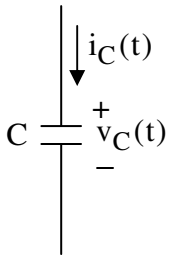
UNIVERSITY OF UTAH
ELECTRICAL & COMPUTER ENGINEERING DEPARTMENT

ECE 1270 **HOMEWORK #5** Summer 2009

1. In a-c, the voltage $v_C(t)$ across a 10nF capacitor is listed. Find the current, $i_C(t)$, flowing in the capacitor in each case as a function of time:

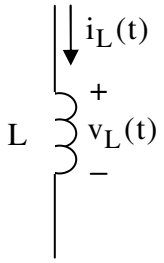


(a) $v_C(t) = 6\text{V}$

(b) $v_C(t) = 42t\ \text{kV/sec}$

(c) $v_C(t) = 1 - e^{-t/2\mu\text{sec}}\text{V}$

2. In a-c, the current $i_L(t)$ flowing into a $6\mu\text{H}$ inductor is listed. Find the voltage, $v_L(t)$, across the inductor in each case as a function of time.



(a) $i_L(t) = 9\text{mA}$

(b) $i_L(t) = 15t\mu\text{A/sec}$

(c) $i_L(t) = 8\cos(2\pi \times 5 \times t)\text{A}$

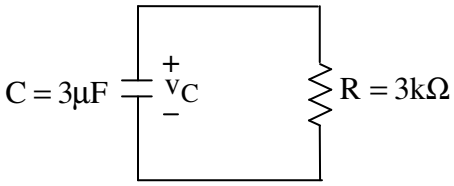
3. The following equation describes the voltage, v_C, across a capacitor as a function of time. Find the time, t, at which v_C is equal to -6V. Plot $v_C(t)$. You may use Matlab.

$$v_C(t) = -12 + 12\left(1 - e^{-t/10\mu\text{s}}\right)\text{V}$$

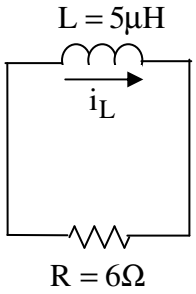
4. The following equation describes the voltage, v_L, across an inductor as a function of time. Find an expression for the current, $i_L(t)$, through the inductor as a function of time. Assume that $i_L(t=0)=0\text{A}$. Plot $i_L(t)$. You may use Matlab.

$$v_L(t)=6-2e^{-t/50\text{ms}}\text{V}$$

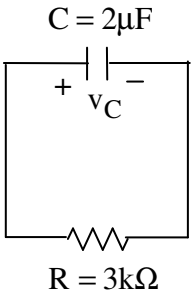
5. Find the voltage, v_C, on the capacitor in the circuit below as a function of time if the initial condition is, $v_C(t=0^+)=3\text{V}$.



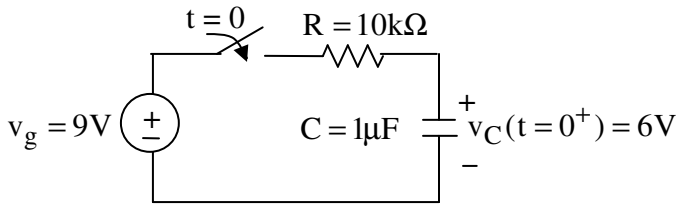
6. Find the current, i_L, through the inductor in the circuit below for t > 0 if the initial condition is $i_L(t=0)=3\text{mA}$.



7. Find the voltage, v_C, across the capacitor in the circuit below for $t>0$ if $v_C(t=0)=15\text{V}$.



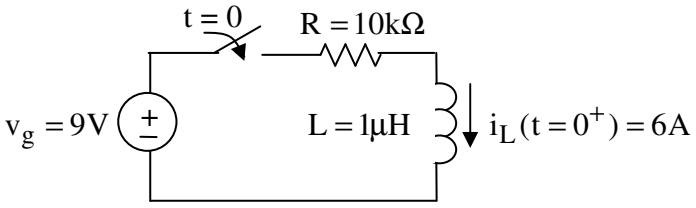
8. After being open for a long time, the switch closes at t = 0.



