EECS 215: Introduction to Electronic Circuits WN 2010
Problem Set 10

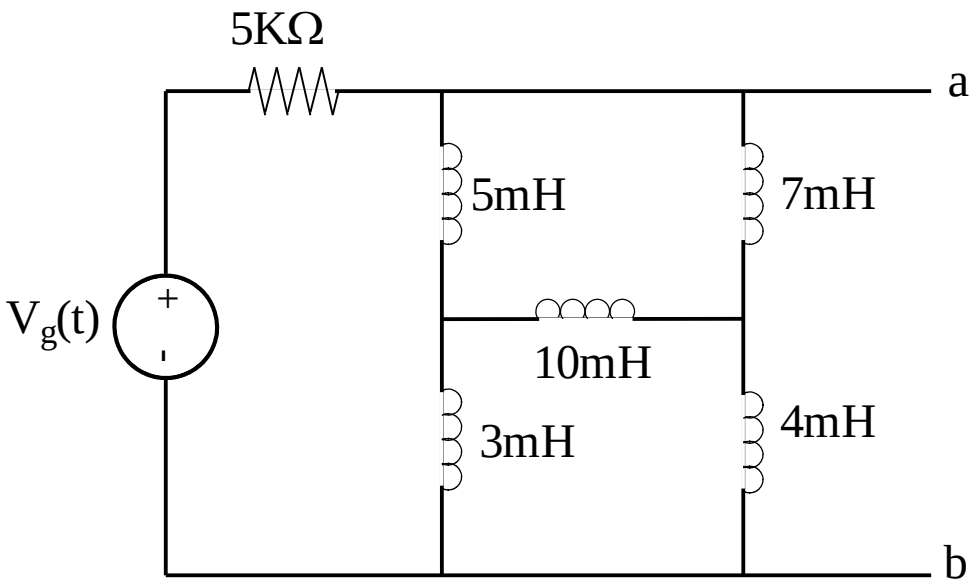
Issued: 4/2/10

Due: 4/9/10, **9:30 AM**

U&M refers to a problem from Ulaby and Maharbiz.

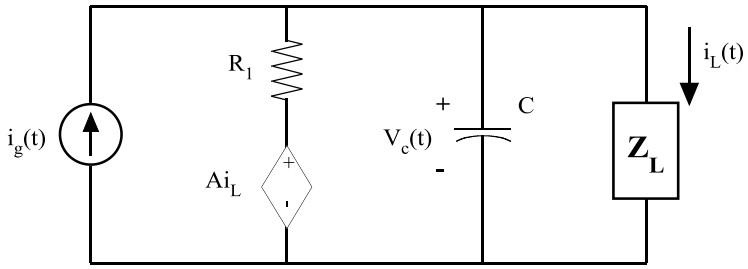
Problems:

1. AC Steady State Analysis Problem. For the circuit shown below, if $V_g(t) = 10\cos(\omega t)V$, find the simplest Norton equivalent for this circuit.



2. U&M 8.4
3. U&M 8.16
4. U&M 8.27
5. U&M 9.14 a, e only. For both parts, list the pole and zero frequencies. You can use Matlab or other tools to actually do the plots; however, on the amplitude part of the plot, show the hand-constructed estimate (straight line asymptotic plots).
6. U&M 9.18
7. Comprehensive Problem
   For the circuit shown below:
   a. If $R_1 = 1000\Omega \quad A = 996\Omega \quad C = 1\mu F \quad i_g(t) = 1mA\cos\left(\left(2000s^{-1}\right)t\right)u(t)$, find the load impedance Z_L such that the AC steady state power <u>dissipated</u> by the load is maximized. The load should be either a resistor and series inductor or a resistor and series capacitor. Specify which one you need and what the values of the resistor and reactive element (F's or H's).

b. Find the function describing $i_L(t)$ including the transient region start-up and plot $i_L(t)$ from t=0 until AC steady state behavior is approximately established.

c. Keeping the component values you found in (a), now assume $i_g(t) = |i_g| \cos(\omega t)$ and find the transfer function $H(\omega) = \frac{i_L}{i_g}$, the poles and zeroes of this transfer function, and do a Bode plot (using Matlab or other tools) over an appropriate frequency range.

d. Use Multisim to verify your results from (c).