ECE 1250 homework # 3

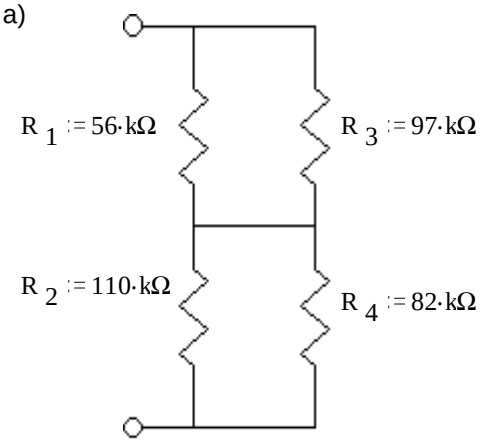
a

Equivalent resistance

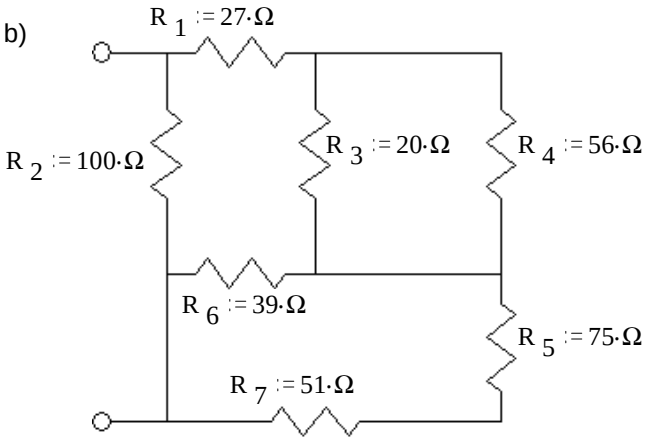
1. Find the equivalent resistance of each of these networks, i.e. what would an ohmmeter read if hooked to the terminals. Work out and keep all your intermediate results -- they will help you in the problems to come.

   Note: the hard part of these problems is actually seeing which resistors are in parallel and which are in series. You may want to redraw the circuits a few times to help you figure it out.

a)



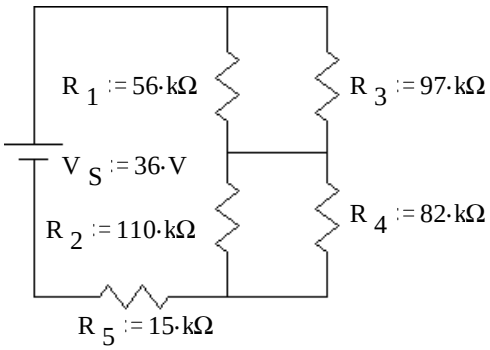
b)



Voltage Dividers

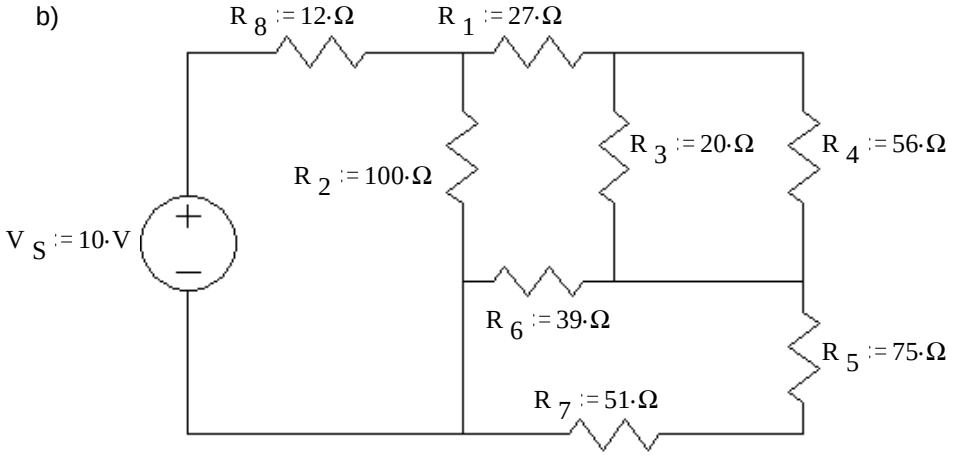
2. Use voltage divider concepts to find the voltages indicated in the following circuits. You may want to use some of your results from problem 1. You may need to use the voltage divider equation more than once.

a)



V_{R5} = ? V_{R4} = ? V_{R1} = ?

b)



V_{R8} = ?

V_{R2} = ?

V_{R1} = ?

