

ANURAG Engineering College
(An Autonomous Institution)

II B.Tech I Semester Supplementary Examinations, June/July – 2024

CONTROL SYSTEMS
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 Hours

Max.Marks:75

Section – A (Short Answer type questions)

(25 Marks)

Answer All Questions

1. Explain a comparison between open loop and closed loop control systems.
2. Describe Mason's Gain formula.
3. Summarize the time domain specifications.
4. Define steady state error.
5. Discuss Routh stability criterion.
6. Define Gain margin and Phase margin
7. State and explain Nyquist stability criterion.
8. When lag/lead/ lag-lead compensation is employed?
9. Write the state model of nth order system?
10. Describe the properties of State transition matrix?

Course Outcome	B.T Level	Marks
CO1	L2	2M
CO1	L1	3M
CO2	L2	2M
CO2	L1	3M
CO3	L2	2M
CO3	L1	3M
CO4	L2	2M
CO4	L1	3M
CO5	L1	2M
CO5	L1	3M

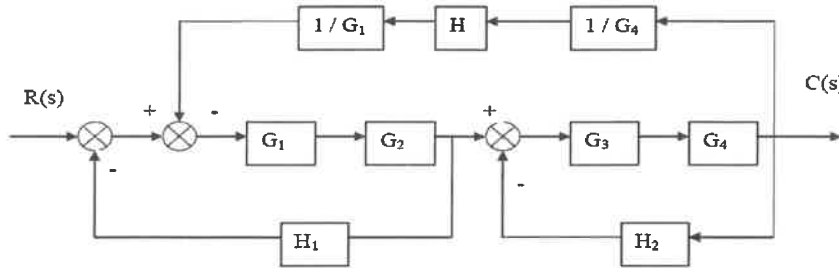
Section B (Essay Questions)

Answer all questions, each question carries equal marks.

(5 X 10M = 50M)

11. A) Using Block diagram reduction technique, obtain the transfer function for the system shown in the figure.

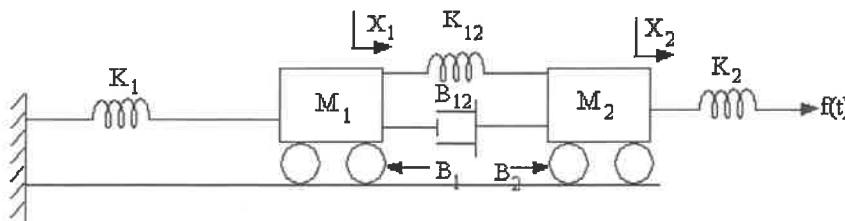
CO1 L3 10M



OR

- B) For the given mechanical system, write down
(i) Mathematical model
(ii) Obtain the transfer function $X_1(s)/F(s)$ and $X_2(s)/F(s)$

CO1 L3 10M



12. A) Examine response of under damped second order system for unit step input signal

CO2 L3 10M

OR

- B) Consider the unity feedback system where the forward transfer function is $G(S) = 25/s(s+5)$. Analyze delay time; rise time, peak time, peak overshoot and settling time.

CO2 L3 10M

13. A) A unity feedback control system has an open loop transfer function $G(S)=K / S (S+2) (S+4)$. Outline the Root locus. CO3 L3 10M
- OR**
- B) Sketch the bode plot for the given system whose $H(s) =1$, and Obtain gain cross over frequency $G(S)=20/S(1+3S)(1+4S)$ CO3 L3 10M
14. A) Draw the Nyquist plot for the system whose open loop transfer function is $G(S)=K / S (S+2) (S+10)$. Determine the range of K for which open loop system is stable CO4 L3 10M
- OR**
- B) Explain lag-compensator? CO4 L3 10M
15. A) Demonstrate the transfer function from state model. And the state space representation of a system is given below CO5 L3 10M
- $$\dot{X} \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} U \quad Y = [0 \ 1]$$
- OR**
- B) Explain solution of state equation. And obtain state transition matrix for the system CO5 L3 10M
- $$\dot{x} = \begin{bmatrix} -3 & 1 \\ 0 & -1 \end{bmatrix} x$$