

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

**B.Tech.(Electrical & Electronics Engineering/
Electrical Engineering/Electronics & Communication Engineering/
Electronics & Electrical Engineering) (Sem.-4)**

LINEAR CONTROL SYSTEMS

Subject Code : BTEE-402

M.Code : 57105

Date of Examination : 05-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

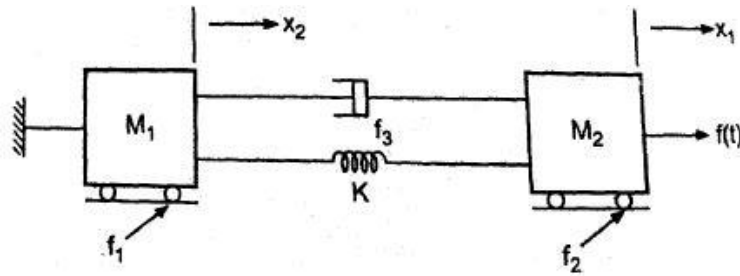
SECTION-A

1. Answer briefly :

- a. What do you mean by non-linear system? Explain.
- b. What is damping ratio? Discuss its importance.
- c. What are the advantages of closed loop system? Discuss.
- d. List the advantages of Laplace transform.
- e. Differentiate between absolute and relative stability.
- f. List the various characteristics of servo motors.
- g. Discuss the significance of time constant in first order system.
- h. Explain the need of Lag compensator in control system.
- i. List the advantages of frequency domain analysis.
- j. What do you mean by gain and phase crossover frequency? Explain their importance in control system.

SECTION-B

2. On the basis of force current analogy write the equations for the system given below :



3. Determine the stability of the system using Routh-Hurwitz criteria whose characteristics equation is given by $s^6 + 4s^5 + s^4 + 4s^3 + 8s^2 + 17s + 30 = 0$
4. For the root locus of a system having open loop transfer function

$$G(s)H(s) = \frac{K(s+3)(s+4)}{(s+1)(s+5)(s+6)}$$

Determine the Asymptotes to the loci, centroid and breakaway points.

5. Explain :
- Plant
 - System
 - Servomechanism
 - Regulating system
 - Disturbances
6. Explain (in detail) the principle and working of synchro transmitter and receiver used in control systems.

SECTION-C

7. Open-loop transfer function of a unity feedback system is $G(s) = \frac{4}{s(s+1)}$. Determine the nature response of the closed loop system for a unit step input. Also determine the rise time, peak time, peak overshoot and settling time.
8. Sketch the Bode plot for the transfer function given below and determine the system gain crossover frequency, phase crossover frequency, gain margin and phase margin.

$$G(s)H(s) = \frac{80(s+5)}{(s+50)s^2}$$

9. Design a lead compensator for a unity feedback system with the open loop transfer function $G_f(s) = \frac{K}{s(s+1)}$

For the specifications of $K_V = 10S^{-1}$ and $\phi = 35^\circ$.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.