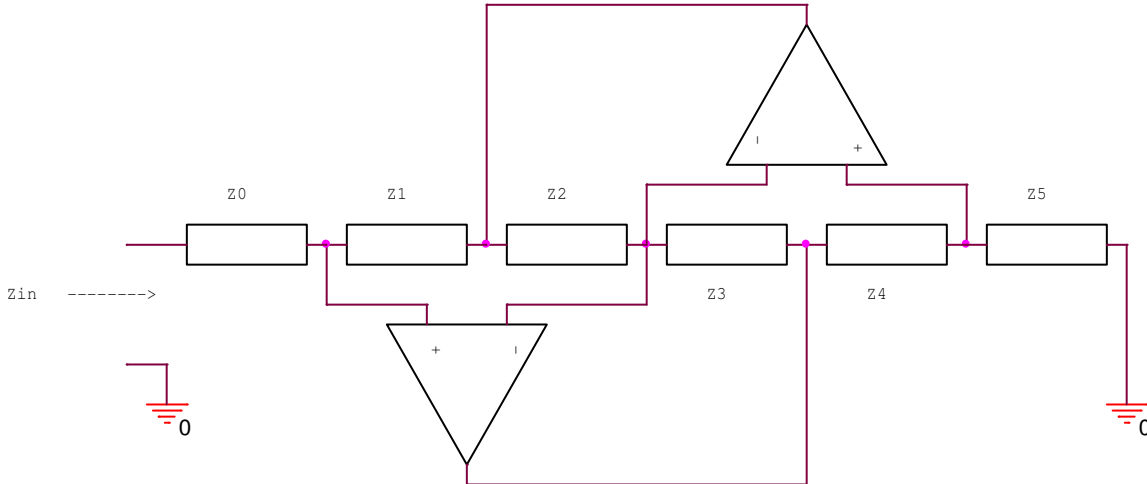


ENEE 417 Experiments Week 7

Week starting 03/09/09; active circuits (C=>L, R=>-R)

- The following circuit is called a GIC (=General Impedance Converter). When the op-amps are ideal, it is known that (where all Z's are impedances)

$$Z_{in}(s) = Z_0(s) + (Z_1(s) \cdot Z_3(s) \cdot Z_5(s)) / (Z_2(s) \cdot Z_4(s))$$



- Verify the above formula for  $Z_{in}(s)$
  - Choose  $Z_0=0$ ,  $Z_1(s)=Z_2(s)=Z_3(s)=Z_5(s)=R$ ,  $Z_4(s)=1/(Cs)$ . In this case loading by a capacitor makes  $Z_{in}(s)$  look like an inductor. Construct the circuit using the 1458 op-amps and various values of R and C (start with  $R=2K\Omega$  and  $C=1\mu F$ ).
  - Devise means to test if an inductor is really seen, one means being via a time constant evaluation and another via an LC resonance.
  - Repeat when  $Z_0=0$ ,  $Z_1=Z_3=Z_5=R$ ,  $Z_2(s)=Z_4(s)=1/(Cs)$ .
- In the above circuit add  $Z_6$  on the top op-amp as feedback from the output to the + input. Choose  $Z_0=0$ ,  $Z_1=Z_2=Z_3=Z_4=R$ ,  $Z_6=R/2$ .  
It is surmised that  $Z_{in}(s) = -Z_5(s)$ .  
Check this analytically and devise an experiment to check your calculations.