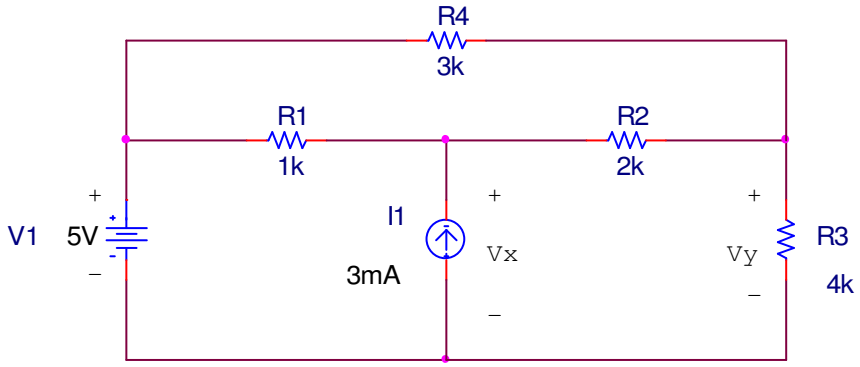
ECE203—DC Circuits
Review for Test 2

Figure 1. Resistive circuit with two independent sources



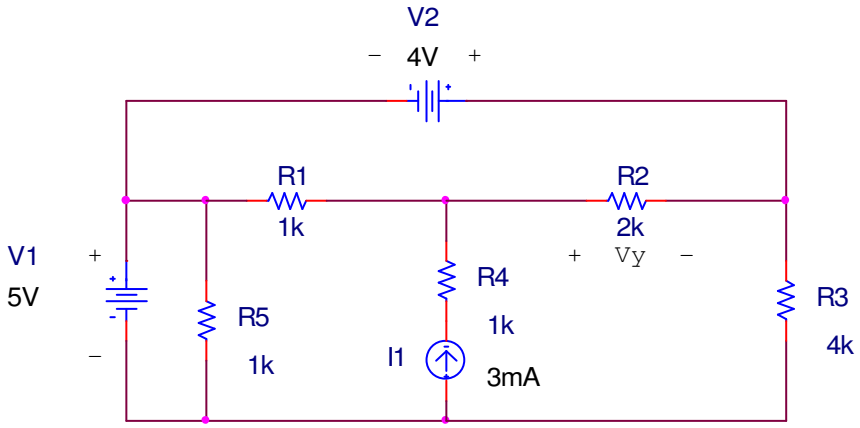
1. Use the node voltage method to find V_x and V_y in the circuit of Figure 1. (Answers: V_x = 6.91V, V_y = 4.73 V)

2. Use the mesh current method to find V_x and V_y in the circuit of Figure 1. (Your results should agree with the results obtained in Problem 1.) (Answers: V_x = 6.91V, V_y = 4.73 V)

3. In the circuit of Figure 1, remove R_3, and (a) find the Thevenin Equivalent circuit that is seen looking into the terminals where R_3 had been connected. (b) find the Norton Equivalent circuit that is seen looking into these terminals (c) Connect R_3 across the terminals each of these equivalent representations, and show that in both cases, that you still get the same value of V_y that was determined in Problems 1, 2, and 3!
(Answers: V_{th} = 6.5 V, R_{th} = 1.5 k, I_n = 4.333 mA, R_n = 1.5 k, V_y = 4.73 V.)

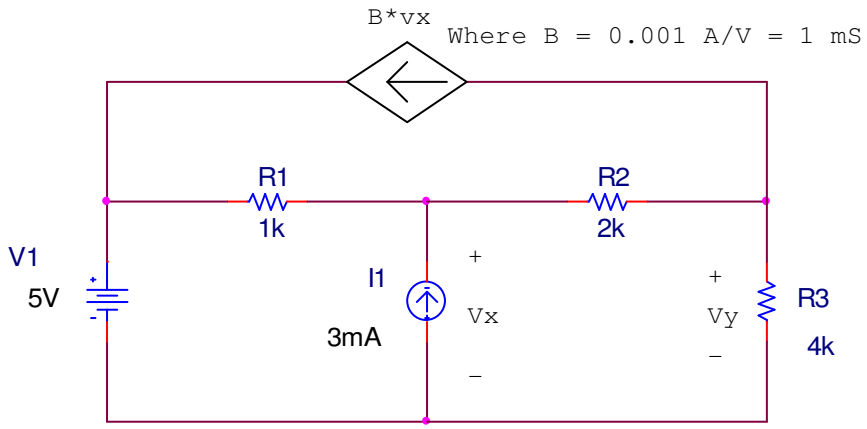
4. Referring to the circuit of Figure 2, (a) use either node or mesh method (whichever is easier) to find V_y. (b) find the power absorbed by the 3 mA source and the 5 V source.
(Answers: P_{3mA} = -34 mW, P_{5V} = -21.25 mW)

Figure 2. Resistive circuit with three independent sources



5. Referring to Fig. 3, (a) use either node or mesh method (whichever is easier) to find V_y and V_x. (b) find the power absorbed in the voltage-controlled current source.
(Answers: V_x = 4.364 V, V_y = -2.909 V, P_{vccs} = -34.51 mW)

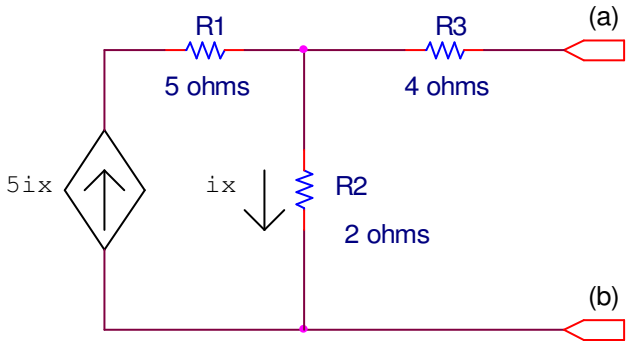
Figure 3. Resistive circuit containing a voltage-controlled current source



6. Referring to Fig. 3, (a) remove R_3 and, looking into the terminals where R_3 had been connected, find the Thevenin Equivalent. (b) Now connect R_3 across the terminals of this Thevenin Equivalent and find V_y. (This value of V_y must agree with the value of V_y obtained in Problem 5.) (Answers: V_{th} = -4V, R_{th} = 1.5 k, V_y = -2.909 V)

7. Referring to Fig. 4, find the Thevenin Equivalent looking into terminals "a-b". (Answers: V_{th} = 0 (since there are NO independent sources present), R_{th} = 3.5 ohms)

Figure 4. Resistive 1-port containing a current-controlled current source



8. Referring to Fig. 5, (a) find the Thevenin Equivalent looking into terminals “a-b”. (b) find the value of load resistance RL which, when placed across terminals “a-b”, extract maximum power from the circuit of Fig. 5. (c) What is the value of this maximum power that can be extracted? (d) What value of R_L will extract maximum current from this circuit? (e) What is this value of maximum current? (f) What value of R_L will extract maximum voltage from this circuit? (g) What is this value of maximum voltage? (Answers: (a) V_{th} = 6 V, R_{th} = 4.4 ohm, (b) R_{Lmax} = 4.4 ohm, (c) P_{Lmax} = 2.045 W, (d) R_L = 0, (e) I_{max} = 1.363 A, (f) R_L = infinity (g) V_{max} = 6 V.)

Figure 5. Simple resistive 1-port circuit