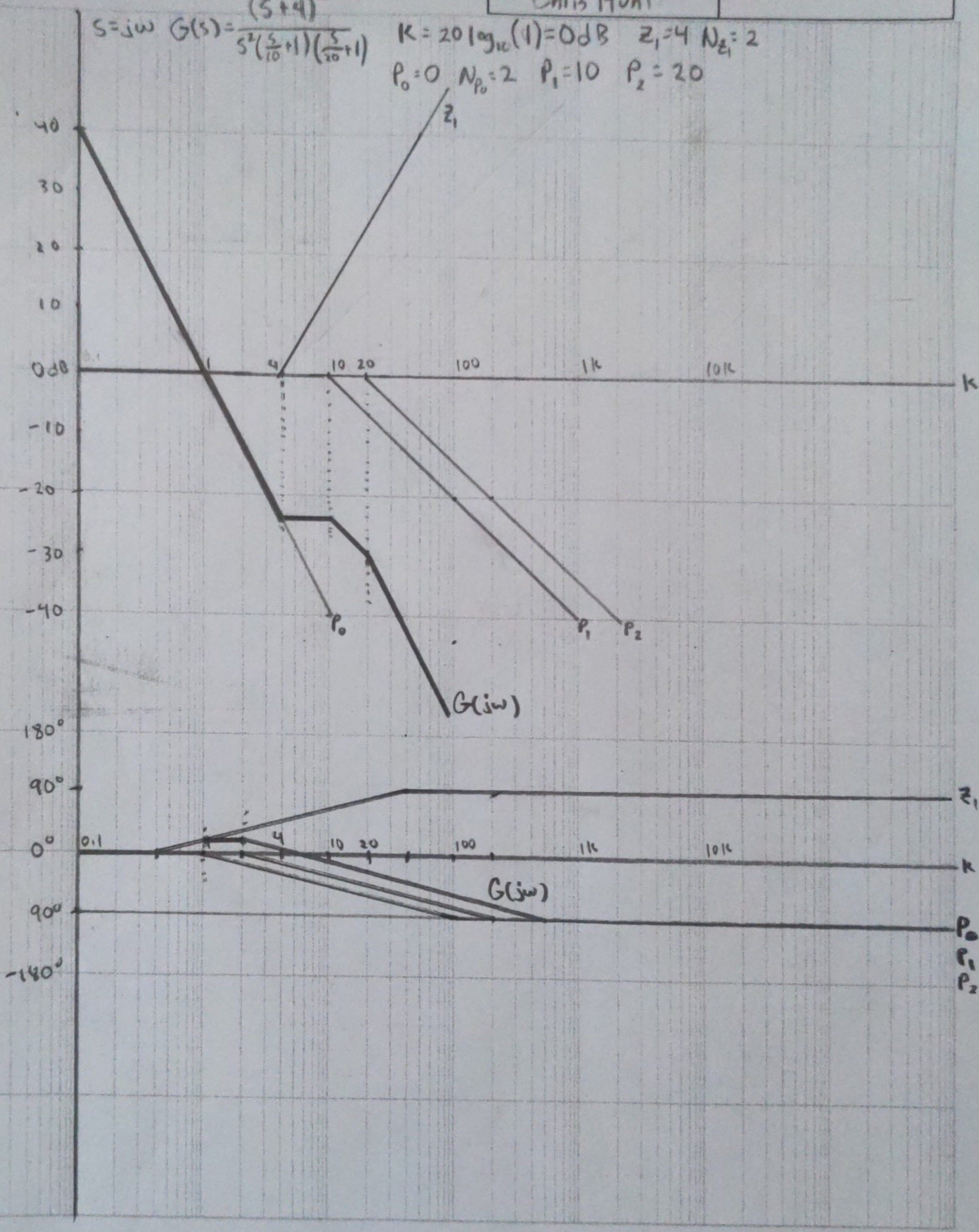
LBCC - ENGR

TITLE	HW18 18.1	
NAME	Chris Hunt	DATE

$S=j\omega \quad G(s)=\frac{(s+4)^2}{s^2(\frac{s}{10}+1)(\frac{s}{20}+1)}$

$K=20\log_{10}(1)=0dB \quad Z_1=4 \quad N_{Z_1}=2$

$P_0=0 \quad N_{P_0}=2 \quad P_1=10 \quad P_2=20$



