

Code: 23EE3403

**II B.Tech - II Semester – Supplementary Examinations  
DECEMBER 2025**

**CONTROL SYSTEMS  
(ELECTRICAL & ELECTRONICS ENGINEERING)**

Duration: 3 hours

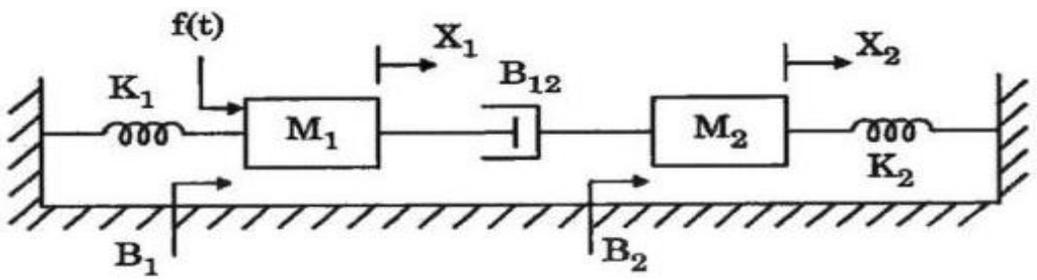
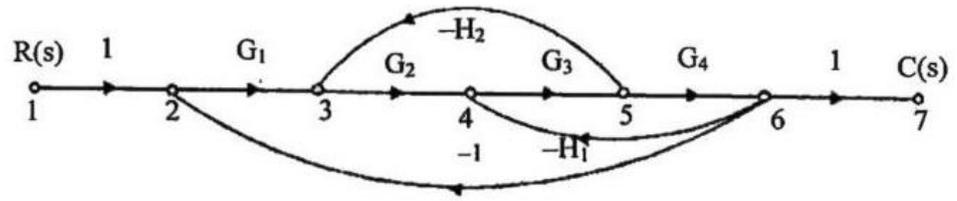
Max. Marks: 70

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- Note: 1. This question paper contains two Parts A and B.  
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.  
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.  
4. All parts of Question paper must be answered in one place.
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**PART – A**

1.a)	Differentiate Linear & Non Linear control systems.
1.b)	What are the effects of feedback on stability?
1.c)	What is under damped system?
1.d)	What is Static error?
1.e)	What are the limitations of Routh 's stability?
1.f)	What is PID controller?
1.g)	State Nyquist stability criteria.
1.h)	Draw the circuit diagram of a lag lead compensator and write its transfer function.
1.i)	What are the advantages of state variable techniques?
1.j)	What are the properties of state transition matrix?

## PART – B

			Max. Marks
<b>UNIT-I</b>			
2	Derive Transfer function of Armature controlled DC servo motor.		10 M
<b>OR</b>			
3	Determine the transfer function of $X_1(s)/F(s)$ and $X_2(s)/F(s)$ for system shown in below figure.		10 M
			
<b>UNIT-II</b>			
4	Find the transfer function $C(S)/R(S)$ of the signal flow graph shown in figure.		10 M
			
<b>OR</b>			
5	a)	Derive the time domain specifications of second order system with unit step input.	5 M
	b)	Explain steady state error. Determine Steady state error for the transfer function with unit step input.	5 M
$G(s) = \frac{12}{(s+1)(s+6)}$			

### UNIT-III

6	a)	The open loop transfer function of feedback control system is given by. $G(s) = \frac{K}{s(s+2)(s+1)}$ Using Routh Criterion determine the range of K and frequency of oscillation of the system.	5 M
	b)	Write a short notes on (i) proportional (P) (ii) Proportional Integral (PI) controllers.	5 M

### OR

7	Sketch the root locus plot of a unity feedback system with an open loop transfer function $G(s) = \frac{K}{s(s+2)(s+4)}$ . Determine the range of K for stability.	10 M
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### UNIT-IV

8	Sketch the Bode plot and determine the Gain margin and phase margin. For the open transfer function is given, $G(s) = \frac{18}{s(1+1.5s)(1+2.1s)}$	10 M
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### OR

9	An unity feedback system having an open loop transfer function $G(s) = \frac{1}{s(s+1)(s+0.5)}$ . Sketch Polar plot and find gain margin and phase margin.	10 M
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### UNIT-V

10	a)	Construct a state model for the system described by the differential equation. $\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} + 6y + u = 0.$ Also draw the block diagram representation of the state model.	5 M
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	b)	Discuss the solution of Homogeneous state equation.	5 M
<b>OR</b>			
11		<p>The state variable formulation of a system is given by</p> $\dot{[x]} = \begin{bmatrix} -3 & 2 \\ -1 & 0 \end{bmatrix} [x] + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u \text{ and } y = [1 \quad 0] [x].$ <p>Find the following: a) Transfer function of the system b) State transaction matrix.</p>	10 M