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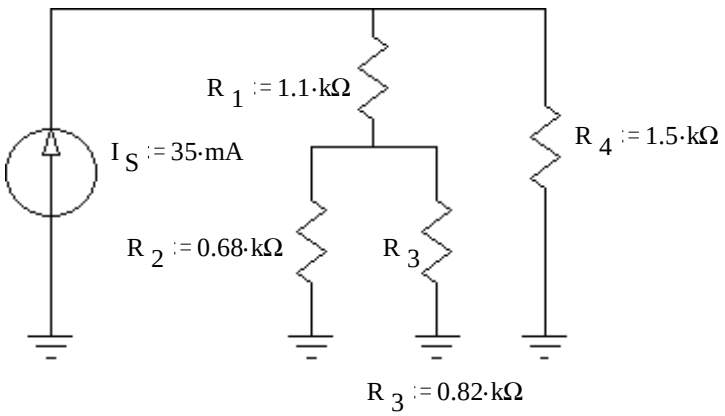
Current Dividers

3. The circuit at right shows a current source hooked to a resistor network. Remember that the grounds are all connected together. You can draw lines between them if it helps you.



a) Use the current divider concept to find the current through each of the resistors in the circuit at right.

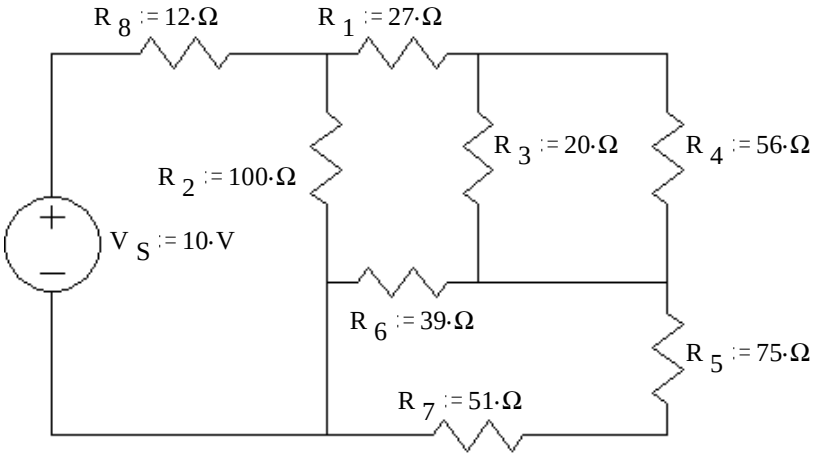
I_{R1} = ? I_{R2} = ?

I_{R3} = ? I_{R4} = ?

b) Confirm that $I_{R2} + I_{R3} = I_{R1}$ and that $I_{R1} + I_{R4} = I_S$, ie, confirm Kirchoff's current law twice.

c) Without recalculating anything, what would happen to all the currents if the source current were doubled? Tripled?

4. Refer back to the circuit of problem 2b.
a) Find the equivalent resistance as seen by the source (R_8 + your answer for problem 1b) and use that to find the source current (I_S or I_{R8}).



b) Find these currents by current divider methods.

I_{R2} = ?

I_{R1} = ?

I_{R4} = ?

c) Using Ohm's law and the currents you found in this problem, confirm the voltages found in problem 2b.

5. Refer to the circuit of problem 3.

a) how much power is dissipated by each resistor? P_{R1} = ? P_{R2} = ? P_{R3} = ? P_{R4} = ?

b) Independently determine the power that the source is contributing to the circuit. $P_S = V_S \cdot I_S$ = ?

c) Show that power is conserved.

Answers

1. a) $R_{eq} := 82.5 \cdot k\Omega$ b) $R_{eq} := 41.7 \cdot \Omega$

2. a) $5.54 \cdot V$, $17.35 \cdot V$, $13.11 \cdot V$ b) $2.23 \cdot V$, $7.77 \cdot V$, $2.93 \cdot V$

3. a) $17.67 \cdot mA$, $9.66 mA$, $8.01 \cdot mA$, $17.33 \cdot mA$ b) both check c) double, triple

4. a) $53.7 \cdot \Omega$, $0.186 \cdot A$ b) $77.7 \cdot mA$, $108.6 \cdot mA$, $28.6 \cdot mA$ c) all agree

5. a) $0.343 \cdot W$, $0.0634 \cdot W$, $0.0526 \cdot W$, $0.451 \cdot W$ b) $0.910 \cdot W$ c) $P_{R1} + P_{R2} + P_{R3} + P_{R4} = P_S$

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