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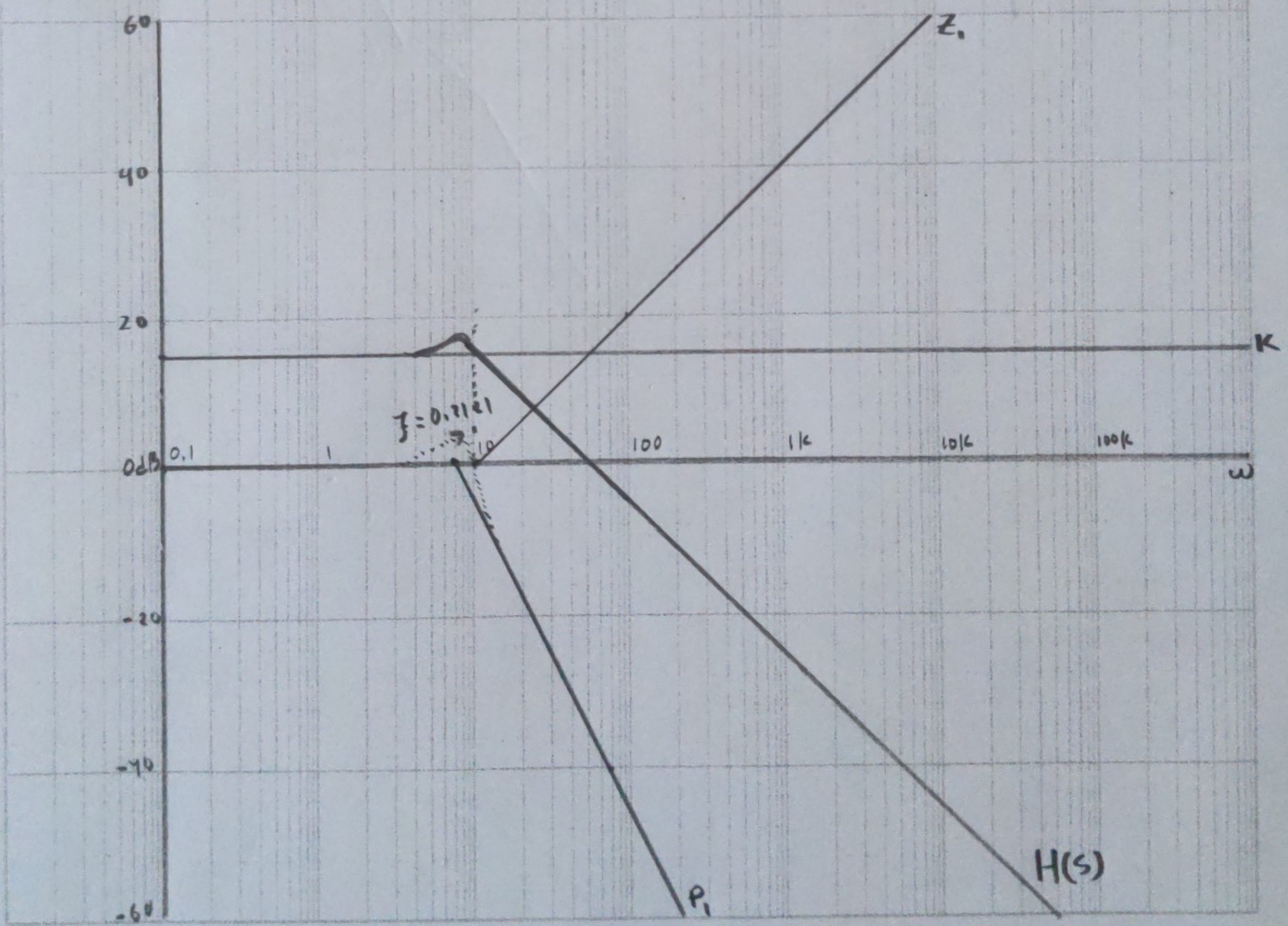
$$H(s) = \frac{30(s+10)}{s^2+3s+50} \qquad s^2+3s+50 \qquad \omega_n^2 = 50 \qquad 2\alpha s = 3s \qquad 2\omega_n = \alpha$$

$$s^2+2\alpha s+\omega_n^2 \qquad \omega_n = \sqrt{50} \qquad \alpha = \frac{3}{2} \qquad \zeta = \frac{3\sqrt{50}}{100} = 0.2121$$

