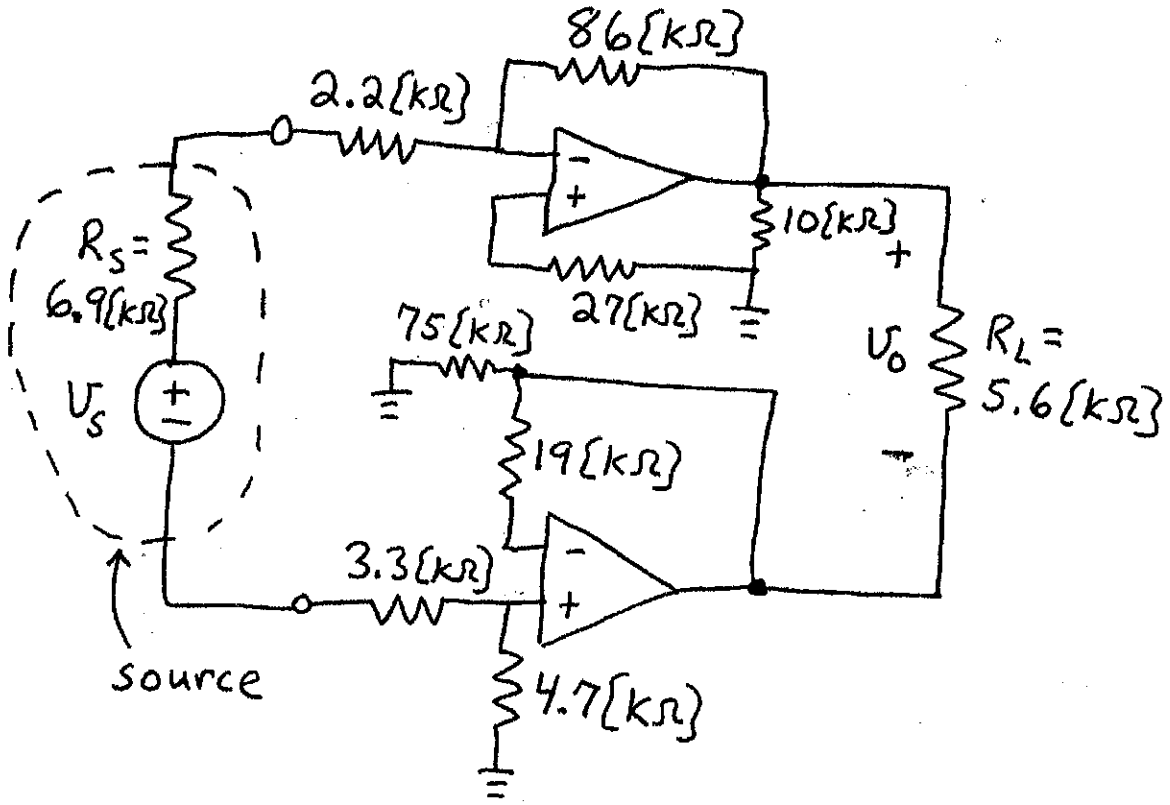
ECE 3355 – ELECTRONICS
HOMEWORK #6

Problems E6.1, E6.2, E6.3, E6.4

E6.1: Assume ideal op amps.

a) Find the voltage gain, v_o/v_s.

b) Find the input resistance seen by the source.

