Name: _____

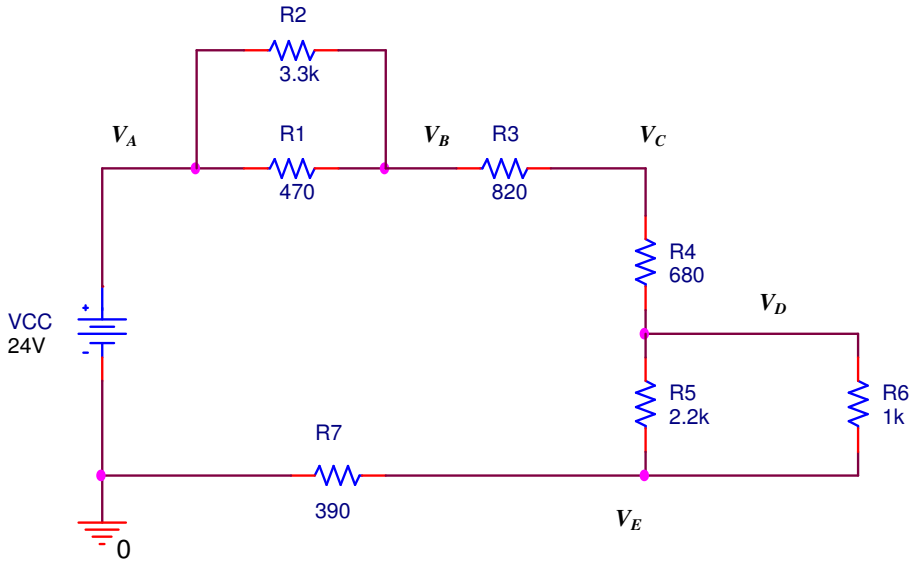
Basic DC Lab - ELEC 101L

LAB #14: Troubleshooting DC Circuits

In this lab the concepts troubleshooting DC Circuits will be explored. One circuit design will be used which has several different faults on different breadboards. The faults possible are an *open circuit*, a *short circuit*, and a *component out of spec.* (wrong component or it does not meet the tolerance requirements). Other common faults in circuits which have to do with the power supply are: supply is dead, out of spec., not turned on, or connected improperly. A power supply that is out of spec. or connected improperly can often damage other components in the circuit. Although common, power supply faults will be ignored in this lab.

PART I: Circuit Analysis and Simulation (20 pts)

All circuit designs must be tested to insure they are working before being used in products and industrial applications. The ability of a technician to troubleshoot both new designs and circuits in use is both important and common. To troubleshoot a circuit, a schematic and a list of voltages and currents is highly desirable. While it is often possible to troubleshoot circuits without any documentation, this usually takes much more time to understand (or reverse engineer) the circuit.



1. Build the schematic above in PSpice. Simulate it with node voltages and total current displayed, and print out the results. Make sure that in the printout it is easy to understand which voltage goes with which node, and which current goes with which branch.

2. Set up the power supply with 5VDC as specified in the circuit.

3. For future use calculate the equivalent resistances for R1||R2, and R5||R6.

R1||R2 = _____ R5||R6 =_____

4. When you are ready to proceed get the first circuit for troubleshooting from the lab instructor.

PART II: Circuit Measurement and Diagnosis (80 pts)

1. Write down the circuit number from the breadboard. Circuit Number: _____

2. Connect the 5VDC power supply to the circuit and write down the current reading

Measured: _____ PSpice: _____

3. Comparing the measured current the predicted the fault is likely be an

OPEN SHORT OUT of SPEC.

4. Now measure all the node voltages and compare them to PSpice Voltages

	V (measured)	V (PSpice)
Va		
Vb		
Vc		
Vd		
Ve		

5. As you look at the voltages around the loop is there a place where the voltage change is either very large (an open) or zero (a short)? If the fault has been isolated write the diagnosis at the bottom of the page.

6. For diagnosing some faults (open in a parallel branch, out of spec. component) the task is a bit more challenging. Without disassembling the circuit there are still ways to locate the problem. Use the measured current and voltage across resistors (between nodes) to determine the circuit resistances.

	Rx (spec.)	(Vx-Vy) (meas.)/I (meas.)
R1||R2, (Va-Vb)/I		
R3, (Vb-Vc)/I		
R4, (Vc-Vd)/I		
R5||R6, (Vd-Ve)/I		
R7, Ve/I		

7. The diagnosed fault for this circuit is _____

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