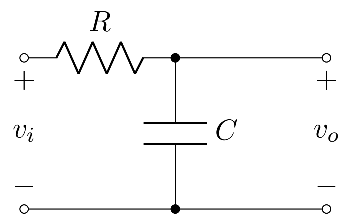
ECE 2260 hw08

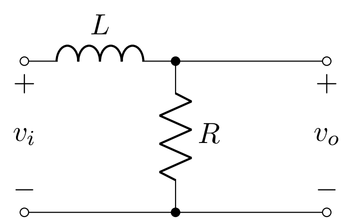
1. Basic Transfer Functions

a) Find the transfer function $H(s) = V_o/V_i$ for the circuit shown below.



(a)

b) Find the transfer function $H(s) = V_o/V_i$ for the circuit below.

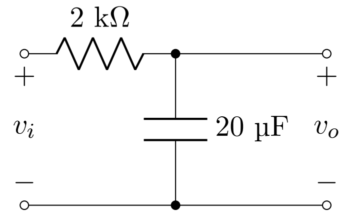


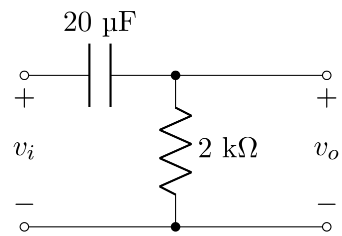
(b)

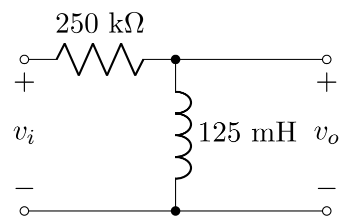
c) Create two different circuits that have the transfer function $H(s) = V_o/V_i = 1000/(s + 1000)$. Use components selected from Appendix H in the textbook.

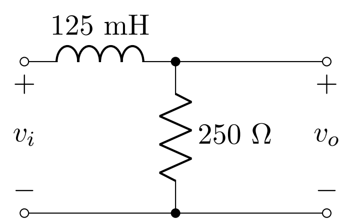
2. Numeric Transfer Functions

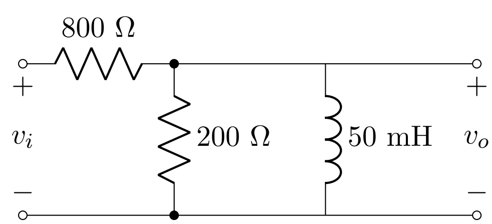
Find the numerical expression for the transfer function (V_o/V_i) of each circuit below and give the numerical value of the poles and zeros of each transfer function.

a) 

b) 

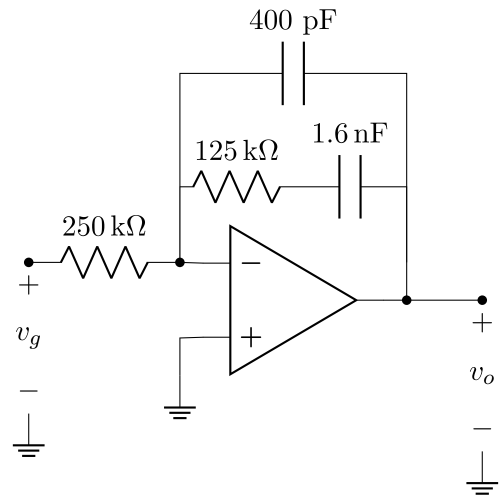
c) 

d) 

e) 

3. Op-Amp Transfer Functions

The operational amplifier in the circuit below is ideal.

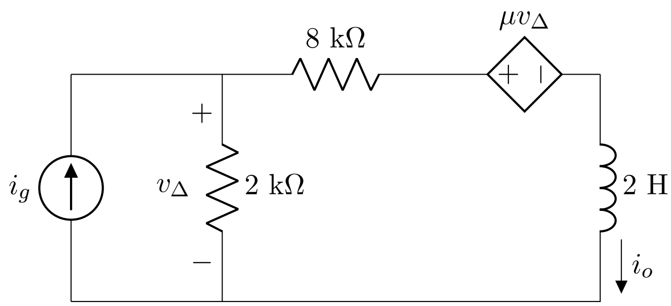


a) Find the numerical expression for the transfer function $H(s) = V_o/V_g$.

b) Give the numerical value of each zero and pole of $H(s)$.

4. Text 13.57 Stability and Step Response

Consider the circuit shown below.



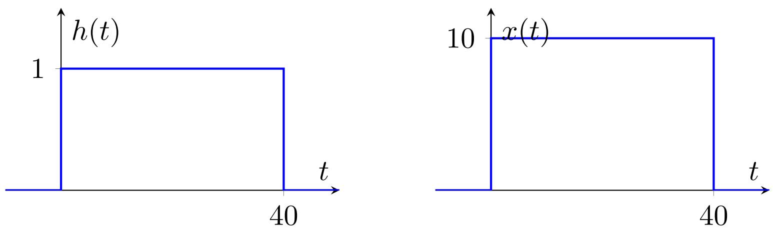
a) Find the transfer function I_o/I_g as a function of μ.

b) Find the largest value of μ that will produce a bounded output signal for a bounded input signal.

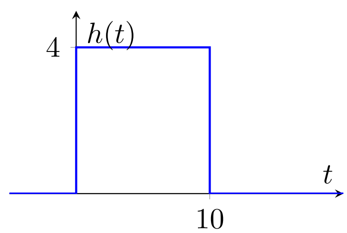
c) Find i_o for $\mu = -3, 0, 4, 5,$ and 6 if $i_g = 5u(t)$ A.

5. Convolution of Rectangular Pulses

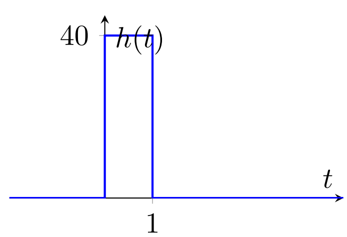
a) Given $y(t) = h(t) * x(t)$, find $y(t)$ when $h(t)$ and $x(t)$ are the rectangular pulses shown in the plot for part (a).



b) Repeat (a) when $h(t)$ changes to the rectangular pulse shown in the plot in part (b).



c) Repeat (a) when $h(t)$ changes to the rectangular pulse shown in the plot in part (c).



d) Sketch $y(t)$ versus t for (a)–(c) on a single graph.

e) Do the sketches in (d) make sense? Explain.