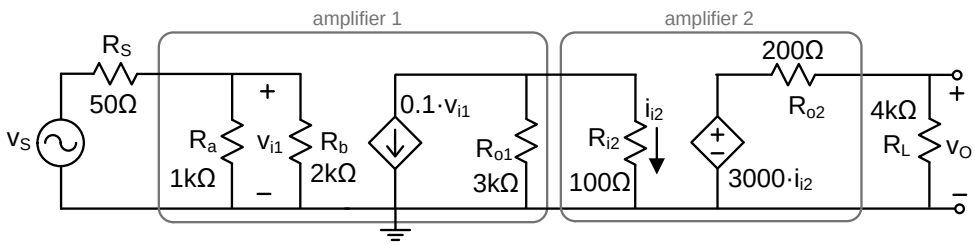
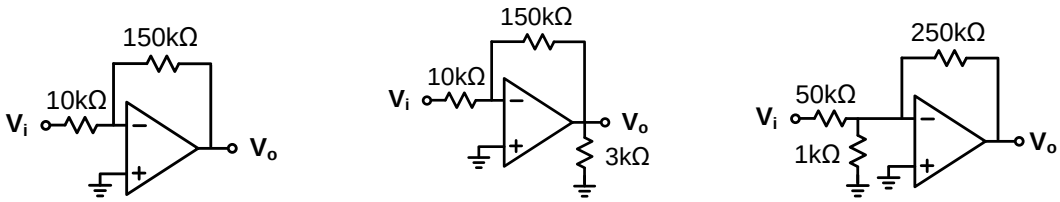
EECE 2412 – Homework 1 – Fall 2016

Due: Wednesday, September 21, 2016

1) The figure below displays the model of a two-stage amplifier that consists of a transconductance amplifier (amplifier 1) and a transresitance amplifier (amplifier 2).
   a. Find R_i, R_o, and $A_{vs} = v_o/v_s$ (as a ratio and in decibels) for the two-stage amplifier.
   b. Reverse the order of the cascaded amplifiers, such that amplifier 2 is connected to the 50Ω source resistance and amplifier 1 is connected to the 4kΩ load resistance. Repeat the analysis for the parameters in part a) and compare the results.



2) Determine the voltage gain (V_o/V_i) and the input resistance for each of the circuits in the figure below under the assumption that the op-amp is ideal.

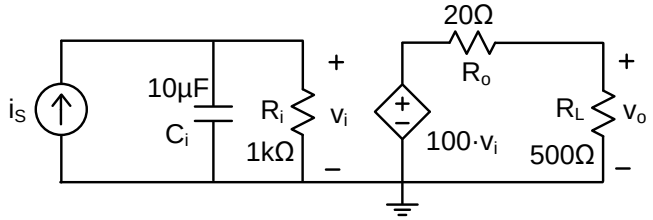


a) b) c)

3) Problem 1.16 on page 55 in the textbook (Allan R. Hambley, Electronics, 2nd edition, Prentice Hall, 1999). Assume that the 5V source voltage is an RMS value.

4) Problem 1.27 on page 56 in the textbook.

5) Assume that the amplifier modeled by the circuit below is driven with an ideal sinusoidal input current source ($i_s = 2\text{mA}\cdot\sin[\omega_{in}t]$).
   a. Determine the transfer function $T(j\omega) = v_o(j\omega)/i_s(j\omega)$.
   b. Evaluate the transfer function for the input frequency of $\omega_{in} = 10$ rad/s, and use the result to determine the equation for the transient output voltage $v_o(t)$ when $i_s = 2\text{mA}\cdot\sin(10\cdot t)$ is applied as input.
   c. Repeat part b) for $\omega_{in} = 1000$ rad/s.



6) Problem 2.22 on page 123 in the textbook.