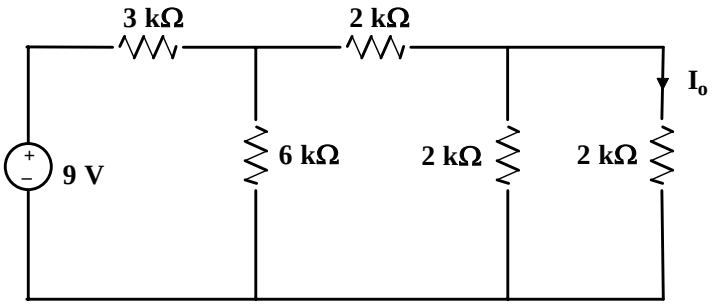
ECE 301
Fall Semester 2005
HW # 2

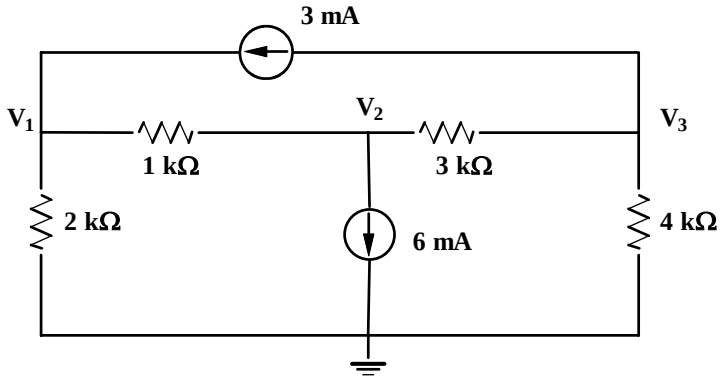
wlg Due: Sept 20 Name _____
Print (last, first)

Use engineering paper. Work only on one side of the paper. Use this sheet as your cover sheet, placed on top of your work and stapled in the top left-hand corner. Number the problems at the top of the page, in the center of the sheet. **Do neat work. Underline your answers. Show how you got your equations**. **Be sure to show how you got your answers.** Each problem counts 10 points.

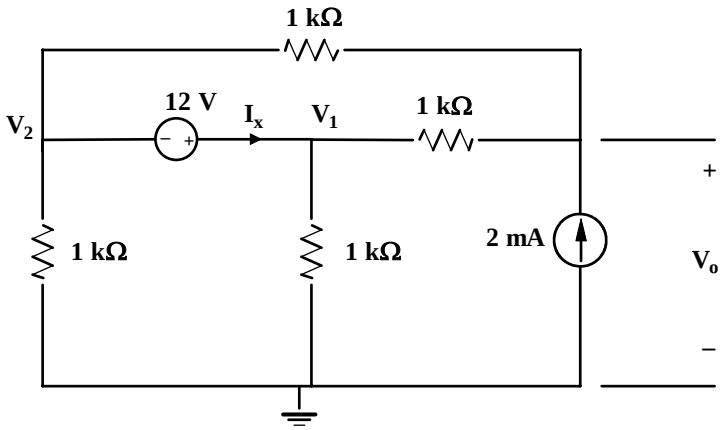
(1) Find I_o by using nodal analysis. Ans I_o = 0.6 mA



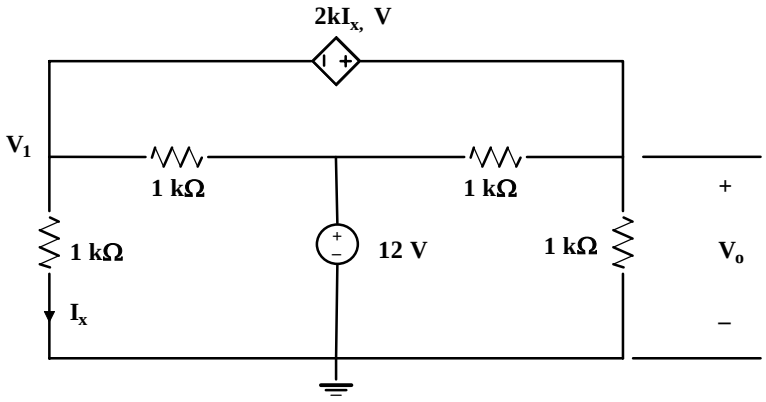
(2) Determine the node voltage equations for V_1, V_2, and V_3 for the following circuit. Use MATLAB to solve for these voltages. Ans V_1 = -6 V, V_2 = -12 V, V_3 = -12 V



