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KAMALA INSTITUTE OF TECHNOLOGY & SCIENCE, SINGAPUR

23EC28PC503

III.B. Tech. I. Semester Regular Examinations, November- 2025

CONTROL SYSTEMS

(ECE)

Time: 3 Hours

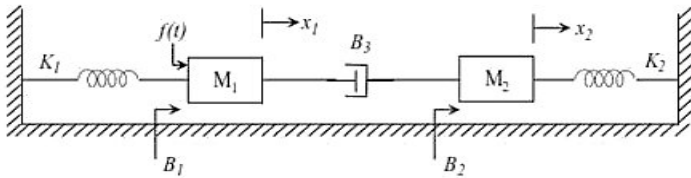
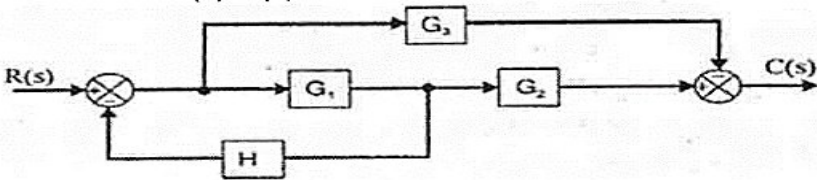
Max. Marks: 60

Note: Question paper consists of Part-A & Part-B.

i) **Part-A** for 10M, ii) **Part-B** for 50marks

- Part A** is compulsory, consists of 10 sub questions from all units carrying equal marks.
- Part-B** consists of **10 questions** (numbered from 2 to 11) carrying **10marks** each. From each unit there are 2 questions and the students should answer one of them. Hence the student should answer **5 questions** from **Part-B**.

PART-A (10Marks)			
Q. No	Questions	Marks	BTL
1.a)	What is feedback? What type of feedback is employed in control systems?	1M	1
1.b)	Define transfer function of Control systems.	1M	1
1.c)	What are standard input signals?	1M	1
1.d)	Define rise time and delay time.	1M	1
1.e)	What is centroid?	1M	1
1.f)	Distinguish between polar plot and Nyquist plot.	1M	1
1.g)	Define transient accuracy?	1M	1
1.h)	What are the uses of lead compensators?	1M	1
1.i)	Define controllability.	1M	1
1.j)	Define state space model.	1M	1

PART-B		(50Marks)	
Q.No	Questions	Marks	BTL
2.	For the mechanical system as shown in the figure, find the transfer function $X_1(S) / F(S)$ 	10M	4
OR			
3. a)	What are the differences between open loop and closed loop control systems?	5M	1
b)	Determine the transfer function $C(S)/R(S)$. 	5M	3
4.	For a system having $G(s) = 200/s(s + 10)$. Determine the rise time, percentage overshoot, peak time and settling time for a step input of 12 units	10M	3
OR			
5. a)	Define the following terms i) Absolute stability ii) Marginal stability iii) Conditional stability.	5M	1
b)	By means of RH criterion determine the stability of the system represented by the characteristic equation $S^4 + 2S^3 + 1S^2 + 1S + 4 = 0$.	5M	2
6.	Develop the bode plot for the system having the following transfer function and determine the phase margin and gain margin. $G(S) = \frac{75(1 + 0.2S)}{S(S^2 + 16S + 100)}$	10M	3
OR			
7.	Draw Nyquist diagram and determine stability for a unity feedback control system having an open loop transfer function given by	10M	3

	$G(s) H(s) = \frac{10}{s(s+3)(s+6)}$		
8. a)	Explain the following control action with a neat diagram and derive their necessary equations: (i) Proportional (ii) Proportional plus Derivative (iii) Proportional plus Integral	5M	1
b)	Determine the transfer function of Lead compensator and draw pole zero plot.	5M	2
OR			
9.	Explain and derive frequency domain specifications.	10M	1
10.a)	State the properties of State Transition Matrix.	5M	1
b)	Diagonalize the following system matrix. $A = \begin{pmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{pmatrix}$	5M	2
OR			
11.a)	Compute transfer function, state transition matrix for a system characterized by the following space equations. $\dot{X}_1 = -3x_1 + x_2 ; \quad \dot{X}_2 = -2x_1 + u ; \quad \text{and } y = x_1 .$	10M	3

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