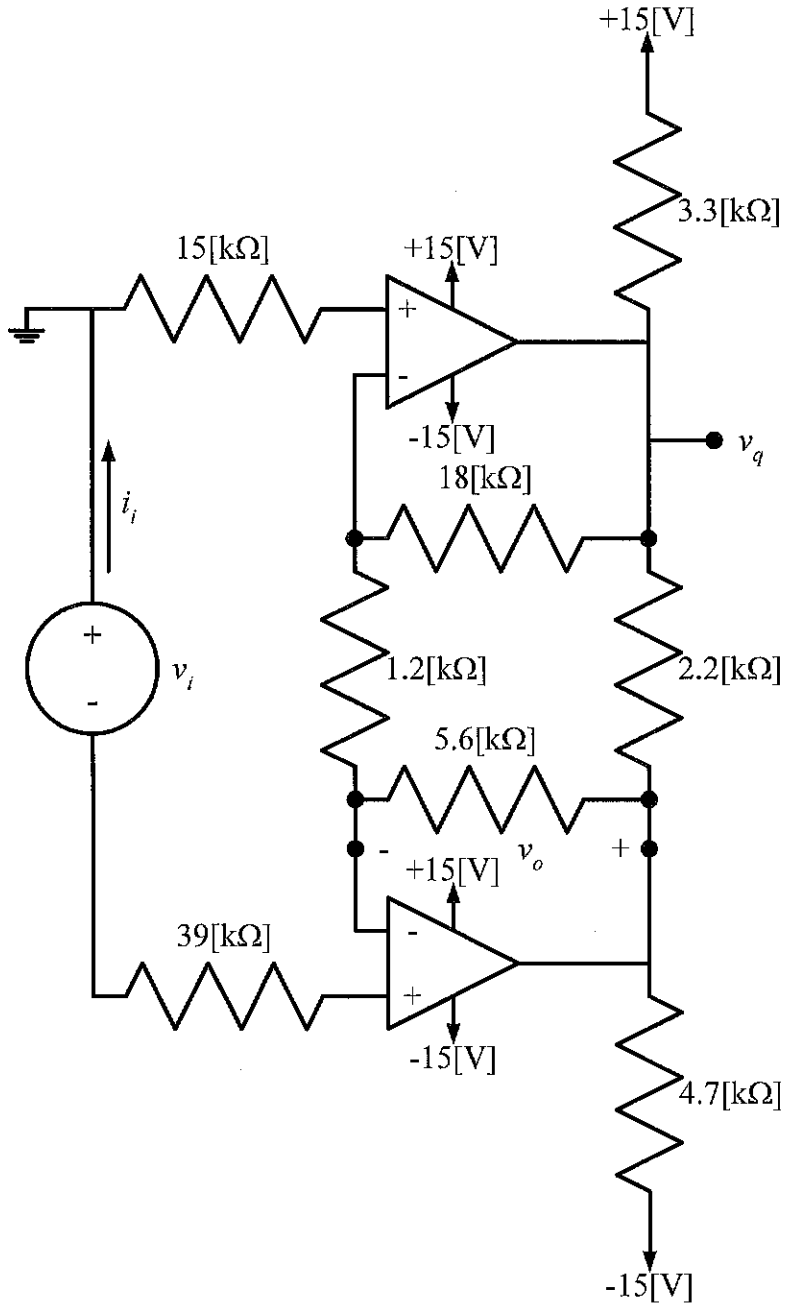


E6.2: Assume ideal op amps.

a) Find the voltage gain, v_o/v_i.

b) Find the input resistance, v_i/i_i.

c) If $v_i = 2$[V], find v_q.

