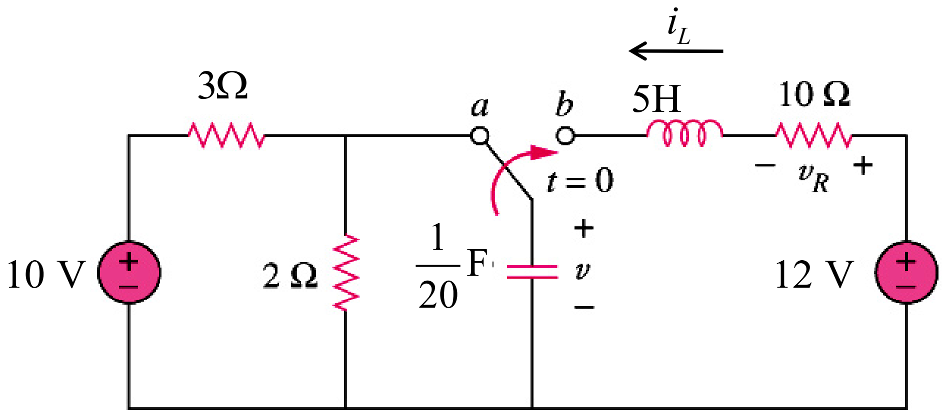
UMBC CMPE306 Fall 2019
Homework L02 Assigned October 30,2019 Due November 6, 2019

These problems are typical of, but harder than, exam problems.

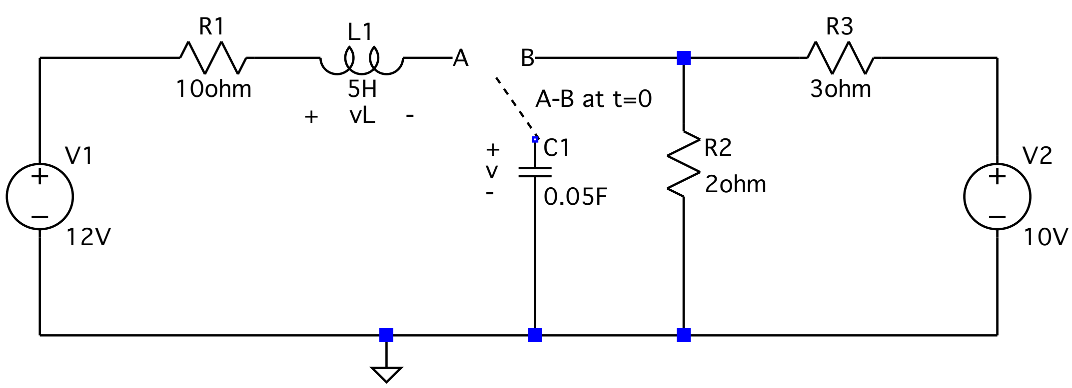
1: Find $v(t), t > 0$



2:

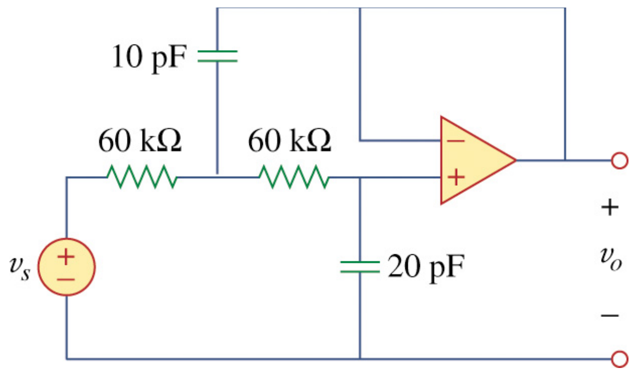
In the previous circuit, find $i_L(t), t > 0$.

