U.S.N.										

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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

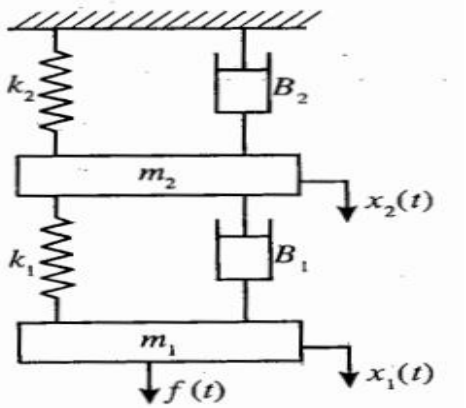
Programme: B.E. **Semester: VI**

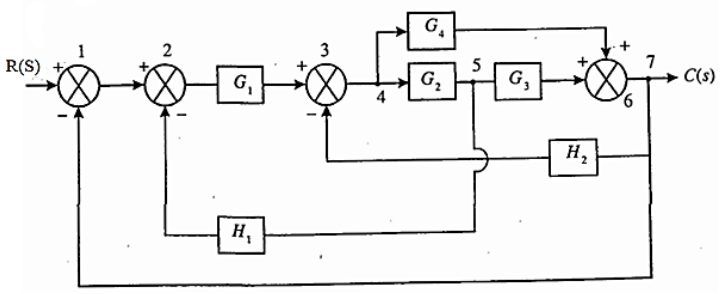
Branch: Aerospace Engineering **Duration: 3 hrs.**

Course Code: 23AS6PCICT / 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.

		UNIT - I	CO	PO	Marks
1	a)	Describe the working principle of missile launcher and guidance system with suitable sketches.	CO1	PO1	**8**
	b)	Mention different types of controllers. Explain any three of them in detail.	CO1	PO1	**12**
		OR			
2	a)	Write a short note on the applications of controls in aerospace engineering.	CO1	PO1	**12**
	b)	Explain the concept of feedback control system with example and give the effects of feedback on the control system.	CO1	PO1	**8**
		UNIT - II			
3	a)	For the mechanical system shown in figure below a. Draw the mechanical network b. Write the differential equation of the system c. Draw the analogous electrical network based on F-V and F-I analogy 	CO3	PO3	**12**
	b)	Explain the models of pneumatic systems along with its basic elements and neat sketches.	CO1	PO1	**8**

			OR			
	4	a)	What do you mean by signal flow graph? Write down the terms used and procedure to draw signal flow graph.	*CO1*	*PO1*	**8**
		b)	Reduce the block diagram shown in the figure to its simplest possible form and find its closed loop transfer function.  Fig:4b	*CO3*	*PO3*	**12**
			UNIT - III			
	5	a)	Derive the transient response of first order system for all standard inputs.	*CO1*	*PO1*	**10**
		b)	Describe the effect of standard test input on steady state errors and error constants and also derive the steady-state errors of TYPE 0,1 and 2 unity feedback systems.	*CO1*	*PO1*	**10**
			OR			
	6	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*	**12**
		b)	What do you mean by steady state error? Derive the expression for error constant and steady state error.	*CO1*	*PO1*	**8**
			UNIT - IV			
	7	a)	What do you mean by stability of the system? Explain its concept by giving example and give the conditions for stability analysis (in the form of tabular column)	*CO1*	*PO1*	**8**
		b)	Sketch the root locus plot for $$\mathbf{G(s)=\frac{K}{s(s+1)(s+2)(s+3)}}$$ For what values of K the system becomes unstable?	*CO3*	*PO3*	**12**
			OR			
	8	a)	Sketch the polar plot of the system having transfer function $$\mathbf{G(s)H(s) = \frac{10s}{(1+4s)}}$$	*CO3*	*PO3*	**8**
		b)	Sketch the root locus plots for	*CO3*	*PO3*	**12**

			G(s)H(s)= $\frac{K}{s(s+2)(s+4)(s+6)}$ For what values of K the system becomes unstable?			
			UNIT - V			
	9	a)	With the help of MIMO system, explain the nth order state-space system and derive the functional form of 'n' dimensional LTI system	*CO1*	*PO1*	**8**
		b)	Verify the following system are controllable and observable or not by using Kalman's test. $\begin{Bmatrix} \dot{x_1} \\ \dot{x_2} \end{Bmatrix} = \begin{bmatrix} -5 & 4 \\ -6 & 5 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \end{Bmatrix} + \begin{Bmatrix} 1 \\ 1 \end{Bmatrix}$ u and C=$\{-2 \quad 3\}\, x$	*CO3*	*PO3*	**8**
		c)	Explain Gilbert's test of controllability and observability.	*CO1*	*PO1*	**4**
			OR			
	10	a)	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=$\{1 \quad 1\}$	*CO3*	*PO3*	**8**
		b)	Give the matrix representation of state equations	*CO1*	*PO1*	**6**
		c)	What do you mean by series and parallel compensation system? Explain with the help of a suitable figure.	*CO1*	*PO1*	**6**

****