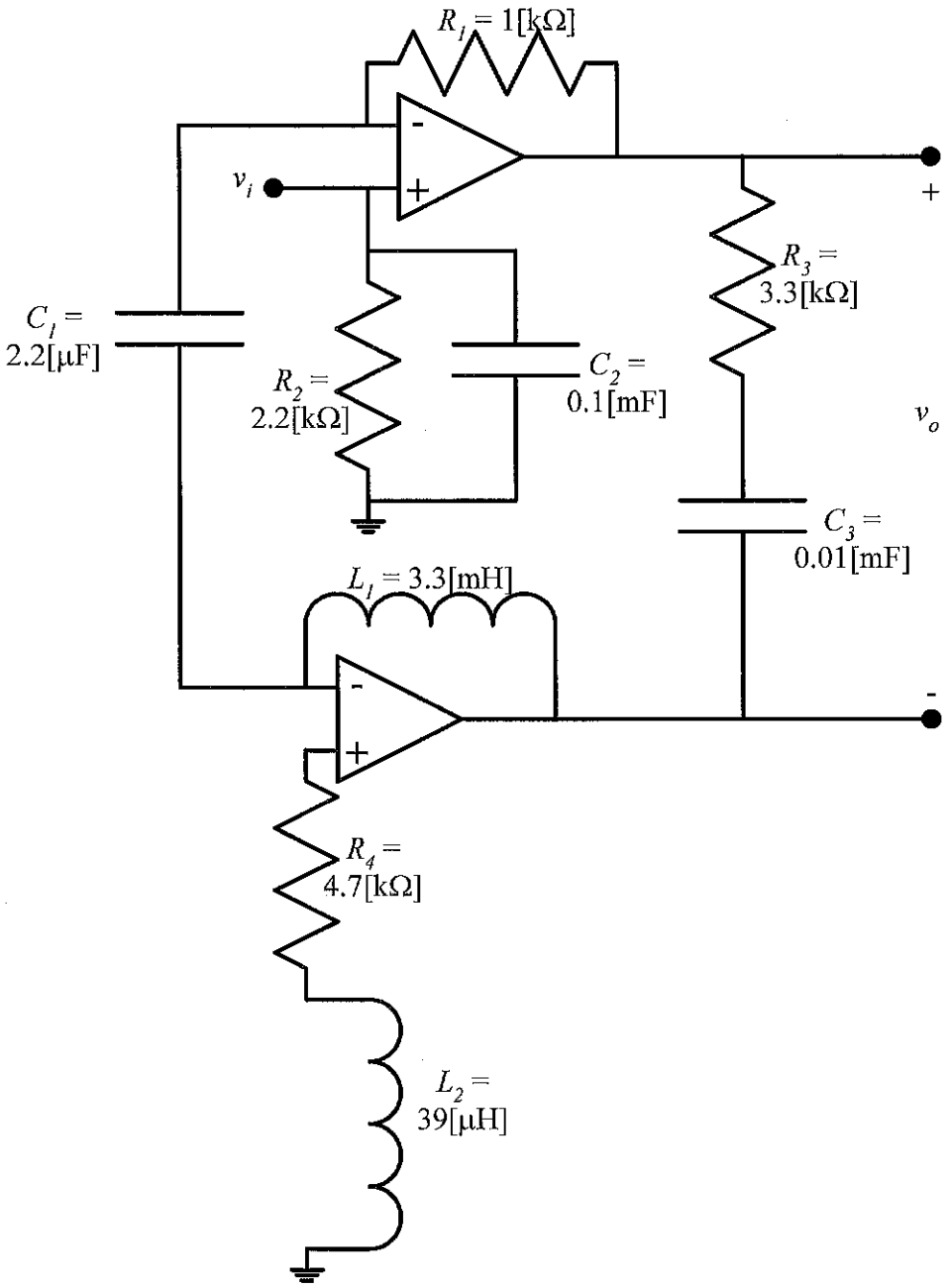


E6.3: For the circuit given below, assume ideal op amps.

