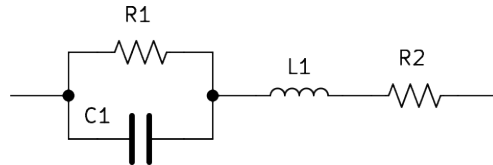


Homework 2. Show all work.

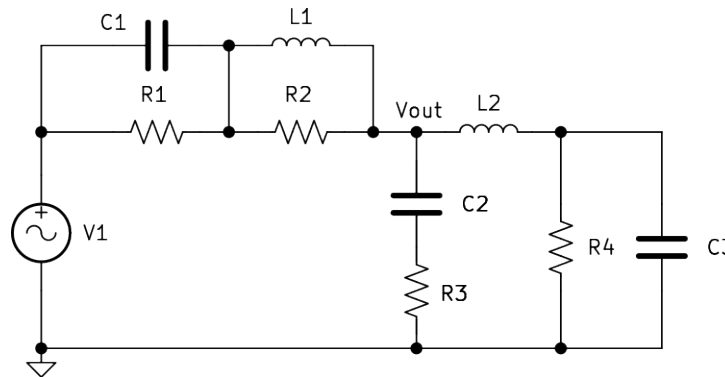
Due June 3<sup>rd</sup>

Problems:

1. Given the voltage **phasor**  $V = 1.62 - j0.95V$ , what is the voltage's magnitude and phase?
2. Calculate the frequency-dependent equivalent impedance of the component network shown below. Simplify.



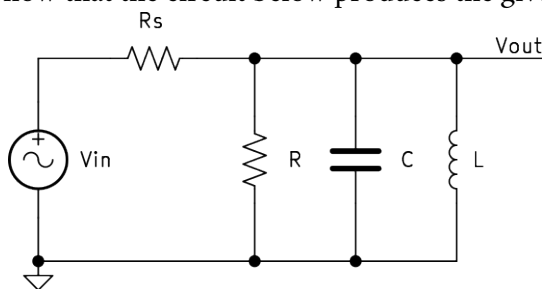
3. Find the approximate transfer functions at low and high frequencies ( $f \rightarrow 0$  and  $f \rightarrow \infty$ , respectively) for the complicated circuit below by simplifying circuit components at the frequency extremes. Draw the approximated low/high frequency circuits first, then calculate the transfer functions.



4. Given the transfer function of an RLC circuit below, calculate the transfer function's approximate magnitude and phase for low- and high-frequency operation.

$$H(j\omega) = \frac{1 + j\omega RC}{(1 - \omega^2 LC) + j\omega RC}$$

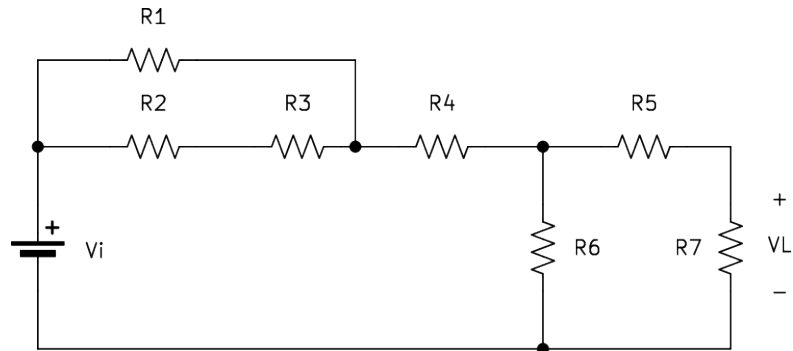
5. Using the transfer function above and the values  $R = 10 \Omega$ ,  $L = 10 \text{ mH}$ , and  $C = 1 \mu\text{F}$ , calculate the transfer function's magnitude and phase at 5 kHz.
6. Show that the circuit below produces the given transfer function.



$$H(j\omega) = \frac{j\omega RL}{R_s R + j\omega (R_s + R) L - \omega^2 R_s R L C}$$

7. Using low- and high-frequency approximations for either the circuit or the transfer function, predict what type of filter the above circuit will resemble. Justify your answer.

8. Find the equivalent Thevenin Voltage and Resistance for the below circuit assuming  $R_7$  is the load resistor. Use the values  $V_i = 5\text{ V}$ ,  $R_1 = R_3 = R_5 = 1\text{ k}\Omega$  and  $R_2 = R_4 = R_6 = 3\text{ k}\Omega$ . Using your calculated Thevenin values, find  $V_L$  if  $R_7 = 500\ \Omega$ .



9. For the transformer circuit below, find the voltage across,  $V_p$ , and current through the primary coil of the transformer and the load voltage,  $V_L$ , if  $V_i = 1\text{ V}$ ,  $R_1 = 10\ \Omega$ , and  $R_2 = 220\text{ k}\Omega$ . Assume the transformer is operating ideally.

