



End Term Examination (December 2019)

School: School of Engineering

Course: Control Systems

Semester: V

Program: B.Tech-Mechatronics

Course Code: MTE 304

Duration (mins): 90

Max Marks: 40

Answer the questions [Any FOUR]

Q1. Write Short notes (ANY TWO)

[10]

(Each question carries 5 marks)

- Gain Margin and Phase Margin
- Plant and controller
- Continuous Time and Discrete time Systems
- Standard Test Signals

Q2. Explain the working of the following (Any TWO)

[10]

(Each question carries 5 marks)

- Obtain the differential equations describing the complete dynamics of the mechanical system shown in following figure 1 and draw the f-v and f-i analogies.

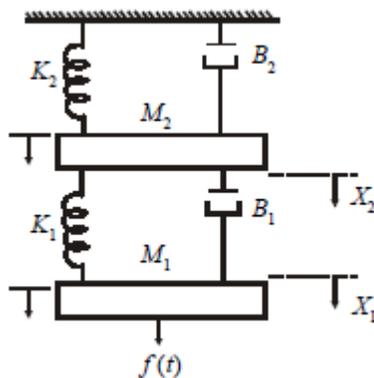


Figure (1)

- b) Obtain the differential equations describing the complete dynamics of the mechanical system shown in following figures 2 and draw the f-v and f-l analogies. Damper is D.

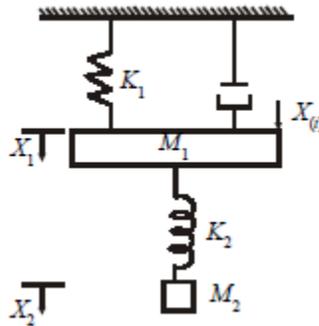


Figure (2)

- c) Find the transfer function of the following system. Gains are G_1, G_2, G_3 . Feedbacks are H_1 and H_2 .

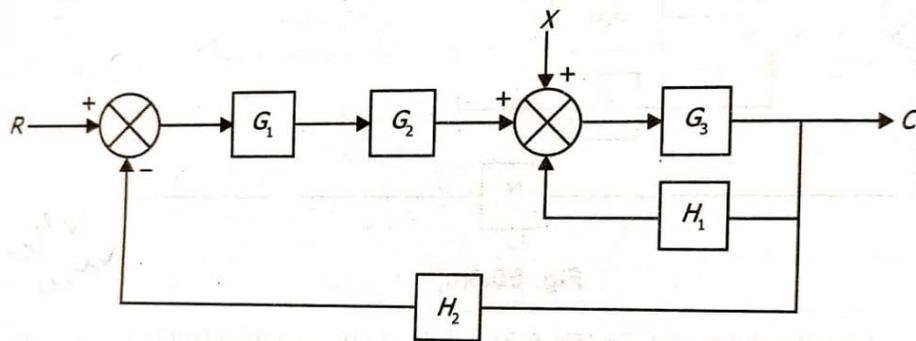


Figure (3)

Q3. Answer the following questions (Any TWO)

[10]

(Each question carries 5 marks)

- a) Find the transfer function of the following system using signal flow graph method.

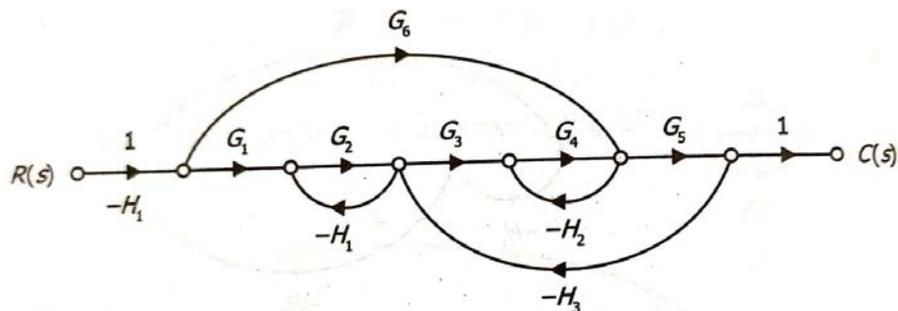


Figure (4)

- b) Using Routh-Hurwitz Criterion explain the effect feedback on i. overall gain of the system and ii. On stability of the system.
- c) For a system having characteristics equation $2s^4 + 4s^2 + 1 = 0$, find the following

- i. The number of roots in the left half of s-plane
- ii. The number of roots in the right half of s –plane
- iii. The number of roots on the imaginary axis.

Q4. Sketch the root locus of the following system with proper scale and measurement for the System-

$$G(s)H(s) = \frac{K}{s(s+1+j)(s+1-j)} \quad (K>0) \quad \text{[10]}$$

Q5. What is the importance of frequency domain analysis? A unity feedback system has $G(s) = \frac{40}{s(s+2)(s+5)}$. Draw the Bode Plot with proper Scale and Pencil. Find Gain margin and Phase Margin

[10]

Note: Along with this paper we need semi log paper and normal log paper.
