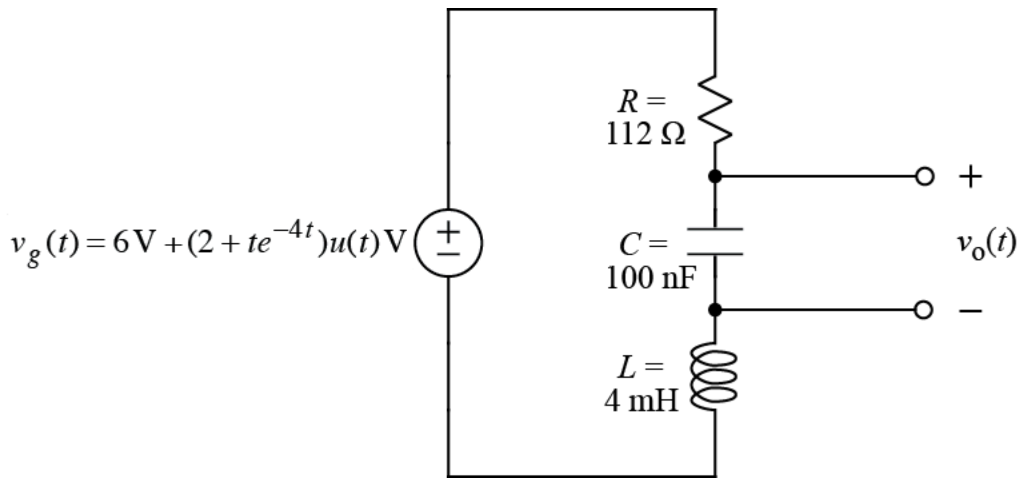
Homework 14

1.



Note: The 6 V in the $v_g(t)$ source is always on.

a) Write the Laplace transform, $V_g(s)$, of $v_g(t)$.

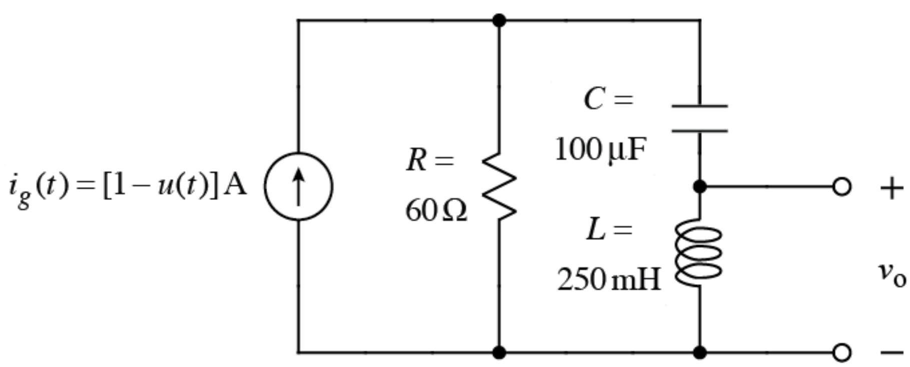
b) Draw the s-domain equivalent circuit, including source $V_g(s)$, components, initial conditions for C's, and terminals for $V_o(s)$.

2.

c) Write an expression for $V_o(s)$.

d) Apply the final value theorem to find $\lim_{t\to\infty} v_o(t)$.

3.



Note: The 1A in the $i_g(t)$ source is always on.

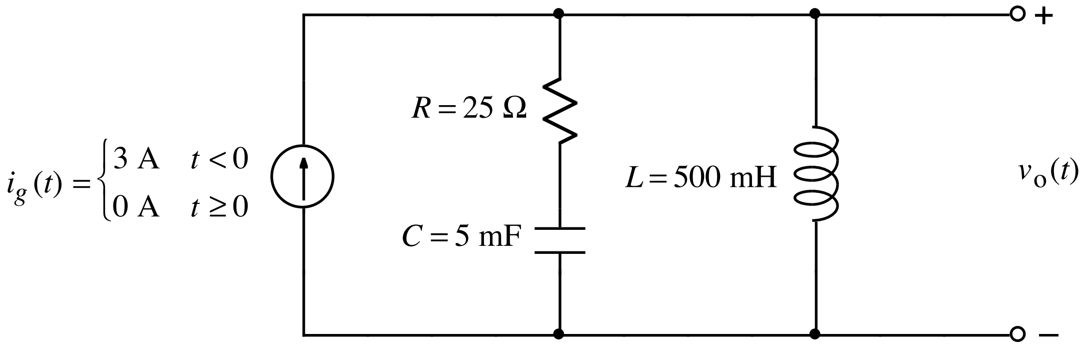
a) Write the Laplace transform $I_g(s)$ of $i_g(t)$.

b) Write the Laplace transform $V_o(s)$ of $v_o(t)$. Be sure to include the effects of initial conditions, if they are nonzero.

4.

c) Write a numerical time-domain expression for $v_o(t)$ where $t \geq 0$.

5.



a) Write the Laplace transform $I_g(s)$ of $i_g(t)$.

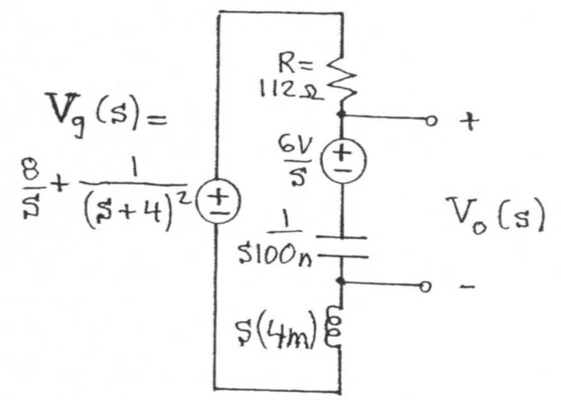
b) Write the Laplace transform $V_o(s)$ of $v_o(t)$. Be sure to include the effects of initial conditions, if they are nonzero.

c) Write a numerical time-domain expression for $v_o(t)$ where $t \geq 0$.

Answers:

1.a) $\mathcal{L}\left\{6+(2+te^{-4t})u(t)\ \text{V}\right\}=\frac{6}{s}+\frac{2}{s}+\frac{1}{(s+4)^2}\ \text{V}$

b)



2.c) $V_o(s)=\dfrac{\left[\frac{8}{s}+\frac{1}{(s+4)^2}\right]\frac{1}{s100\text{n}}+\frac{6}{s}[s4\text{m}+112]}{s4\text{m}+112+\frac{1}{s100\text{n}}}$

d) 8 V

3.a) 0 A

b) $V_o(s)=-\dfrac{60s}{(s+120)^2+160^2}$

4.c) $v_o(t)=\left[-60e^{-120t}\cos(160t)+45e^{-120t}\sin(160t)\right]u(t)\ \text{V}$

5.a) 0 A

b) $V_o(s)=-75\,\text{V}\dfrac{s+8}{(s+10)(s+40)}$

c) $v_o(t\geq 0)=[5e^{-10t}-80e^{-40t}]u(t)\ \text{V}$