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KAMALA INSTITUTE OF TECHNOLOGY & SCIENCE, SINGAPUR

23EE28PC502

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

CONTROL SYSTEMS

(EEE)

Time: 3 Hours

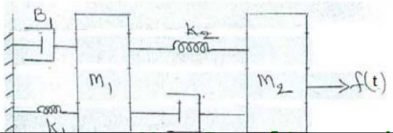
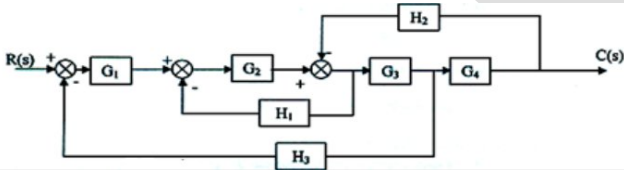
Max.Marks:60

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 are the different types of control system?	1M	1
1.b)	What is the difference between AC servo motor and D.C servo motor?	1M	2
1.c)	What is the difference between type and order of a system?	1M	2
1.d)	What is the necessary condition that the characteristic equation of a feedback system satisfies the BIBO stability?	1M	2
1.e)	What are the advantages of frequency domain analysis?	1M	1
1.f)	State the Nyquist criterion.	1M	1
1.g)	What is transient accuracy?	1M	1
1.h)	Draw the pole-zero plot of Lag compensator.	1M	3
1.i)	What is state?	1M	1
1.j)	What are the advantages of state variable techniques?	1M	1
PART-B (50Marks)			

Q.No	Questions	Marks	BTL
2. a)	Contrast differences between open loop and closed loop control systems.	5M	2
b)	Write the differential equations to represent the following system in figure 2 below and draw its electrical equivalent circuit	5M	3
			
OR			
3. a)	Explain how Synchro acts as an error detector and determine the transfer function.	5M	3
b)	Obtain the transfer function for the system represented by block diagram shown below figure using the block diagram reduction technique.	5M	3
			
4. a)	Derive the time domain specifications of second order system with unit step input.	5M	3
b)	A unity feedback system has a forward path transfer function $G(s) = \frac{8}{s(s+2)}$. Find the value of damping ratio, undamped natural frequency of the system, percentage over shoot, peak time and settling time.	5M	3
OR			
5. a)	Apply R-H criterion to determine stability of the system with the following characteristic equation $2s^4 + 10s^3 + 5s^2 + 5s + 10 = 0$. Find the number roots with positive real parts, if any.	5M	4
b)	Explain the limitations of Routh's stability criteria.	5M	2
6. a)	Describe the procedure for developing the polar plot.	5M	2

b)	A unity feedback control system has an open loop transfer function given by $G(s)H(s) = \frac{10}{s(s+3)(s+6)}$. Draw Nyquist diagram and determine stability.	5M	4
OR			
7. a)	Sketch the Bode plot and determine the Gain margin and phase margin. For the open transfer function is given, $G(s) = \frac{8}{s(1+0.3s)(1+0.1s)}$	10M	4
8. a)	Explain frequency domain specifications	5M	2
b)	Explain in detail about lead compensation design procedure.	5M	3
OR			
9. a)	What is PID controller and write its merits and demerits.	5M	2
b)	Explain about the analog and digital implementation of controllers	5M	3
10.a)	Distinguish between Transfer function model and State Space model.	4M	2
b)	Diagonalize the system matrix given below. $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -5 & -4 \end{bmatrix}$	6M	4
OR			
11.a)	The state variable formulation of a system is given by $\begin{bmatrix} \dot{x} \end{bmatrix} = \begin{bmatrix} -3 & 2 \\ -1 & 0 \end{bmatrix} \begin{bmatrix} x \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u \text{ and } y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x \end{bmatrix}.$ Find the following: a) Transfer function of the system b) State transaction matrix and c) State equation for a unit step input under zero initial condition.	10M	4

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