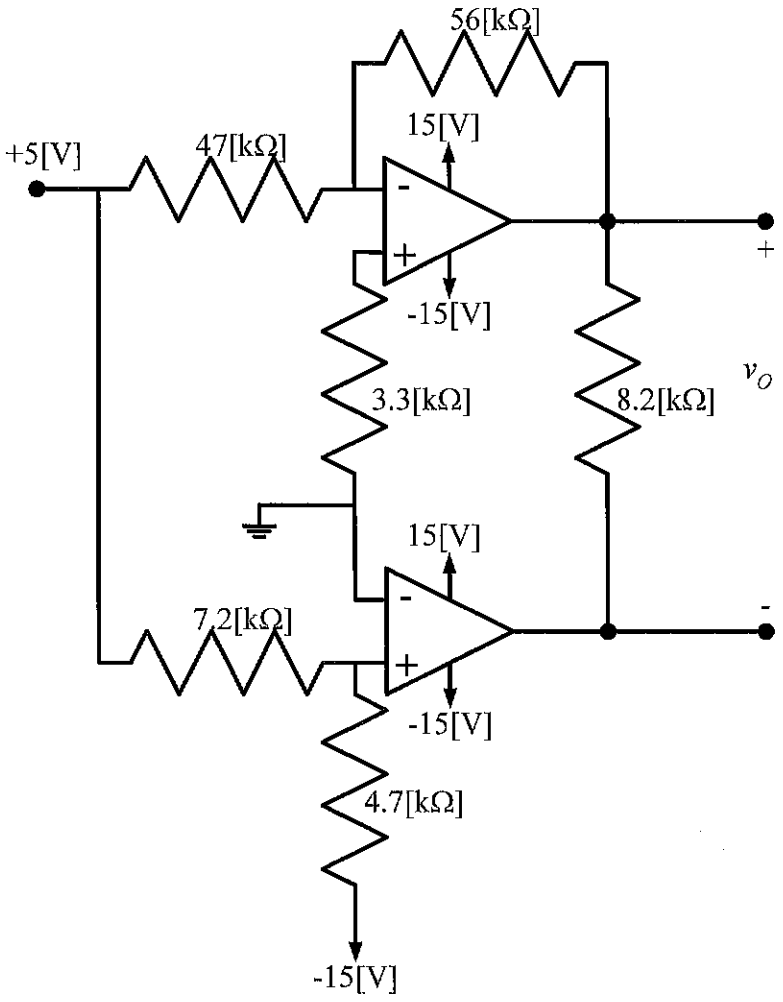
a) Find the transfer function, $T(\omega) = V_o/V_i$.

b) Find the number of poles and the number of zeroes for this transfer function.

c) Find the values of the poles and zeroes for this transfer function.



E6.4: Assume ideal op amps. Find v_O.



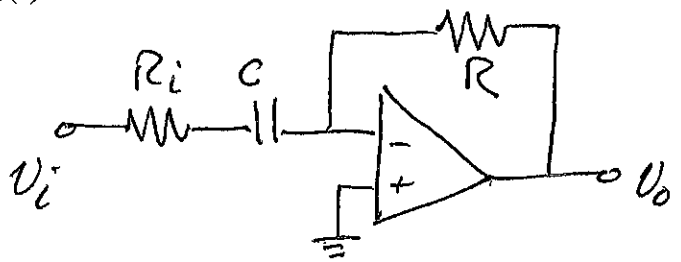
E6.5 (from Sedra and Smith 7 ed., problem 2.92)

The circuit below is a "first-order high pass active filter". For this circuit, do the following.

a) Find the transfer function V_o/V_i.

b) Choose values for the resistors and the capacitor such that the gain at high frequency is 40 dB, the input resistance seen by the signal at high frequency is 1 kΩ, and the 3dB frequency f = 2kHz.

c) Given that $v_i(t) = 100$ [mV] applied at t = 0 (i.e., a step function at t = 0), find the output $v_o(t)$.



Numerical Solutions:

E6.1) a) -4.75

b) 10.2[kΩ]

E6.2) a) -4.67

b) infinity

c) 15[V]

E6.3) a) $H(\omega)=\frac{V_o}{V_i}=1+j\omega\left(2.2\times10^{-3}[\mathrm{s}]\right)+\left(j\omega\right)^2\left(7.26\times10^{-9}[\mathrm{s}^2]\right)$.

b) two zeroes, no poles

c) ω_1 = 455.2[rad/s], and ω_2 = 302.6x10^3[rad/s].

E6.4) 9.04[V]

E6.5 d) v_o = 100 exp(-t/(79 [μs])