Department of Electrical Engineering and Computer Science
College of Engineering
University of California, Berkeley

EECS 40 Summer 2002

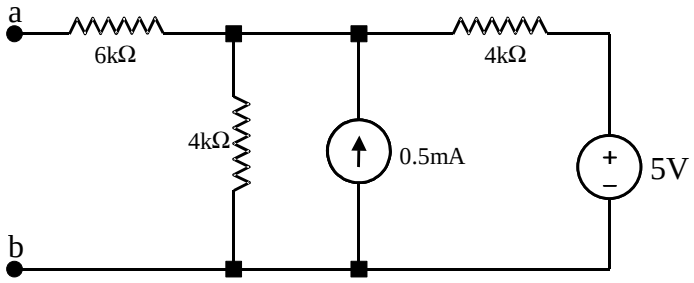
Problem Set 5
Due Monday July 15, 12pm

Short Problem Set

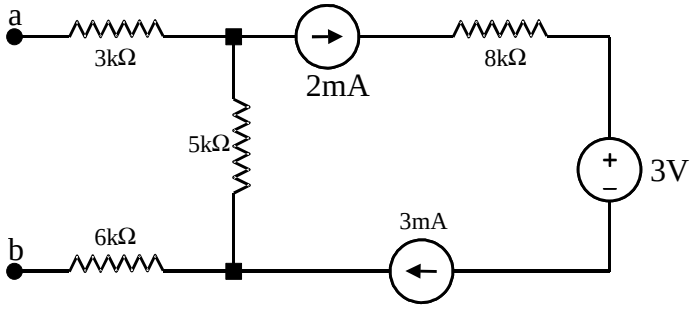
1) A car battery whose open circuit voltage is normally 6.4 V is loaded by a 2Ω load and the voltage is found to be 6.1V. What is a sensible equivalent circuit for the battery, assuming it is linear?
2) You find an old-fashioned "panel meter" and after some investigation find it is linear and deflects full scale when 10μA flows into it. Under those conditions there is a voltage of 100mV across its terminals. You want to construct a voltmeter with this meter and propose simply putting a resistor in series with it. What resistance would you need so that the meter deflected full scale at 10V applied. Under these conditions, what would it read if you used it to measure the open circuit voltage of a circuit which had a Thevenin equivalent source of 8V and Thevenin resistance of 10K.
3) Text problem 2.5
4) Draw the I-V graphs of the following circuits (associated sign convention). If they are correct linear circuits they must have Thevenin equivalents with respect to terminals a and b, find the equivalents. If one or more of the circuits is incorrect (violates KCL or KVL) or nonlinear , state the problem (and do not find an equivalent circuit).

Note: in analyzing circuits you can often make the job simpler by making a Thevenin to Norton or Norton to Thevenin transformation of part of the circuit. (For example note how you can combine elements if you replace the 4K/5V on the right side of the circuit (a) by its Norton equivalent.) None of these circuits requires Nodal analysis.

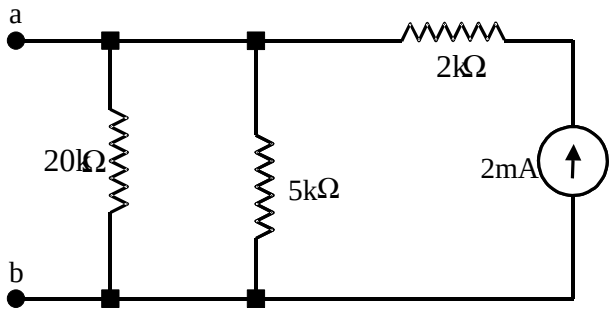
(a)



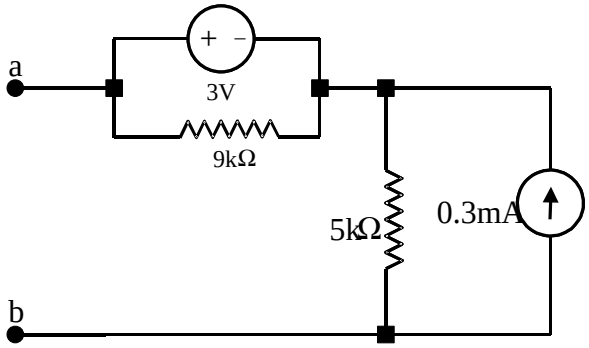
(b)



(c)



(d)



(5) An uncharged 1μF capacitor is suddenly placed across the terminals a-b of circuit 4(b) above. Plot the voltage across the capacitor terminals versus time and write an equation for $v_{ab}(t)$ where we define t=0 as the instant the capacitor is connected.