

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
III B. Tech I Semester Regular/Supplementary Examinations, April/May -2025
CONTROL SYSTEMS

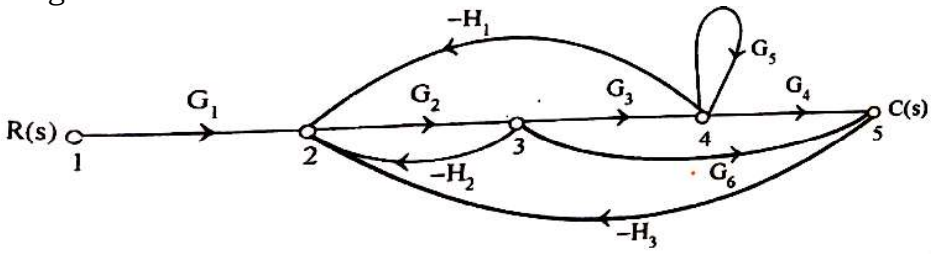
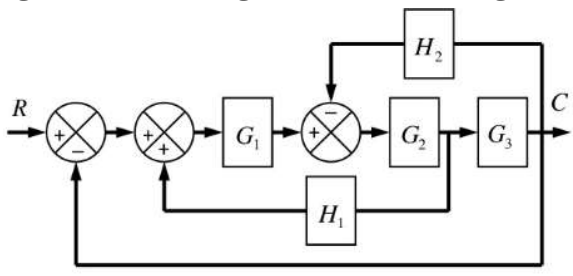
(Electrical & Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

UNIT-I		
1.	a)	Find the overall gain $(C(s))/(R(s))$ for the signal flow graph shown in Figure 1. [7M]
 <p align="center">Figure 1.</p>		
	b)	Distinguish between Open loop control system and closed loop control system. [7M]
(OR)		
2.	a)	Find $\frac{C}{R}$ for the given block diagram shown in Figure 2. [7M]
 <p align="center">Figure 2.</p>		
	b)	Derive an expression for the transfer function of an armature-controlled DC servo motor. [7M]
UNIT-II		
3.	a)	Explain the effect of Proportional control, Integral control and derivative control action on the performance of a second order system. [7M]
	b)	Write the equations for time domain specifications of a standard second order system with unit step input. [7M]
(OR)		
4.	a)	Sketch the root locus plot of a unity feedback system whose open loop transfer function is $G(s) = \frac{K(s^2 - 2s + 2)}{(s+2)(s+3)(s+4)}$ [7M]
	b)	Determine the RH stability of given characteristic equation $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$ [7M]

		<u>UNIT-III</u>	
5.	a)	Sketch the polar plot and discuss the stability of the system represented by $G(s)H(s) = \frac{K}{s(s+1)(s+5)}$	[7M]
	b)	State and explain Nyquist stability Criteria.	[7M]
		(OR)	
6.	a)	Compare between Time domain analysis and Frequency domain analysis.	[7M]
	b)	Given the open loop transfer function of a unity feedback system $G(s) = \frac{1}{s(1+s)(1+2s)}$. Draw the bodeplot and measure the gain margin and phase margin.	[7M]
		<u>UNIT-IV</u>	
7.	a)	Draw the electrical circuit diagram that represents the Lead-Lag compensator and explain in detail	[7M]
	b)	Describe the design procedure of a lag compensator.	[7M]
		(OR)	
8.	a)	Explain in detail about the lead compensator along with its characteristics	[7M]
	b)	What is compensation and what are the types of compensation?	[7M]
		<u>UNIT-V</u>	
9.	a)	Obtain the solution for time invariant state equation for step input.	[7M]
	b)	Write short notes on controllability and observability	[7M]
		(OR)	
10.	a)	Determine the state and output equations in vector matrix form for the system whose transfer function is given by $G(s) = \frac{s+2}{s(s^2+4s+3)}$	[7M]
	b)	Explain properties and significance of state transition matrix. Obtain the state transition matrix of $A = \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$	[7M]

.....