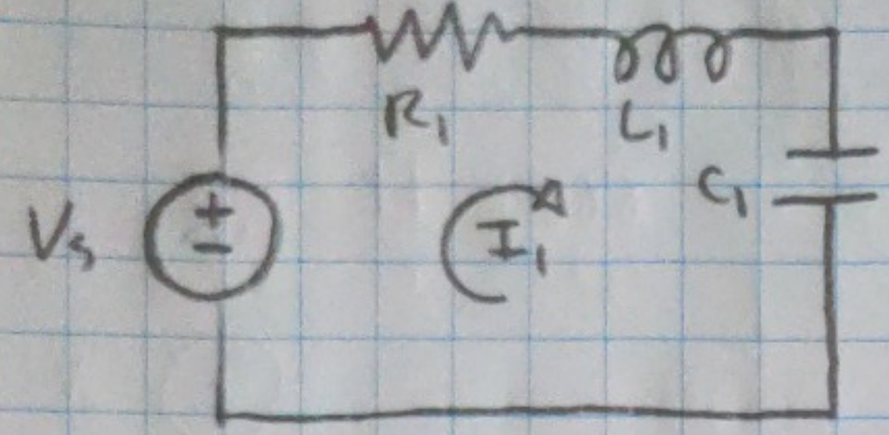
$$H(s) = \frac{30(s+10)}{s^2+3s+50} \rightarrow \frac{30\cdot 10\left(\frac{s}{10}+1\right)}{s^2+2\zeta\omega_n s+\omega_n^2}\left(\frac{\omega_n^2}{\omega_n^2}\right) \rightarrow \frac{6\left(\frac{s}{10}+1\right)}{s^2+\frac{2\zeta s}{\omega_n}+1}$$

$$K = 20\log_{10}(6) = 15.6\,dB \qquad Z_1 = 10 \qquad P_1 = \sqrt{50} = \sim 7$$



Chris Hunt HW18 ENGR202

18.3) Find L_1, Q, and B of the RLC circuit



$\omega_o = 6280$ rad/s

$R_1 = 2.9\ \Omega$

$C_1 = 47\mu F$

$L_1 = ?$

Find L_1) $\omega_o = \frac{1}{\sqrt{LC}}$ rad/s $\rightarrow L = \frac{1}{C\omega_o^2}$

$$L_1 = \frac{1}{47\mu F \cdot 6280^2 \frac{rad}{s}} = \boxed{0.54\ mH}$$

Find Q) $Q = \frac{\omega_o L}{R} = \frac{1}{\omega_o RC}$

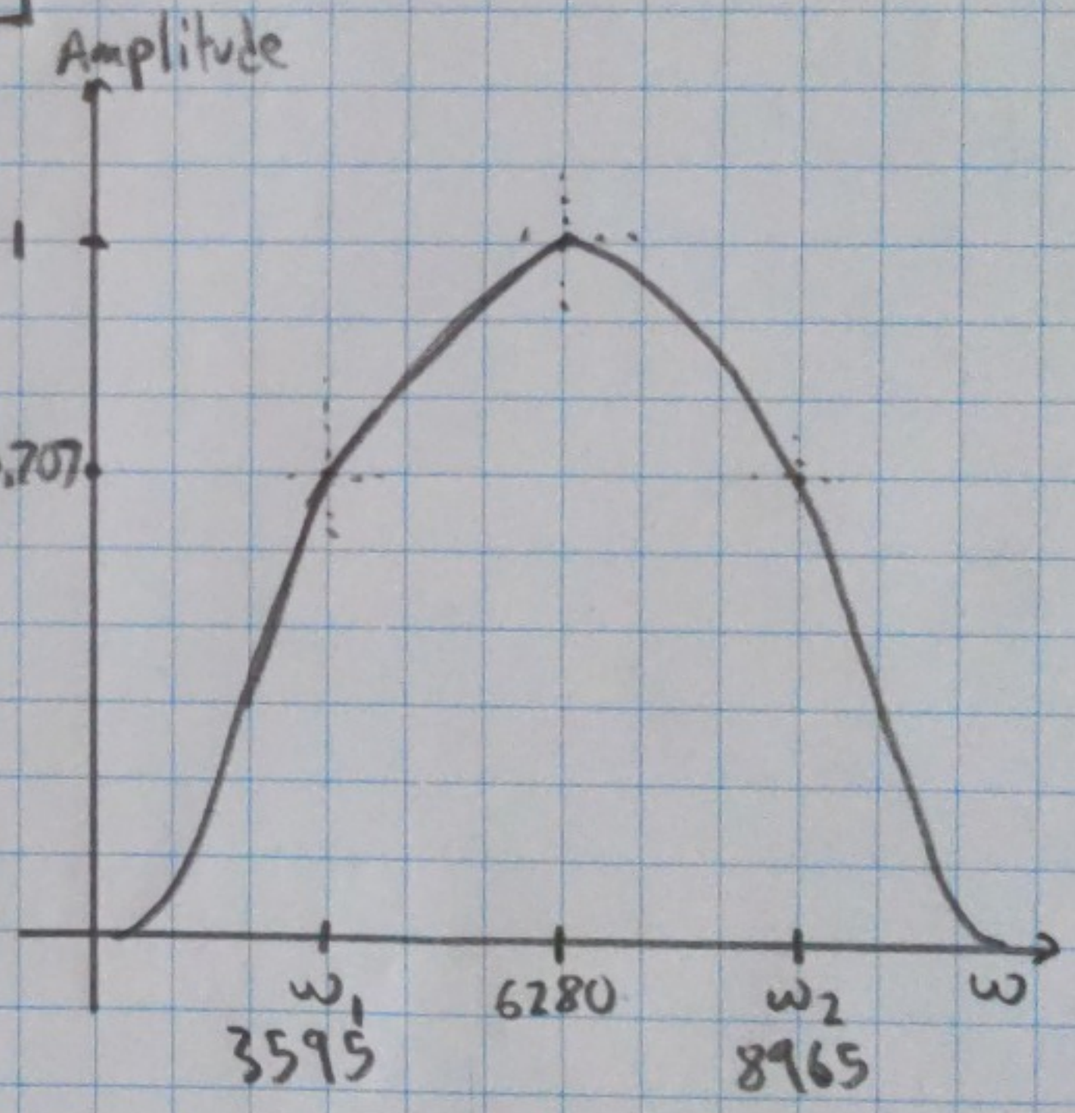
$$Q = \frac{6280\ \frac{rad}{s} \cdot 0.54mH}{2.9\ \Omega} = 1.17$$