(a) Find an expression for $v_C(t)$ for $t \geq 0$.

(b) Find the energy stored in the capacitor at time t = 10 ms.

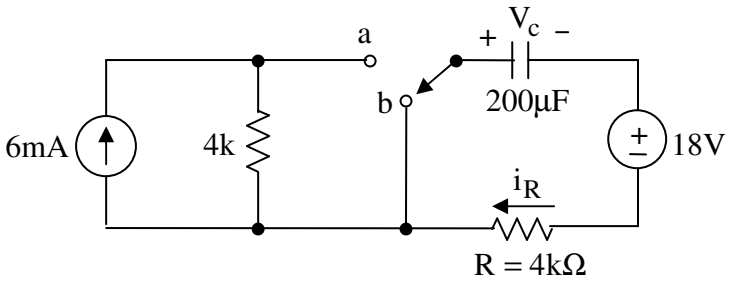
9.



(a) Find an expression for $i_L(t)$ for $t \geq 0$. Note: Assume the initial current in the L is created by circuitry not shown in the diagram.

(b) Find the energy stored in the inductor at time t = 10 ms.

10. The switch has been in a position a for a long time. It switched to position b at t = 0.



(a) Find an expression for $V_c(t)$ for $t > 0$.

(b) Find the current, i_g, in R as a function of time.

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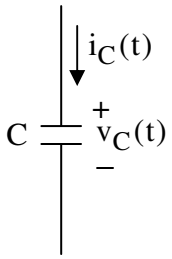

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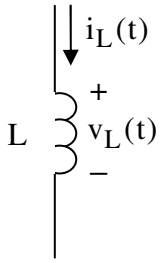

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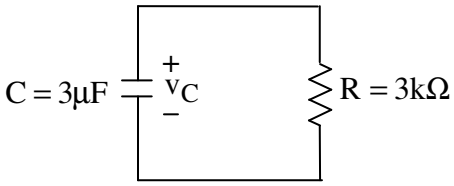

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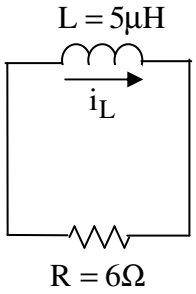

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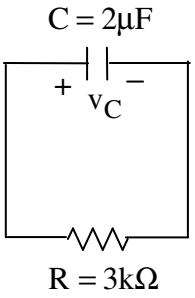

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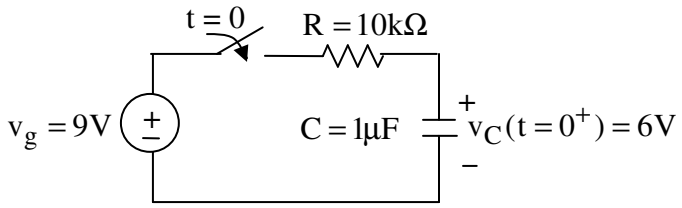

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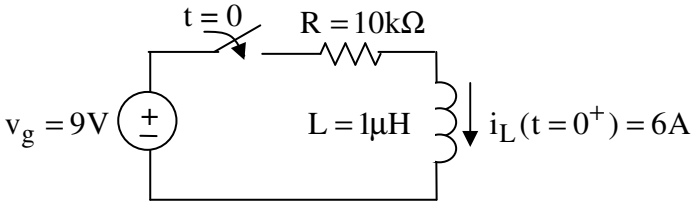

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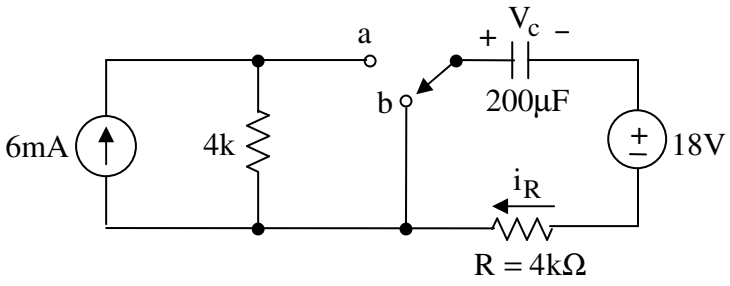

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