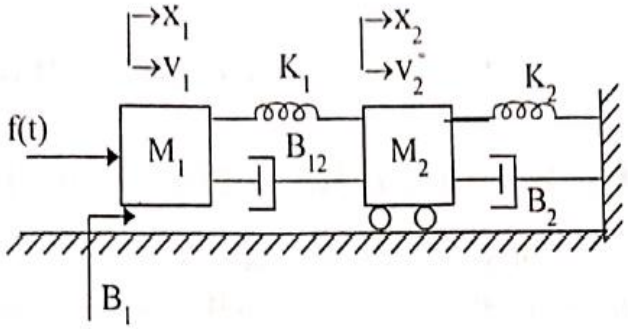
BL – Blooms Level CO – Course Outcome

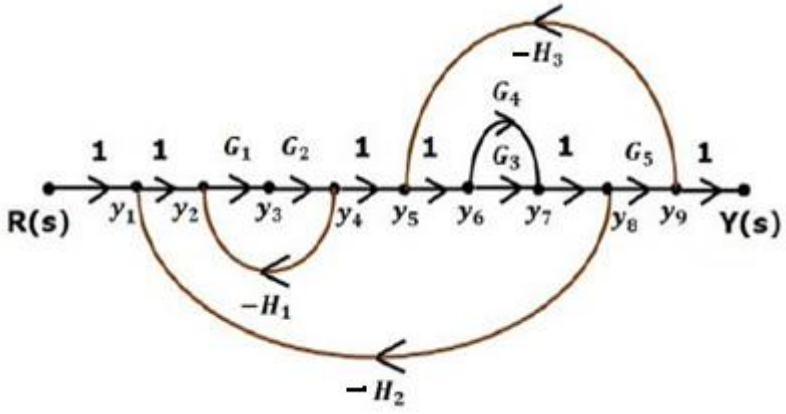
PART – A

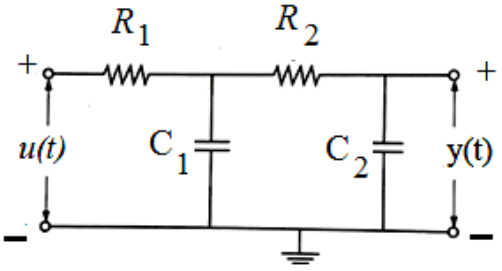
		BL	CO
1.a)	List the merits of closed loop control system.	L2	CO1
1.b)	Why positive feedback is not preferred in control systems?	L2	CO3
1.c)	For the given block diagram, construct the signal flow graph. 	L3	CO4
1.d)	What is transient response and steady state response?	L2	CO2
1.e)	Write the statement of Routh's criteria for stability.	L2	CO1
1.f)	How many break away points exist for $G(s)H(s)=\frac{K(s+6)}{s(s+2)(s+4)}$.	L3	CO3
1.g)	Define resonant frequency.	L2	CO1
1.h)	Mention the requirement of gain margin and phase margin for a stable system.	L2	CO3

1.i)	Define state controllability.	L2	CO2
1.j)	What is the significance of State Transition Matrix?	L2	CO3

PART – B

			BL	CO	Max. Marks
UNIT-I					
2	a)	Describe the concept of closed loop control system with one example.	L2	CO1	4 M
	b)	Write the differential equations governing the mechanical system shown in Fig., and hence draw the Force –voltage analogous circuit. 	L3	CO3	6 M
OR					
3	a)	Compare open loop and closed loop control systems.	L3	CO3	6 M
	b)	Derive the transfer function of series RC circuit with voltage across capacitor as its output.	L3	CO3	4 M
UNIT-II					
4	a)	Obtain the transfer function of below signal flow graph using Mason's Gain formula.	L3	CO3	5 M

					
	b)	For a unity feedback control system, the open loop transfer function is $G(s)=\frac{10(s+2)}{s^2(s+1)}$. Find position, velocity and acceleration error constants.	L3	CO3	5 M
OR					
5	a)	For a unity feedback system whose open loop transfer function is $G(s)=\frac{10}{s(s+1)(s+2)}$, find the steady state error when it is subjected to the input, *r(t)=1+2t.*	L4	CO4	5 M
	b)	List out various time domain specifications and define them.	L2	CO1	5 M
UNIT-III					
6	a)	What are the difficulties in the formulation of the Routh table? Explain how they can be overcome.	L2	CO1	5 M
	b)	Use R-H criterion and comment on stability of a unity feedback system whose transfer function has poles at s = 0, s = -1, s = -3 and zeros at s = -5.	L3	CO3	5 M
OR					
7		Sketch the root locus for unity feedback system $G(s)=\frac{K}{s(s+2)(s+4)}$. Find the value of K for the system to be stable.	L4	CO4	10 M

		UNIT-IV			
8	a)	The open loop transfer function of a unity feedback system is given by $G(s)=\frac{1}{s^2(1+s)(1+2s)}$. Sketch the polar plot.	L3	CO3	6 M
	b)	Define the various frequency response specifications.	L2	CO1	4 M
		OR			
9	a)	Draw the Bode plot and hence find the gain margin and phase margin for a unity feedback system whose transfer function is given by $$G(s)=\frac{10}{s(1+0.1s)(1+0.2s)}$$	L4	CO4	7 M
	b)	Explain the stability analysis from Nyquist stability criterion.	L2	CO3	3 M
		UNIT-V			
10	a)	State and prove the properties of State Transition Matrix.	L3	CO5	5 M
	b)	Evaluate the Observability of the system with, $A=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ 0 & -2 & -3\end{bmatrix}$, $B=\begin{bmatrix}0\\0\\1\end{bmatrix}$ and $C=\begin{bmatrix}3 & 4 & 1\end{bmatrix}$.	L4	CO5	5 M
		OR			
11	a)	Obtain the state model for the electrical network shown in figure. 	L3	CO5	5 M
	b)	Obtain the transfer function of the system having the state model, $X'(t)=\begin{bmatrix}-5 & -1\\ 3 & -1\end{bmatrix}X(t)+\begin{bmatrix}2\\5\end{bmatrix}U(t)$, and $Y(t)=\begin{bmatrix}1 & 2\end{bmatrix}X(t)$.	L3	CO5	5 M