Department of Electrical Engineering

National Institute Of Technology Srinagar

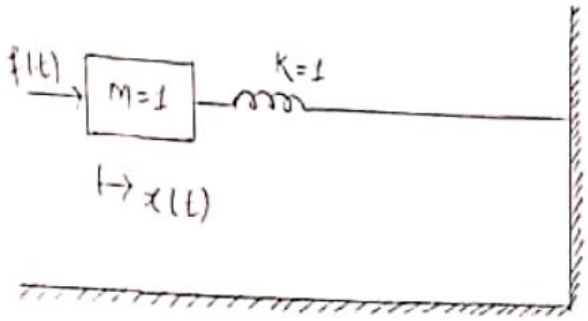
ajor Examination
m: B.Tech 4th (I.T)
b: Control Systems
te: Attempt any four questions.

Max Marks: 60
Time: 2 hours
Date: 13/07/2017

a) List the different types of control actions used in automatic control systems. Also explain (with reasons) the most commonly used controller. (05)

b) Explain Force Voltage analogy. Also derive the electrical analogous of various translational elements. (05)

c) Find x(t) if an impulsive force f(t) is applied on the following system. Given that M=K=1. (05)



Q2

a) What do you mean by Steady state and Transient response? Calculate the steady state error for a type 2 system subjected to a parabolic input. (05)

b) Sketch the Root Locus for the following system. (10)

$$G(s) = \frac{K}{s(s+2)(s+4)}$$

Determine the point of intersection of the root locus with the imaginary axis & discuss its stability.

Q3

a) Draw the Polar plot for the following system. (10)

$$G(s) = \frac{100}{s(s-2)(s+4)(s+8)}$$

Also find w_{pc} and Gain Margin(dB).

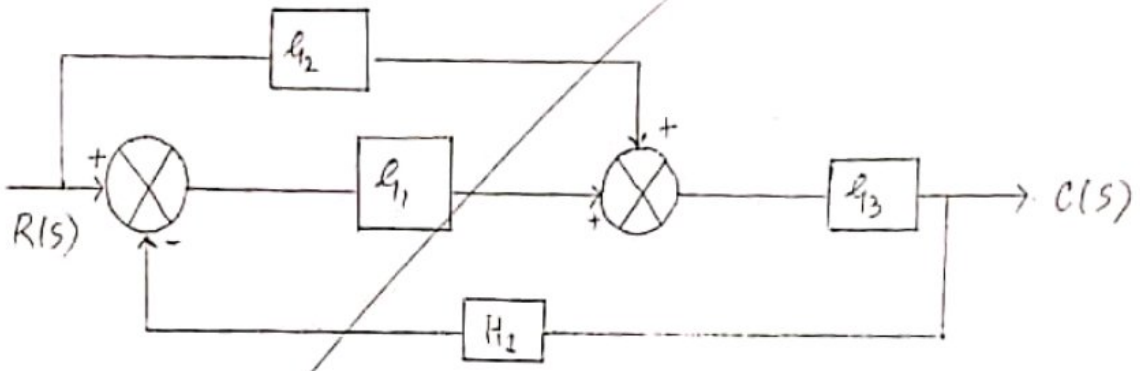
b) Use Routh Hurwitz criteria & calculate the number of roots of the system that lie in the right half of s plane. (05)

$$\frac{C(s)}{R(s)} = \frac{s+5}{2s^4+s^3+3s^2+5s+10}$$

Q4

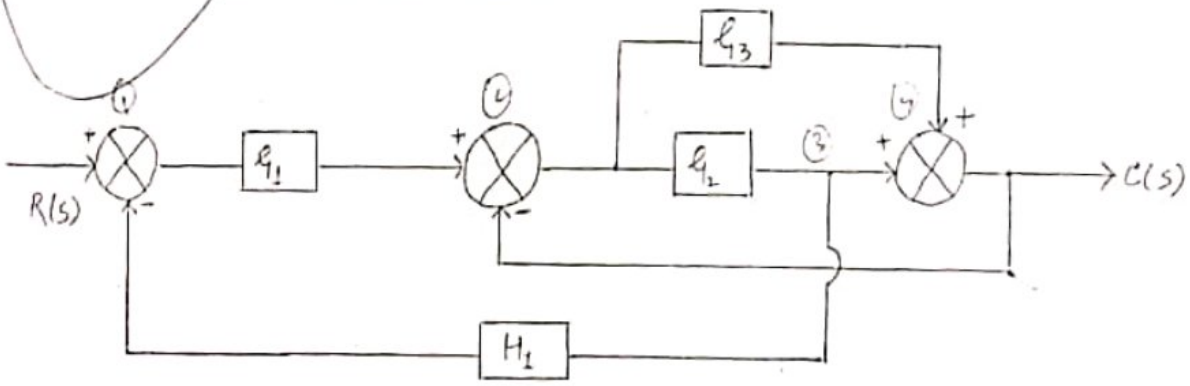
a) Find the state equations for the following circuit. Choose the state variables as current through the inductor & voltage across the capacitor.

b) Find the transfer function $\frac{C(s)}{R(s)}$ from the following block diagram using block diagram reduction techniques. (7.5)



Q5

a) Draw the corresponding signal flow graph for the block diagram shown below and evaluate it's closed loop transfer function using Mason's gain formula. (7.5)



b) Determine the damping ratio, undamped natural frequency of oscillatory roots & Peak Overshoot for a unit step input given that (7.5)

$$\frac{C(s)}{E(s)} = \frac{1}{(1+0.5s)(1+0.2s)}$$

The system is unity feedback type.