INEL5207 - Spring 2008 - Problemas adicionales examen 1

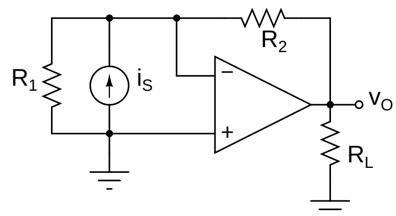
1. For the circuit shown below, a power supply of $\pm 15V$ is used. The opamp utilizes a bias current $I_Q = 50mA$ and exhibits a short-circuit current $I_{ss} = 20mA$ but can otherwise be considered ideal). If $i_S = 1mA$, $R_2 = 10k\Omega$ and $R_1 = R_L = 1k\Omega$, determine the following quantities:

   (a) output voltage v_O,

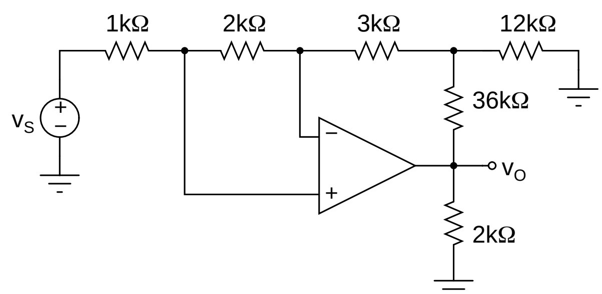
   (b) opamp output current and direction,

   (c) power dissipated by the opamp,

   (d) power dissipated by the whole circuit.



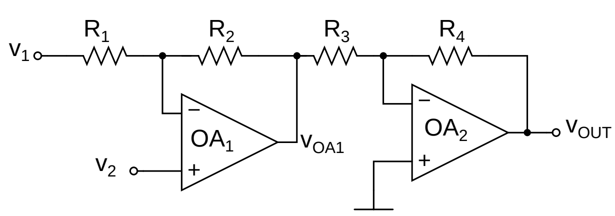
2. Assuming the opamp of the following circuit has an open-loop gain $a = 3000V/V$, $r_d = \infty$ and $r_o = 0$, find the voltage gain $A_v = \frac{v_O}{v_S}$ for the following circuit.



3. For the circuit shown in problem 2, determine the loop gain T using the same parameters for the opamp.

4. Show that the result obtain in problem 2 is consistent with the feedback formula $A_V = A_{ideal}\frac{1}{1+\frac{1}{T}}$.

5. For the following circuit,



let both v_1 and v_2 be connected to ground and consider only the effect of each transistor's bias current I_B. Assume that current I_B flows into the + and - inputs of each opamp and that the opamps are matched (i.e. identical).

(a) Find the relationship between the resistance values that causes the cancelation of the error due to the bias current. Consider only the resistors shown in the above figure.

(b) Determine the worse-case error due to the offset voltage $\mid V_{OS} \mid \leq 1mV$ if R_1, R_2, R_3 and R_4 are chosen so that: (i) the overall voltage gain is +25V/V; (ii) the input is v_1 and (iii) no resistor is less than $1k\Omega$; and (iv) the relationship found in part (a) is satisfied.