PVP 23

Code: 23ES1402

II B.Tech - II Semester – Regular / Supplementary Examinations
APRIL 2026

LINEAR CONTROL SYSTEMS
(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

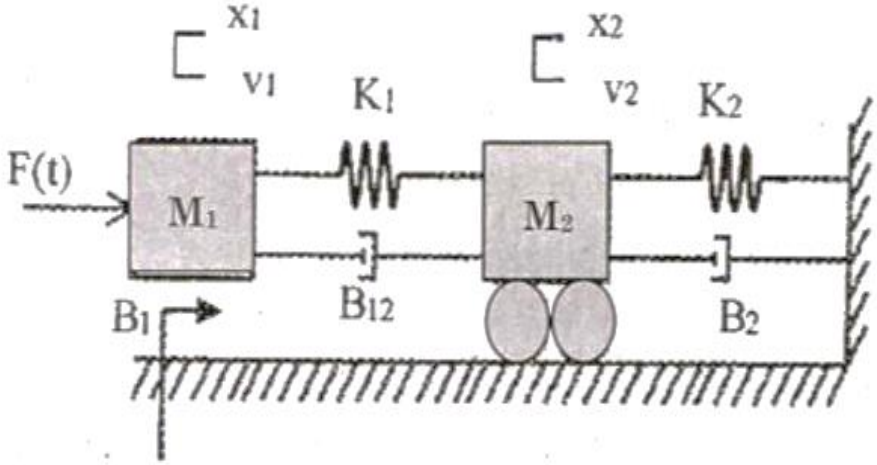
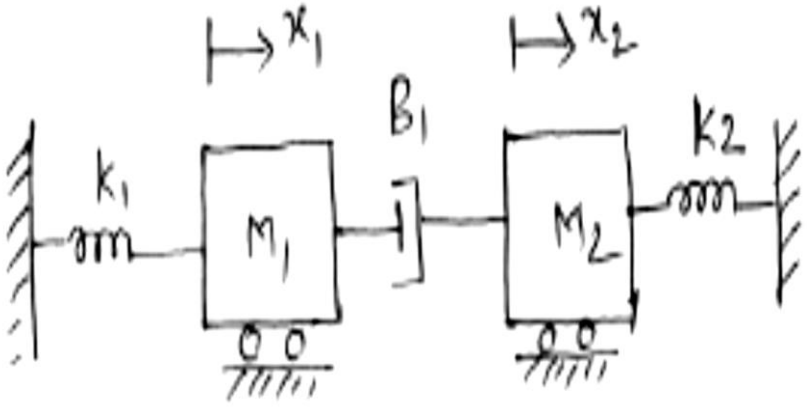
Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

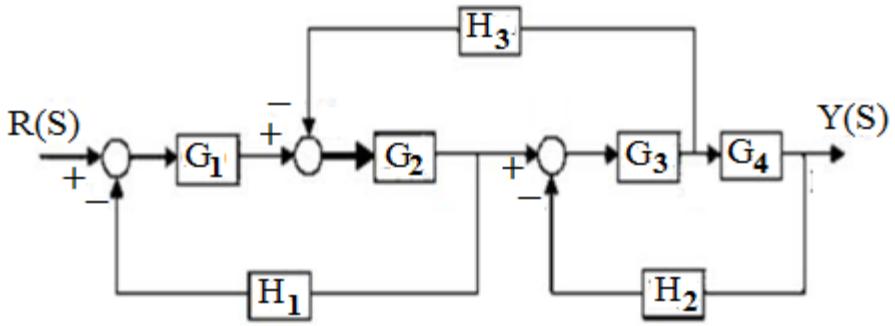
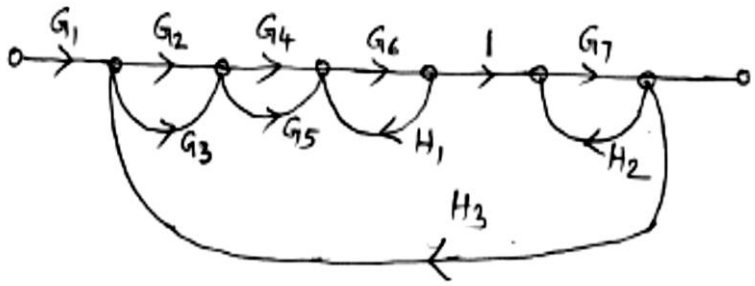
BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	Explain how feedback affects overall gain of the system?	L2	CO1
1.b)	Write the disadvantages of Open loop Systems.	L2	CO1
1.c)	Mention various time domain Specifications.	L2	CO2
1.d)	What is the difference between steady state and transient response?	L2	CO2
1.e)	What are asymptotes?	L2	CO3
1.f)	What is the effect of adding poles and zeroes to a transfer function on the root locus?	L2	CO3
1.g)	State and explain Nyquist stability criterion.	L2	CO4
1.h)	What is the significance of bode plots?	L2	CO4
1.i)	List out the advantages of state space model.	L2	CO5
1.j)	Compare transfer function and state variable approach.	L2	CO5

PART – B

			BL	CO	Max. Marks
		UNIT-I			
2	a)	Write the differential equations governing the mechanical translational system as shown in figure. Draw the electrical analogous circuit by using Force-Voltage analogy. 	L3	CO1	5 M
	b)	Compare positive feedback and negative feedback.	L3	CO1	5 M
		OR			
3	a)	Distinguish between Open loop and Closed loop Systems.	L3	CO1	5 M
	b)	Draw the equivalent electrical analogous circuit based on force current analogy for the following mechanical system. 	L4	CO1	5 M

		UNIT-II			
4	a)	For the system represented by block diagram shown in figure. Determine Y(s) /R(s). 	L4	CO2	5 M
	b)	What is a signal flow graph and explain Masons Gain formula.	L4	CO2	5 M
		OR			
5	a)	Obtain the transfer function for the following signal flow graph by using Mason's gain formula. 	L5	CO2	5 M
	b)	Discuss the reduction rules for obtaining transfer function of a block diagram.	L4	CO2	5 M
		UNIT-III			
6		Illustrate the procedure step by step to construct the root locus.	L4	CO3	10 M
		OR			
7	a)	By using Routh criterion determine the stability of the system represented by the following characteristics equation $S^5 + S^4 + 2S^3 + 2S^2 + 11S + 10=0$	L5	CO3	5 M
	b)	Explain the limitations of Routh Stability criterion.	L2	CO3	5 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 for the system.	L5	CO4	5 M
	b)	What is frequency response and define the different frequency domain specifications?	L3	CO4	5 M
		OR			
9		Sketch Bode plot for the following transfer function G(S)= $\frac{s^2}{(1+0.2s)(1+0.02s)}$.	L3	CO4	10 M
		UNIT-V			
10	a)	A system is characterized by the transfer function $\frac{y(s)}{u(s)} = \frac{3}{s^2+6s^2+11s+6}$. Find the state and output equation in matrix form.	L5	CO5	5 M
	b)	State and prove properties of state transition matrix.	L3	CO5	5 M
		OR			
11		Test the controllability and observability of the system whose state space representation is $\begin{bmatrix} X_1' \\ X_2' \\ X_3' \end{bmatrix} = \begin{bmatrix} 0 & 0 & 2 \\ -2 & -3 & 0 \\ 0 & 2 & 3 \end{bmatrix} \begin{bmatrix} X1 \\ X2 \\ X3 \end{bmatrix} + \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix} \text{u};$ $\text{y} = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} X1 \\ X2 \\ X3 \end{bmatrix}$	L5	CO5	10 M