Find B) $B = \frac{R}{L} = \frac{\omega_o}{Q}$

$$B = \frac{2.9\ \Omega}{0.54mH} = 5370\ rad/s$$

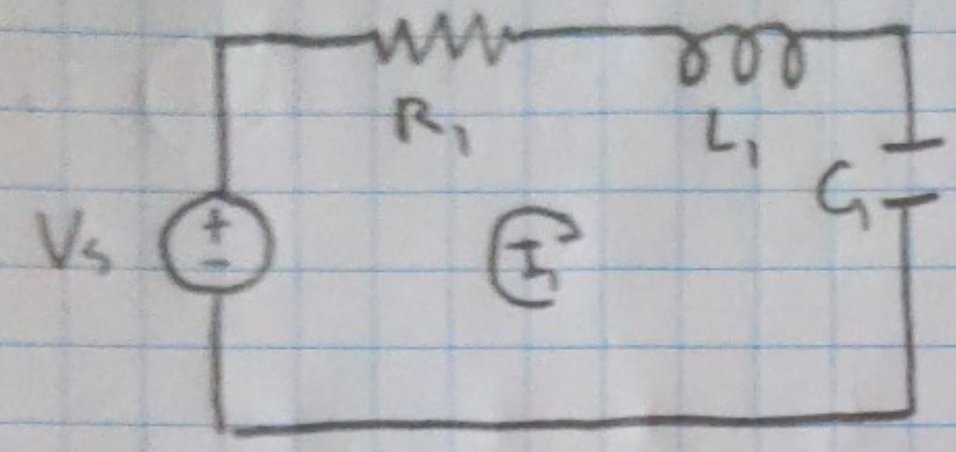
$\omega_1 = 3595$ rad/s

$\omega_2 = 8965$ rad/s



Chris Hunt HW18 ENGR 202

18.4) Find the values of L_1 and C_1 of a RLC circuit such that the circuit will be resonant at 100kHz and have a bandwidth of 1kHz



$\omega_0 = 100\,kHz \cdot 2\pi$ $R_1 = 10\,\Omega$

$B = 1\,kHz$ $C_1 = 1.59\,nF$

$L_1 = 1.59\,mH$

Find L_1) $B = \frac{R}{L} \rightarrow L = \frac{R}{B}$

$$L_1 = \frac{10\,\Omega}{1kHz \cdot 2\pi} = \boxed{1.59\,mH}$$

Find C_1) $\omega_0 = \frac{1}{\sqrt{LC}} \rightarrow C = \frac{1}{L\omega_0^2}$

$$C_1 = \frac{1}{1.59\,mH \cdot (100kHz \cdot 2\pi)^2} = \boxed{1.59\,nF}$$