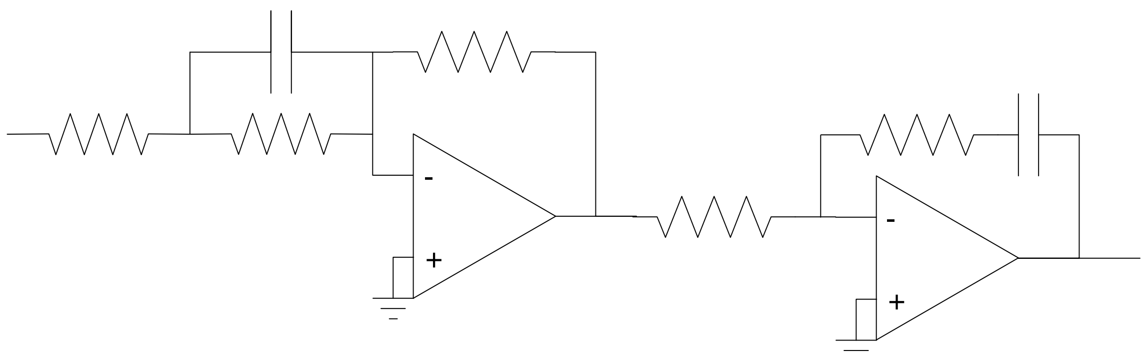
ECE 461 Handout #26

Meeting Design Specs

Find R and C to implement K(s)

$$K(s) = \left(\frac{20(s+2)(s+5)}{s(s+10)} \right)$$



Solution:

There are multiple solutions. One is to rewrite K(s) as a lead * PID

$$K(s) = \left(\frac{20(s+2)(s+5)}{s(s+10)}\right)$$

$$K(s) = \left(\frac{5(s+2)}{(s+10)}\right)\left(\frac{4(s+5)}{s}\right)$$

Lead (blue): $\left(\frac{5(s+2)}{(s+10)}\right)$

Let R3 = 1M

As s goes to infinity, the capacitor is a short

$$\left(\frac{5(s+2)}{(s+10)}\right)_{s\to\infty} = 5$$

R1 = 200k (R3/5)

As s goes to zero, the gain is 1.00

R1 + R2 = R3

or, the pole is 5x the zero

R2 + R1 = 5*R1

The zero is at s = -2

$$\left(\frac{1}{R_2 C}\right) = 2$$

PI: $\left(\frac{4(s+5)}{s}\right)$

Let R2 = 1M

As s goes to infinity, the C is a short

$$\left(\frac{4(s+5)}{s}\right)_{s\to\infty} = 4$$

R2 = 4*R1

R1 = 250k

The zero is at -5

$$\left(\frac{1}{R_2 C}\right) = 5$$