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EC ENGR 3 Lab 1B
Week 1 Lab 1

Multi-Meter Measurements

1.

Resistor #	Marked	DMM Measured	% Deviation from Marked
R1	3.3KΩ	3.238KΩ	1.9%
R2	2.2KΩ	2.159KΩ	1.8%
R3	1KΩ	1.004KΩ	0.4%

The % Deviation is less than the indicated tolerance.

2. 1200 ohms is within 20% of 1000 ohms, thus 1200 ohms at 20% would overlap with 1500 ohms and 1000 ohms.

3. a.
R1 Color Code Value: 2.2K R1 Measured Value: 2.176K
R2 Color Code Value: 100K R2 Measured Value: 99.5K

b.
RSeries Value: 101.6K RParallel Value: 2.148K

c.
RSeries Resistance Calculated: 101.7 Measured: 101.6 % Difference: 0.1%
RParallel Resistance Calculated: 2.129 Measured: 2.148 % Difference: 0.9%

d. In the parallel connection, the smaller resistor dominates.
e. In the series connection, the larger resistor dominates.

Measuring Internal Resistance of a Power Supply

Unloaded voltage (i.e. without 5 Ω resistor): 6.15 V
Loaded voltage (with 5 Ω resistor): 6.144 V
Voltage shift: 0.006 V
Calculate internal resistance: (Hint: The voltage divider equation will be useful here):
$V_x = V_0 R1/(R1+R2)$
$V_x = 6.144$
$V_0 = 6.15$
$R1 = 5$

Solving for R2 gets the resistance of 0.00488 ohms

Unloaded and Loaded Voltage Dividers

5.

	Unloaded Voltage Divider	Loaded Voltage Divider
Vout (measurement)	3.131 V	2.695V
Vupper1K (calculation)	2.869 V	3.305V
Itotal (calculation)	0.003131 amps	0.003305 amps

The increase in total current lowers the output voltage of the loaded voltage divider circuit because it goes through more resistance and there is more of a voltage drop in the first resistor.

Validation of Kirchhoff's Laws

2.

Measurement	Value
A	5.040
B	-1.674
C	-1.691
D	-1.676
E	0
F	1.689
G	0

3. Add measurements A through D: -0.001

4. Add measurements C, E, F, and G: -0.002

6.

Measurement	Value
A	5.038
B	-1.786
C	-1.465
D	-1.788
E	0.732
F	0
G	0.729

7.

Resistor	Current	Choose One
B	0.001786	Entering
C	0.001465	Leaving
G	0.000331	Leaving

9. 0.0001. Yes, because the measurements summed to 0 and the current through the node was conserved.