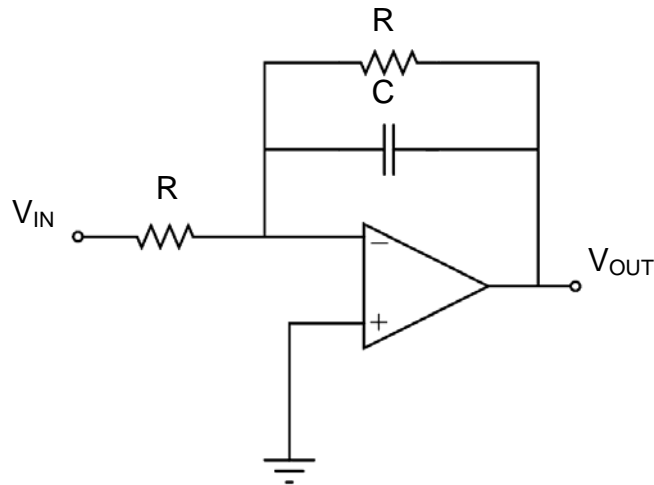


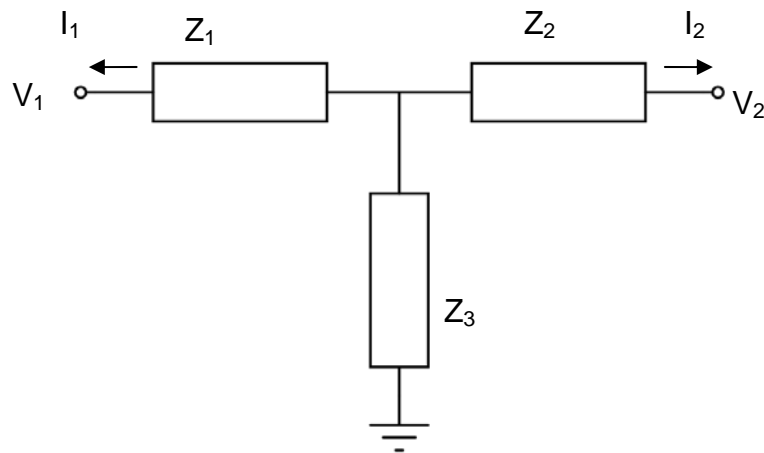
HOMEWORK ASSIGNMENT # 2

Prob. 1. One problem dealing with very low frequency filters is the large associated time constants i.e. $\tau=RC$.

- a) Design a first order low pass filter with a cut-off frequency of 1.5915 Hz using $C=0.1\text{nF}$ and the circuit shown below with $GB=0.9\text{ MHz}$, $A_o = 2 \times 10^5\text{ V/V}$.



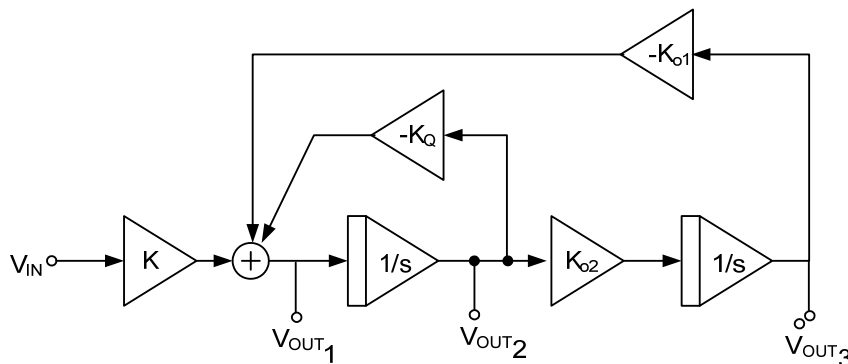
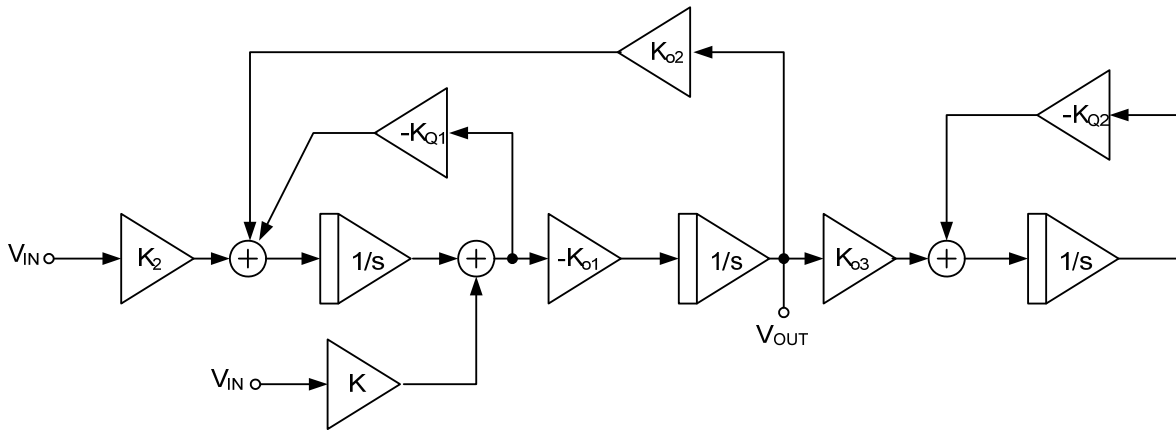
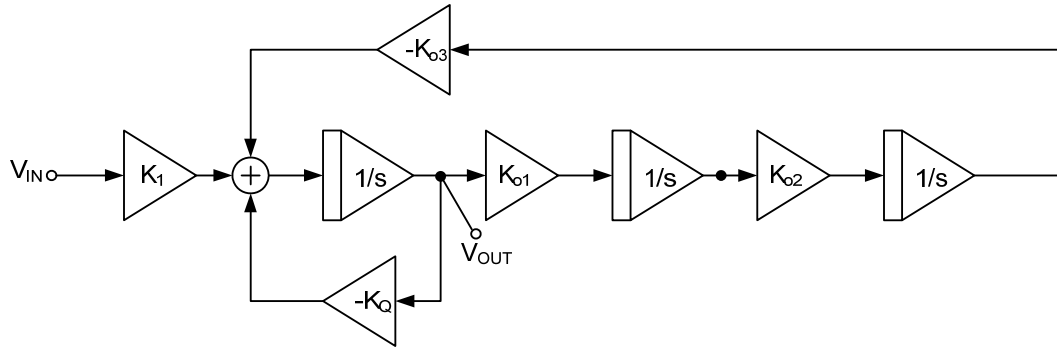
- b) Determine the equivalent short circuit impedance $Z_{sc} = \frac{V_1}{I_2} \Big|_{V_2=0} = \frac{V_2}{I_1} \Big|_{V_1=0}$



Use this T network to replace resistors R in prob. 1 a) and discuss their advantages and disadvantages. Provide the design component values and compare simulations comparing results in 1 a) and 1 b).

For 622 students only.- Determine the output noise of the above LP filter with and without the T network, also include simulations to verify your derivations.

2. Obtain the transfer functions on the block diagrams shown below:



3. Design a second-order active RC bandpass filter for $\omega_0 = 2\pi \times 5 \times 10^6$ r/s and $Q = 14$. You can pick the filter topology but you also need to determine and justify the minimum value of the GBs of the Op Amp. Discuss your Biquad topology selection. Find a commercial Op Amp capable of meeting the GB specification, provide details.