Band pass filter

3. For the filter in Fig. 1 use modal analysis to show

\[ H(s) = \frac{(s \omega_0 A_0 / Q)}{(s^2 + s \frac{\omega_0}{Q} + \omega_0^2)} \]

where \( R_1 C = -\frac{Q}{w_0 A_0} \), \( R_3 C = 2 \frac{Q}{\omega_0} \)

\[ R' R_3 C^2 = \frac{1}{\omega_0^2} , \quad Q = \frac{f_0}{f_0 - f_L} = \frac{f_0}{BW} \]

\[ 2\pi f_0 = \omega_0 , \quad R' = R_1, \quad I_2 = \frac{R_1 R_2}{R_1 + R_2} \quad \text{and} \quad A_0 < 0 \]

Fig. 1:

[Diagram of the band pass filter]

Calculate values for \( f_0 = 2 \text{kHz}, Q = 10, A_0 = -10 \) and \( C = 0.001 \mu F \). Compare with filter "value."