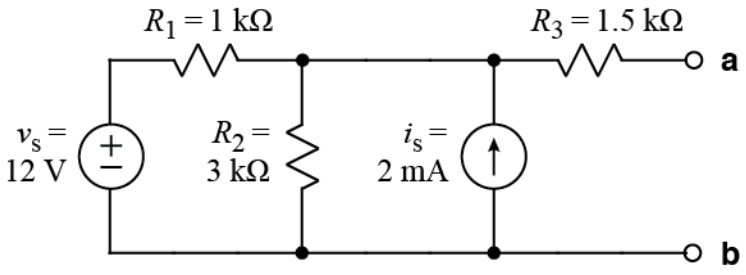
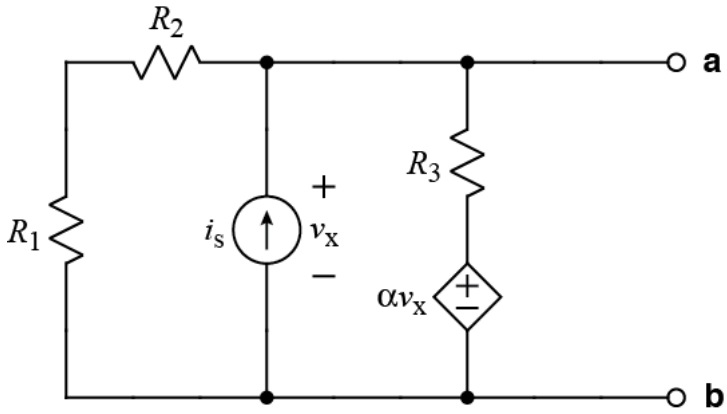
Homework 6

1.



Find the Thevenin equivalent circuit at terminals a-b.

2.

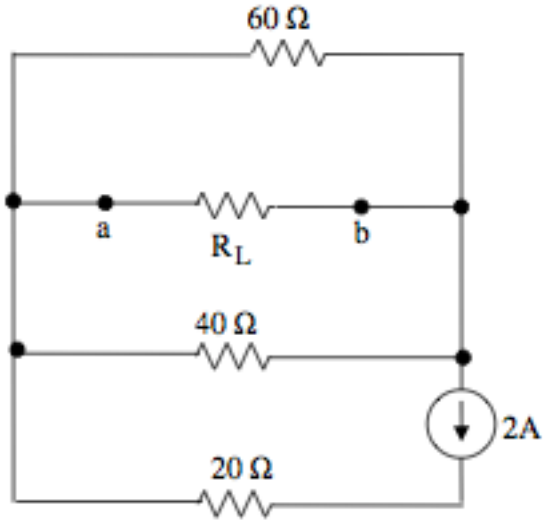


Find the Thevenin equivalent circuit at terminals a-b. v_x must not appear in your solution. The expression must not contain more than circuit parameters α, R_1, R_2, R_3, and i_s. **Note:** $0 < \alpha < 1$.

3. Make at least one consistency check (other than a units check) on your expression for problem 2. In other words, choose component values that make the answer obvious, and verify that your answer to problem 2 gives that obvious answer. State the values of resistors and sources for your consistency check.

4. Find the Norton equivalent of the circuit in problem 2.

5.



a) Calculate the value of R_L that would absorb maximum power.

b) Calculate that value of maximum power R_L could absorb.

Answers:

1. $v_{\mathrm{Th}} = 10.5\,\mathrm{V}\,,\ R_{\mathrm{Th}} = 2.25\,\mathrm{k\Omega}$

2. $v_{\mathrm{Th}} = i_{\mathrm{s}} \cdot (R_1 + R_2) \,\|\, R_3 \,\|\, \dfrac{-R_3}{\alpha} = i_{\mathrm{s}} \cdot R_{\mathrm{Th}}$

5.a. Hints: Remove R_{L} when finding the Thevenin equivalent, and 20 Ω resistor in series with current source is irrelevant. So if you combine the 40 Ω and 60 Ω, you are starting with a Norton form.

5.b. $p_{\max} = \dfrac{v_{\mathrm{Th}}^2}{4R_{\mathrm{Th}}} = 24\,\mathrm{W}$