

**PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(AUTONOMOUS)**

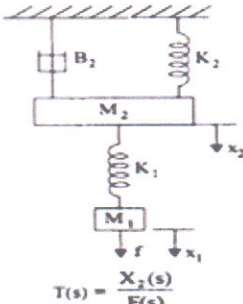
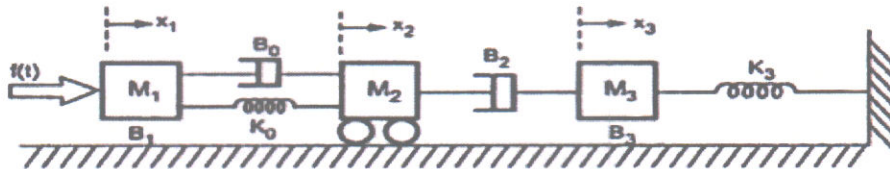
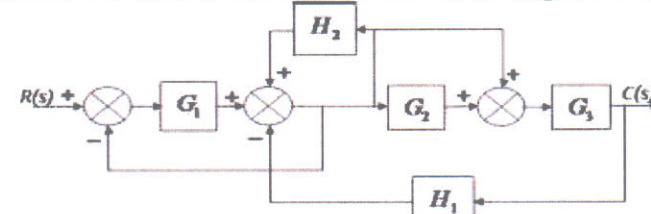
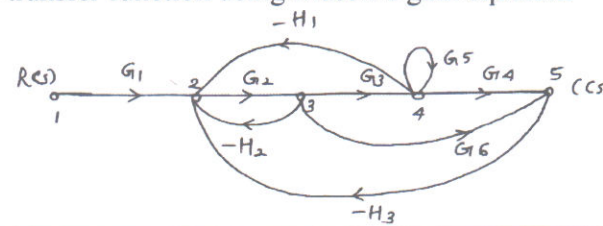
II B.Tech II Semester Regular/Supplementary Examinations, May-2024

**CONTROL SYSTEMS
(ECE)**

Time: 3 hours

Max. Marks: 70

**Answer ONE Question from each Unit
All Questions Carry Equal Marks**

Q. No.	Questions	BTL	CO	Marks
UNIT – I				
1.	a) Discuss the advantages of closed loop system with example b) Obtain the transfer function for the following mechanical translational system.	K2	CO1	7M
	 <p align="center">$T(s) = \frac{X_2(s)}{F(s)}$</p>	K3	CO1	7M
OR				
2.	a) Explain how the parameter variation effects the system performance with negative feedback. b) Obtain the transfer function of the given system	K2	CO1	7M
		K3	CO1	7M
UNIT – II				
3.	a) Discuss the characteristics of Servo motors b) Determine the transfer function for the block diagram shown in Figure	K1	CO2	4M
		K3	CO2	10M
OR				
4.	a) Give the constructional details of an armature controlled DC servo motor. b) Find the transfer function using Mason's gain equation	K1	CO2	4M
		K2	CO2	10M

UNIT – III					
5.	a)	Derive expressions for rise time, peak time, peak overshoot and settling time of a second order system excited by a step input.	K3	CO3	7M
	b)	Examine the stability of the characteristic polynomial for K ranging from 0 to ∞ . Use Routh-Hurwitz criterion $T(s)=s^4+20s^3+5s^2+10s+15$.	K4	CO3	7M
OR					
6.	a)	Derive the response of under damped second order system for unit step input.	K3	CO3	7M
	b)	Using R-H criteria, find the stability of the system whose characteristic equation is given by $P(s)=s^6+2s^5+8s^4+12s^3+20s^2+16s+16$.	K2	CO3	7M
UNIT – IV					
7.	a)	Explain the construction rules of root locus.	K2	CO4	7M
	b)	Sketch the polar plot for a given open loop transfer function $G(S)H(S) = \frac{1}{s(s+2)(S+4)}$	K3	CO4	7M
OR					
8.	a)	For the following transfer function, draw the Bode plot and obtain gain cross over frequency. $G(S) = \frac{20}{s(1+3s)(1+4s)}$	K3	CO4	7M
	b)	Explain the terms gain margin, phase margin, gain crossover frequency and phase crossover frequency.	K2	CO4	7M
UNIT – V					
9.	a)	Obtain the transfer function for the given state model $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$ $y = [0 \quad 1] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$	K4	CO5	7M
	b)	Explain the concept of Controllability and observability.	K2	CO5	7M
OR					
10.	a)	Determine the state space form (or) equations for the following transfer function. $G(S) = \frac{1}{(s^2+3s+2)}$	K3	CO5	7M
	b)	Verify the controllability and observability of a control system, which is represented by the following state equation. $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -2 & -2 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u$ $y = [1 \quad 1] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$	K3	CO5	7M