U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

October 2024 Supplementary Examinations

Programme: B.E. **Semester: VI**

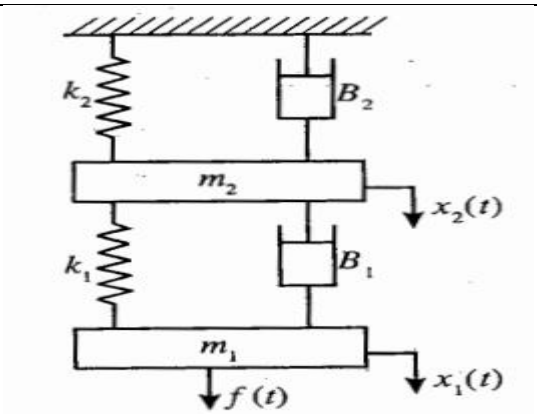
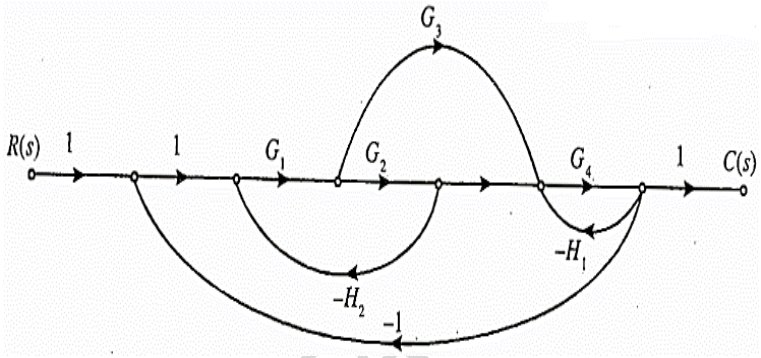
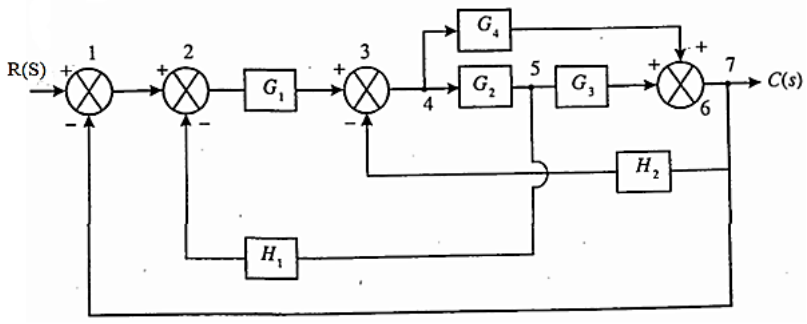
Branch: Aerospace Engineering **Duration: 3 hrs.**

Course Code: 22AS6PCICT **Max Marks: 100**

Course: INTRODUCTION TO CONTROL THEORY

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

				CO	PO	Marks
			UNIT - I			
1	a)	Give the brief review of historical developments of control theories and practices.		CO1	PO 1	**06**
	b)	Describe the working principle of rocket autopilot system with suitable sketches.		CO1	PO1	**06**
	c)	Explain the functions that automatic control systems provide for flight control.		CO2	PO3	**08**
		OR				
2	a)	Mention different types of controllers. Explain any two of them in detail.		CO1	PO1	**08**
	b)	Define impulse response function of a system.		CO2	PO1	**04**
	c)	Explain the state model of linear system.		CO1	PO1	**08**
		UNIT - II				
3	a)	Explain the models of pneumatic systems along with its basic elements and neat sketches.		CO1	PO1	**06**
	b)	Derive the transfer function of first order liquid system.		CO3	PO1	**04**
	c)	For the mechanical system shown in figure 3c below i) Draw the mechanical network ii) Write the differential equation of the system iii) Draw the analogous electrical network based on F-V and F-I analogy		CO3	PO3	**10**

			 figure 3c			
			OR			
4	a)	For the Signal flow graph shown below figure 4a, determine the transfer function $\left(\frac{C(s)}{R(s)}\right)$ using Mason's formula.  figure 4a	*CO3*	*PO3*	**08**
	b)	Reduce the block diagram shown in the figure 4b to its simplest possible form and find its closed loop transfer function.  figure 4b	*CO3*	*PO3*	**08**
	c)	Derive the transfer function of a closed loop system.	*CO2*	*PO1*	**04**
		UNIT - III			
5	a)	What are the different types of standard test inputs used in evaluating the performance of a system and also derive its Laplace transform representation with suitable plots.	*CO1*	*PO1*	**10**
	b)	Derive the transient response of first order and second order system for all standard inputs.	*CO3*	*PO1*	**10**

			UNIT - IV			
	6	a)	Sketch the polar plot of the system having transfer function $G(s)H(s) = \frac{10s}{(1+4s)}$	*CO3*	*PO3*	**08**
		b)	Sketch the root locus plots for $G(s)H(s)= \frac{K}{s(s+2)(s+4)(s+6)}$ For what values of K the system becomes unstable?	*CO3*	*PO3*	**12**
			UNIT - V			
	7	a)	What is the need for system compensation? Explain its types with a example for each.	*CO1*	*PO1*	**06**
		b)	Verify the following system are controllable and observable or not by using Kalman's test. $\begin{Bmatrix} \dot{x_1} \\ \dot{x_2} \end{Bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -2 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \end{Bmatrix} + \begin{Bmatrix} 0 \\ 1 \end{Bmatrix} u$ and C={1 1}	*CO3*	*PO3*	**08**
		c)	Give the matrix representation of state equations.	*CO1*	*PO1*	**06**

******