(3) Use nodal analysis to solve for V_o and I_x. $V_o = 2$ V, $I_x = 12$ mA



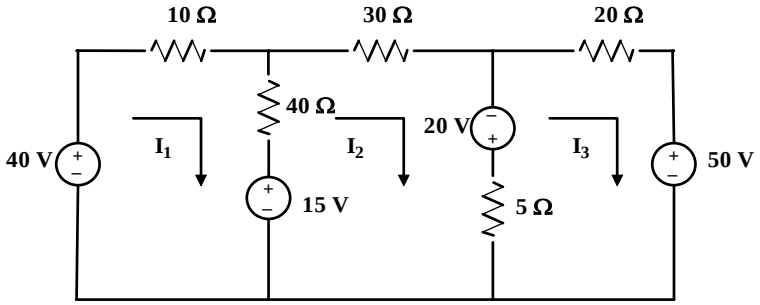
(4) Use nodal analysis to solve for V_o and I_x in the following circuit. $V_o = 9$ V, $I_x = 3$ mA



(5) Work problem 3.15 in the text. Ans v = 8.89 V

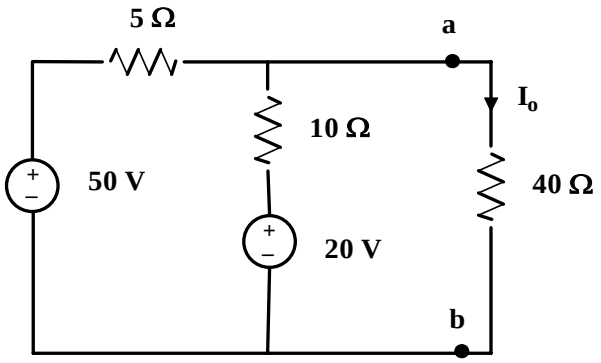
(6) Work problem 3.19 from the text. Ans I = -0.163I, A

(7) You are given the following circuit. Use mesh analysis to find I_1, I_2 and I_3. Write out the equations and then place them in matrix form. $I_1 = 1.28$ A, $I_2 = 0.976$ A, $I_3 = -2.60$ A

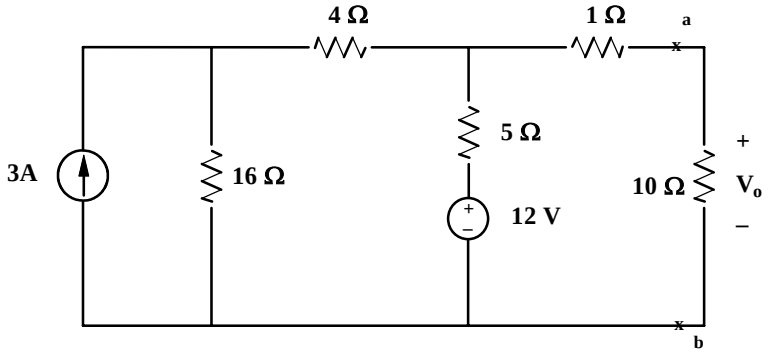


(8) You are given the circuit shown below. Ans: $I_o = 12/13$ A

(a) Use source transformation to determine the current I_o.
(b) Use superposition to determine I_o.
(c) Find the Thevenin equivalent circuit to the left of terminals a-b and then find I_o.



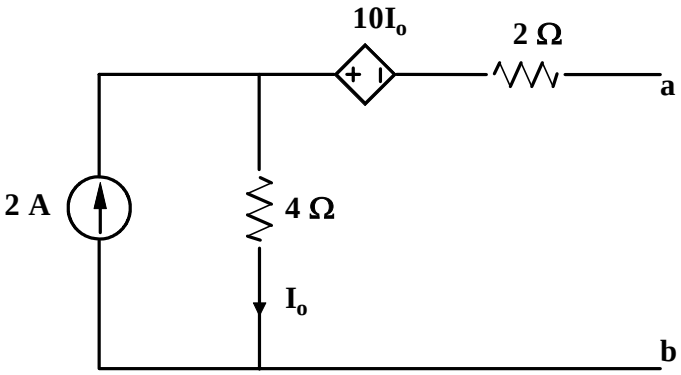
(9) Find the Thevenin equivalent circuit for the network to the left of terminals "a" and "b". Give your values for V_{TH} and R_{TH}. Use the Thevenin circuit to find V_o. Ans: R_{TH}= 5 Ω, V_{TH}=19.2 V, V_o=12.8 V.



(10) Replace the 10 Ω resistor of Problem (9) with R_x. Find R_x for maximum power transfer. Give the value of the power delivered to R_x. Ans: $P_{Rx} = 18.43$ W

(Extra) This problem is not required. Work for extra credit (10 points).

Find the Norton equivalent circuit for the following network. In doing this problem, find the open circuit voltage at terminals a-b. This is called V_{oc}. It is also V_{TH}. Then find I_{sc}, which is I short circuit. This is the current that flows from a to b when a short is placed between a and b. $R_{TH} = V_{oc}/I_{sc}$, The Norton current source is the I_{sc} that you obtained. Ans: $R_{TH} = -4\ \Omega$, $I_N = 3$ A.



On this problem, do not find R_{TH} by applying a source at a-b and calculating $R_{TH} = V_s/1$, where 1 represents a 1 amp source applied at a-b. You may do the problem like this for fun if you wish. But I want you to find R_{TH} from V_{oc}/I_{sc}.