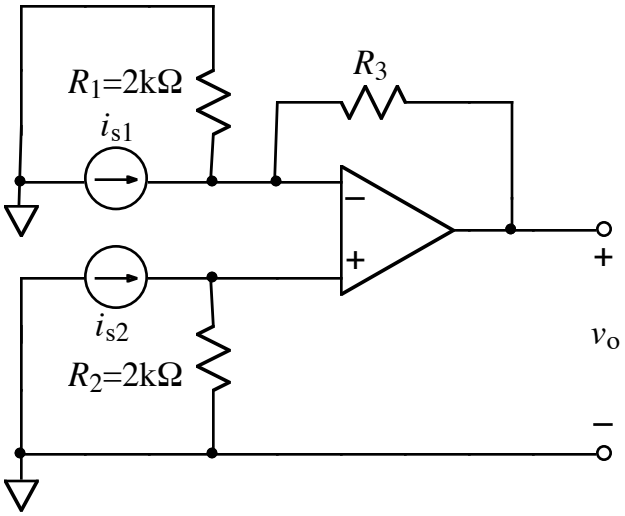
HOMEWORK #17

1.



Rail voltages = ±10 V

The above circuit operates in linear mode. Derive a symbolic expression for v_o. The expression must contain not more than the parameters i_{s1}, i_{s2}, R_1, R_2, and R_3.

2. a) If $i_{s1} = 0$ μA, find the value of R_3 that will yield an output voltage of $v_o = 1$ V when $i_{s2} = 10$ μA.

b) Derive a symbolic expression for v_o in terms of common mode and differential input currents:

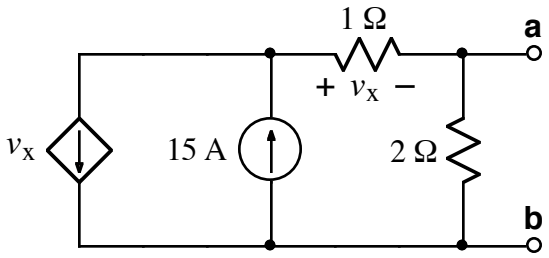
$$i_\Sigma \equiv \frac{i_{s1} + i_{s2}}{2} \qquad \text{and} \qquad i_\Delta \equiv \frac{i_{s1} - i_{s2}}{2}$$

The expression must contain not more than the parameters i_Σ, i_Δ, R_1, R_2, and R_3. Write the expression as i_Σ times a term plus i_Δ times a term. Hint: start by writing i_{s1} and i_{s2} in terms of i_Σ and i_Δ:

$$i_{s1} \equiv i_\Sigma + i_\Delta \qquad \text{and} \qquad i_{s2} \equiv i_\Sigma - i_\Delta$$

3. If $i_\Delta = 0$ and $R_1 = R_2$, write a formula for the current flowing from left to right in R_3 as a function of not more (and possibly less) than the following terms: i_Σ, R_1, R_2, and R_3.

4.



Find the Thevenin equivalent of the above circuit relative to terminals **a** and **b**.

5. a) If we attach R_L to terminals **a** and **b**, find the value of R_L that will absorb maximum power.

b) Calculate the value of that maximum power absorbed by R_L.