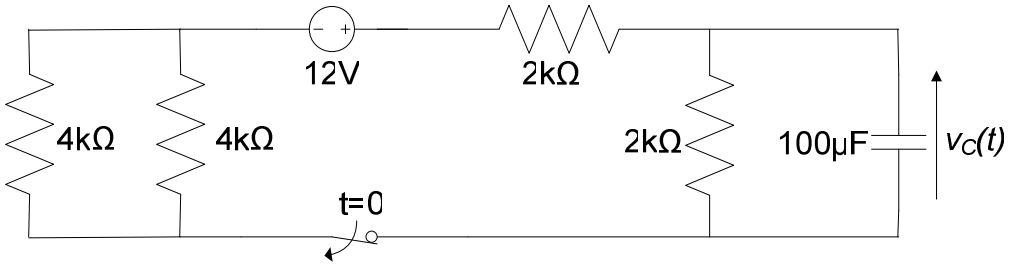
Problem Set 10 (Fall 2008)

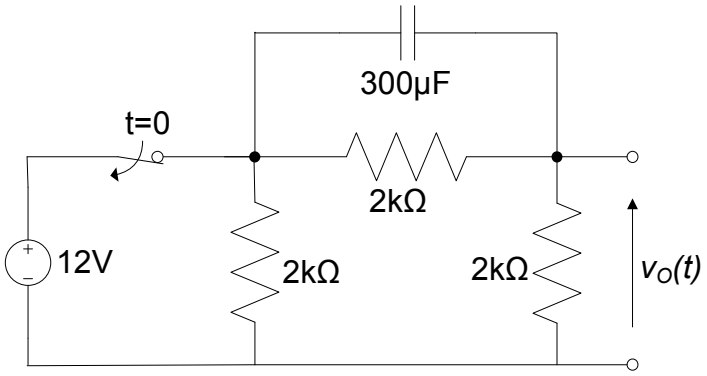
Use our step-by-step approach (Irwin pp. 202-204) (do not use diff'l eq'ns) for all of the following:

RC Circuits:

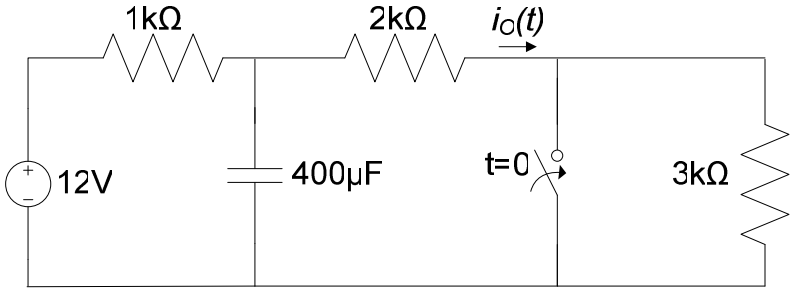
10.1 Find $v_C(t)$ for $t>0$ in the circuit below and plot the response including the time interval just prior to opening the switch.



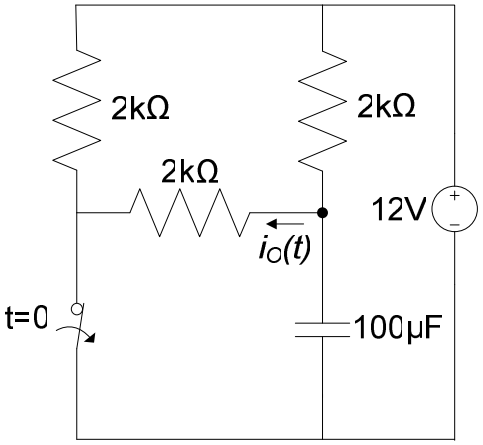
10.2 Find $v_O(t)$ for $t>0$ in the circuit below and plot the response including the time interval just prior to opening the switch.



10.3 Use the step-by-step technique to find $i_O(t)$ for $t>0$ in the circuit below.



10.4 Use the step-by-step method to find $i_o(t)$ for t>0 in the circuit below.

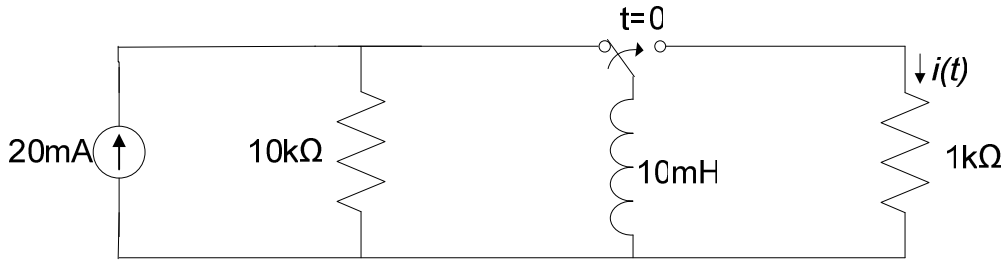


10.5 Continue 10.2 and find $v_o(t)$ for t>0.5sec if at t=0.5sec. S is closed. (S = the switch)

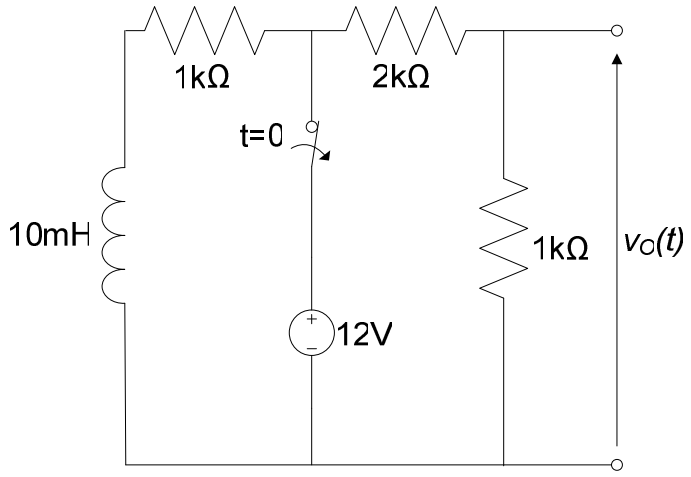
10.6 Continue 10.3 and find $i_o(t)$ for t>0.5sec if at t=0.5sec. S is opened.

RL Circuits:

10.7 Find $i(t)$ for t>0 in the circuit below and plot the response including the time interval just prior to switch movement.



10.8 Use the step-by-step method to find $v_O(t)$ for $t>0$ in the circuit below.



TAs: The step-by-step approach uses the standard forms:

$$v(t) = V_F + (V_I + V_F)e^{-t/\tau}$$

and $$i(t) = I_F + (I_I + I_F)e^{-t/\tau}$$

where the subscripts I and F refer to the Initial and Final values, respectively.

$v_C(t=0^+) = v_C(t=0^-)$ and $i_L(t=0^+) = i_L(t=0^-)$.

In steady state i_C=0 and v_L=0. ($\Delta\omega$=bandwidth)

$\tau = CR$ and $\tau = \dfrac{L}{R}$

In addition, if a transient is not at t=0 but at some other time, say t_1, then offset the result by using $t = t - t_1$, i. e. use $e^{-(t-t_1)/\tau}$.