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**PACE INSTITUTE OF TECHNOLOGY & SCIENCES::ONGOLE
(AUTONOMOUS)**

**III B.TECH I SEMESTER END SUPPLEMENTARY EXAMINATIONS, MARCH/APRIL– 2023
CONTROL SYSTEMS
(ECE Branch)**

Time: 3 hours

Max. Marks: 60

Note: Question Paper consists of Two parts (Part-A and Part-B)

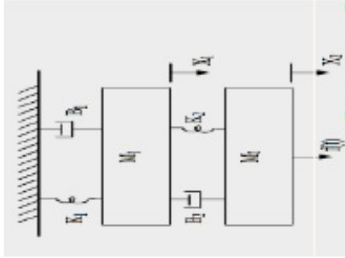
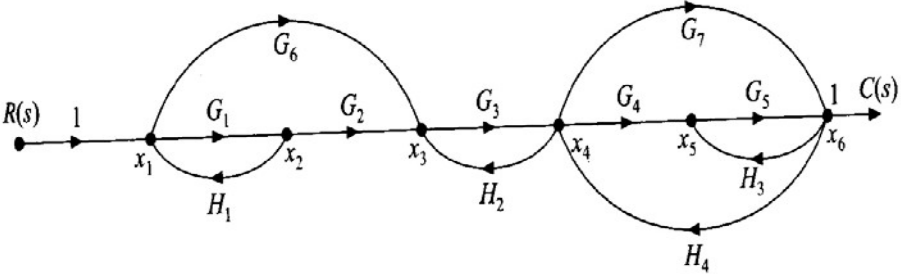
PART-A

Answer all the questions in Part-A (5X2=10M)

Q.No.	Questions	Marks	CO	KL
1.	a) Illustrate closed loop system with suitable example.	[2M]	1	
	b) What are the drawbacks of Static Error Coefficients?	[2M]	2	
	c) What is the necessary condition for stability of the system?	[2M]	3	
	d) How do you infer whether a system is critically stable from bode plots?	[2M]	4	
	e) Define Controllability of a System.	[2M]	5	

PART-B

Answer One Question from each UNIT (5X10=50M)

Q.No.	Questions	Marks	CO	KL
UNIT-I				
2.	Determine the transfer function $X1(s)/F(s)$ for the mechanical system shown in figure (1)	[10M]	1	
 <p align="center">Figure (1)</p>				
OR				
3.	Determine the transfer function of the system shown in figure (2) using Mason's gain formula.	[10M]	1	
 <p align="center">Figure (2)</p>				
UNIT-II				



4.	a)	Explain the Standard test signals	[5M]	2	
	b)	Describe the time response of first order system for Step input signal.	[5M]	2	
OR					
5.		A unity feedback system is characteristic by an open loop transfer function $G(S) = \frac{10}{S(S+6)+10}$. i) Find the constants K_p , K_v and K_a and ii) determine the steady state error if the input is $r(t) = 1+t+t^2$.	[10M]	2	
UNIT-III					
6.		Using Routh-Hurwitz criterion, determine the stability of the closed loop system that has the following characteristic equation and also determine the number of roots that are in the right half s-plane and on the imaginary axis: $8S^6+3S^4S^3+6S^2+S+9=0$.	[10M]	3	
OR					
7.	a)	Explain the frequency domain specifications.	[5M]	3	
	b)	Define Polar plot and Sketch the polar plot of a system given by $G(s) = \frac{1}{[S(S+1)(2S+1)]}$	[5M]	3	
UNIT-IV					
8.		Explain the different steps to be followed for design of lag-lead compensator using bode Plot.	[10M]	4	
OR					
9.		Design a lead –lag compensator to meet the following specifications : (a).Phase margin is at least 40° and (b) steady state error for the ramp input is 0.04 rad , if A unity feedback system has open loop transfer function . $G(s) = \frac{K}{[S(S+1)(S+30)]}$	[10M]	4	
UNIT-V					
10.	a)	.Explain :- (i)state variables and (ii) State transition matrix	[5M]	5	
	b)	Write state variable representation for lag compensation network.	[5M]	5	
OR					
11.	a)	Explain the properties of state transition Matrix.	[5M]	5	
	b)	Consider a system having state model $\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} -2 & -3 \\ 4 & 2 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 3 \\ 5 \end{bmatrix} U$ and $Y = \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix}$ with $D=0$. Obtain its transfer function.	[5M]	5	