3: The switch (dotted line) moves **from A to B** at $t = 0$. Determine $v(t),\ t > 0$

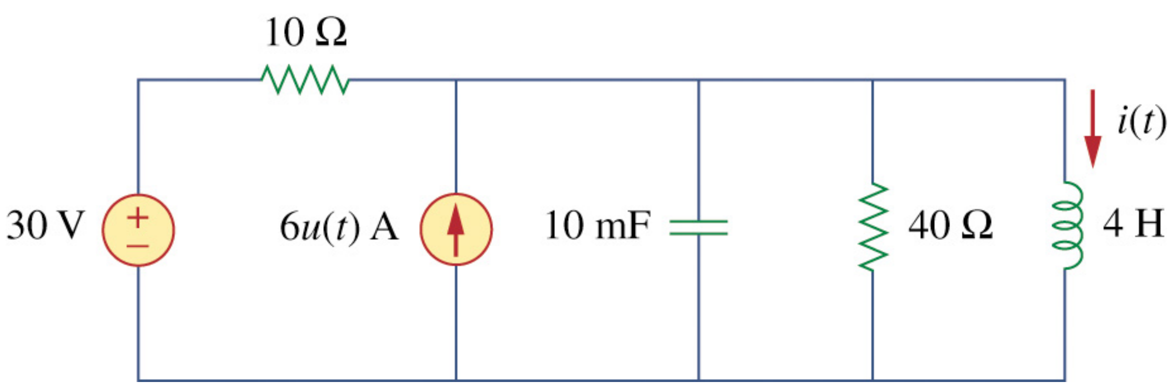


4: **One of my favorite problems. Work carefully and it works! Also, it gives practice constructing the differential equations. (This one will NOT be on the exam, but work on it anyway!)**

Obtain the differential equation for the op-amp circuit shown below. This is a second-order op-amp circuit. *Hint: Solve the problem in terms of generic variables* R_1, R_2, C_1, C_2*, then substitute the given values. Remember the differential equation for the capacitors! Remember your op-amp rules!*



5: Find $i(t)$, $t > 0$. The expression $u(t)$ on the 6A source means that the source is OFF for $t < 0$ and turns ON with a value of 6A at $t = 0$. *Hint: Remember what it means to turn off a current source.*

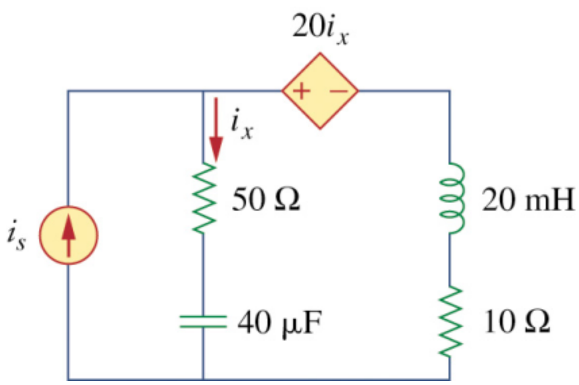


6:

For the circuit shown below, assume that $i_s(t) = 6\cos 10^3 t$ A.

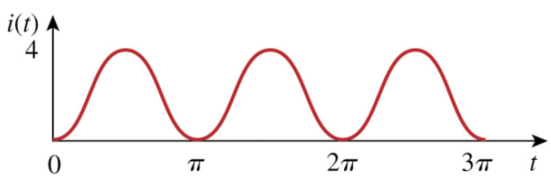
I want you to do this problem two ways. First, replace the capacitor with a 40Ω resistor, and the inductor with a 20Ω resistor. Compute the current i_x and the voltage generated by dependent source. This should be pretty easy, as we covered it all before the first exam. *Hint: What is the effect of a resistor on a sinusoidal current or voltage?*

Second, using the original circuit, use the angular frequency of the current source to convert $40\mu\text{F}$ and 20mH to their complex impedances. (*Hint: both will be strictly imaginary, with no real part. We call the imaginary part of the impedance the reactance.*) Treat these reactances in the same way as resistances (just imaginary) and repeat the problem. The process is the same, but the computations now require complex arithmetic.



7:

Write the rectangular (real plus imaginary), phasor, exponential and time domain forms of the following waveform. You can assume that the waveform is sinusoidal in form. There are multiple possible answers, you only need provide one.



8:

Find the voltage across the capacitor. The voltages are sinusoidal, because they are written as phasors. We always take a 0° phase to be a cosine. The frequency doesn't matter, because the $\mathbf{Z}_L = j\omega L$ and $\mathbf{Z}_C = \dfrac{1}{j\omega C}$ conversions have already been done.