

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Third Semester

Electronics and Communication Engineering

UCT24303 – Control Systems

(Ordinary graph sheet, Semi log sheet and polar sheet can be permitted)

Regulations -2024

Duration : 3 Hrs

Maximum : 100 Marks

PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

Q.No	Questions	BTL	CO	Marks
1.	List the basic elements of mechanical translational systems.	L1	1	2
2.	State Masons Gain formula.	L1	1	2
3.	Write the different time domain specifications.	L2	2	2
4.	Infer the characteristics of PI controller.	L2	2	2
5.	Define Gain and Phase Cross Over Frequency.	L1	3	2
6.	Explain any two frequency domain specifications.	L2	3	2
7.	Relate the necessary and sufficient condition for the stability in Routh Stability criterion.	L2	4	2
8.	What is meant by Nyquist stability criterion?	L1	4	2
9.	Recall the concept of state variable model.	L1	5	2
10.	Interpret the properties of state transition matrix.	L2	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

Q.No	Questions	BLT	CO	Marks
11	a. Write the differential equations governing the mechanical systems shown in fig 1 and build the transfer function.	L3	1	16

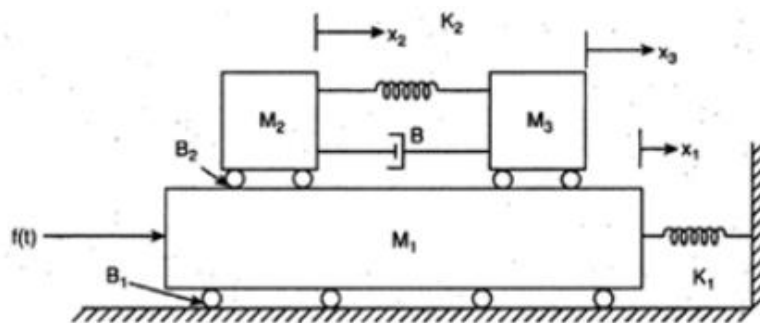


Fig.1

Or

- b. Convert block diagram reduction to signal flow graph as shown in fig 2 and develop the transfer function. L3 1 16

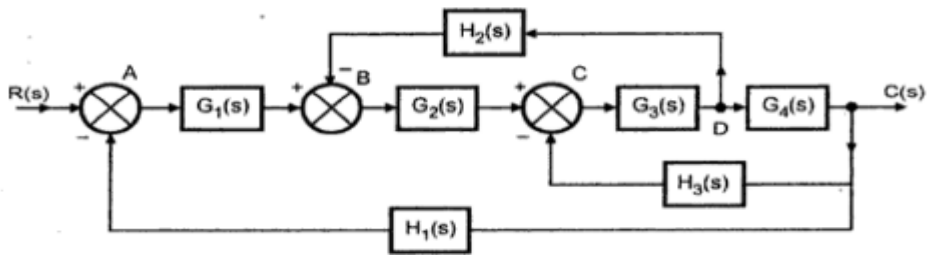


Fig.2

12. a. Develop an expression for time response of a second order system subjected to an unit step input for over damped system. L3 2 16
- Or
- b. Build and explain the effects of PID controller on the system dynamics. L3 2 16
13. a. A unity feedback control system:

$$G(S) = \frac{ks^2}{(1 + 0.2S)(1 + 0.02S)}$$
 Sketch the bode plot and find its gain margin and phase margin. L2 3 16
- Or
- b. Illustrate cascade Lag-Lead compensator with an example and also explain their importance. L2 3 16
14. a. The open loop transfer function of a unity feedback system is given by:

$$G(S) = \frac{K(S + 9)}{S(S^2 + 4S + 11)}$$
 Examine the root locus of the system. L4 4 16
- Or
- b. The open loop transfer function of feedback control system is given by:

$$G(S) = \frac{K}{(S^2 + 6S + 25)(S^2 + 6s + 8)}$$
 Using Routh Criterion, Obtain the range of K and frequency of oscillation of the system. L4 4 16
15. a. Show the controllability and observability for the system described by:

$$\begin{pmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{pmatrix} = \begin{pmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} + \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix} u \quad y = (1 \ 2 \ 2) \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$$
 L2 5 16
- Or
- b. Explain the design a digital control system using state feedback. L2 5 16