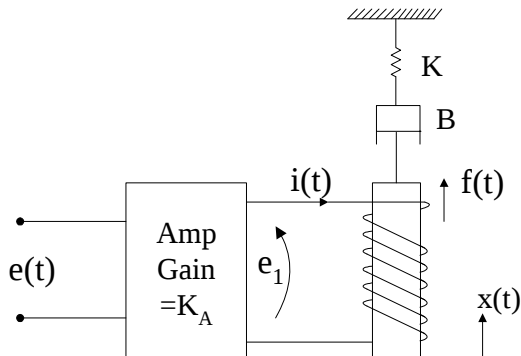


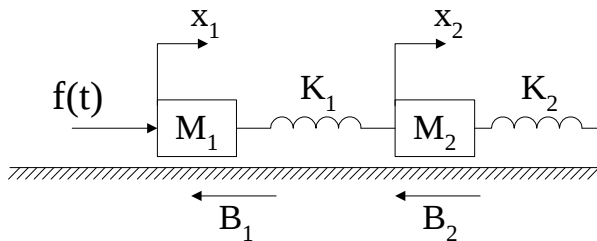


Prob. 1

- A. Find the transfer function $X(s)/E(s)$ for the circuit below

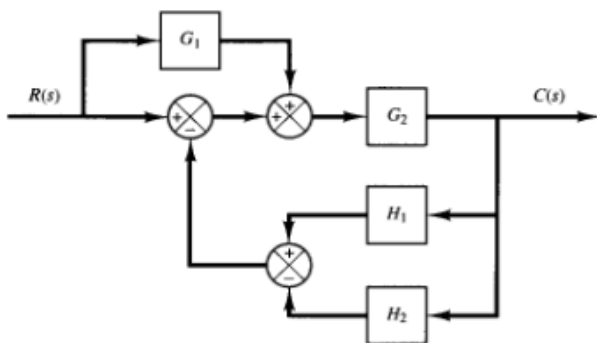


- B. Find the transfer function $X_1(s)/F(s)$

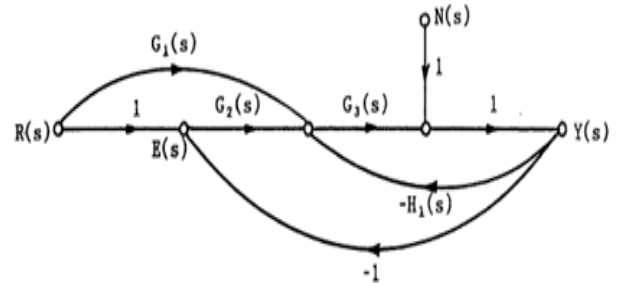


Prob. 2

- A. Reduce the block diagram shown below to find the transfer function $C(s)/R(s)$



- B. Find the Transfer function $\frac{Y(s)}{R(s)} \Big|_{N(s)=0}$



Prob. 3

- A. Sketch the response of the system $y(t)$ that have transfer function $T(s) = \frac{4s - 20}{s^2 + 4s + 29}$, $r(t) = 10\delta(t)$, $y(0) = 0$, $y'(0) = 6$

- B. Check the stability of the system that have the characteristic equation

$$s^5 + 4s^4 + 8s^3 + 8s^2 + 7s + 4$$

- C. Find the range of K for the system that have $c/cs = s^3 + 3ks^2 + (k+2)s + 4$ to be stable

Prob. 4

- A. A unity feedback control system is characterized by the open loop transfer function

$$G(s) = \frac{k(s+14)}{s(s+3)(s+7)}$$

- What is the value of k and input shape which give a steady state error SSE = 0.5?
- What is the system type?
- What is the steady state error for the step input?

- B. Sketch the root locus of open loop transfer function

$$G(s)H(s) = \frac{(s+1)}{s(s-1)(s^2+4s+16)}$$

Best Wishes
Dr. Mostafa A. El-Hosseini