PVP 23

Code: 23EE3403

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

CONTROL SYSTEMS
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

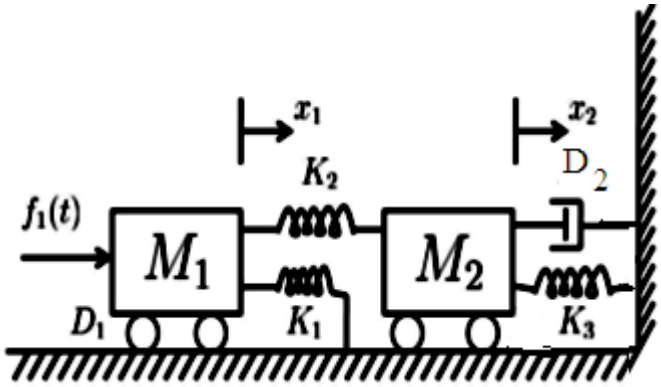
Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	Differentiate open loop and closed loop control systems.	L2	CO1
1.b)	What are the effects of feedback on Sensitivity?	L3	CO2
1.c)	Define peak time and peak overshoot.	L3	CO3
1.d)	What is Steady state error?	L4	CO4
1.e)	Differentiate absolute stability and marginal stability.	L4	CO4
1.f)	What is PD controller?	L3	CO2
1.g)	State the Nyquist criterion.	L4	CO4
1.h)	Draw the circuit diagram of a lag compensator and write its transfer function.	L3	CO3
1.i)	What are the advantages of state variable techniques?	L3	CO2
1.j)	What is Kalman's test of controllability?	L4	CO5

PART – B

			BL	CO	Max. Marks
		UNIT-I			
2		Derive the Transfer function of Armature controlled DC servo motor.	L3	CO2	10 M
		OR			
3		Develop the differential equations governing the mechanical system as shown in below figure. Also find the transfer function $X_1(s)/F(s)$ 	L4	CO4	10 M
		UNIT-II			
4		A unity feedback system has a forward path transfer function $G(s)=\frac{8}{s(s+2)}$. Find the value of damping ratio, undamped natural frequency of the system, percentage over shoot, peak time and settling time.	L3	CO3	10 M
		OR			
5	a)	Derive any two time domain specifications of second order system with unit step input.	L3	CO3	5 M

	b)	Explain steady state errors and error constants.	L4	CO4	5 M
		UNIT-III			
6	a)	Explain Routh's stability criterion.	L3	CO3	5 M
	b)	Write a short notes on (i) proportional (P) (ii) Proportional Integral (PI) controllers	L3	CO2	5 M
		OR			
7		Sketch the root locus plot of a unity feedback system with an open loop transfer function $G(s)=\frac{K}{s(s+1)(s+2)}$. Determine the range of K for stability.	L3	CO2	10 M
		UNIT-IV			
8		Sketch the Bode plot and determine the Gain margin and phase margin. For the open loop transfer function $G(s)=\frac{8}{s(1+0.3s)(1+0.1s)}$.	L4	CO4	10 M
		OR			
9	a)	Describe the procedure for developing the polar plot.	L4	CO4	5 M
	b)	A unity feedback control system has an open loop transfer function given by $G(s)H(s)=\frac{10}{s(s+3)(s+6)}$. Draw Nyquist diagram and determine stability.	L4	CO4	5 M

		UNIT-V			
10	a)	Obtain the state space representation of an n^{th} order differential equation.	L3	CO2	5 M
	b)	A second order linear system is described by $\dot{x}_1 = -2x_1 + 4x_2 + u$ $\dot{x}_2 = -x_1 - 2x_2 + u$ and $y = x_1 + x_2$. Find the transfer function.	L3	CO2	5 M
		OR			
11		The state variable formulation of a system is given by $[\dot{x}] = \begin{bmatrix} -3 & 2 \\ -1 & 0 \end{bmatrix} [x] + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$ and $y = \begin{bmatrix} 1 & 0 \end{bmatrix} [x]$. Find the following: a) State transition matrix and b) State equation for a unit step input under zero initial condition.	L4	CO5	10 M