Lab 5

Node Voltage, Mesh Current, and Superposition

ELEN 50 Lab: Electric Circuits I

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Submitted
At

By:

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Laboratory Part 1: Node Voltage and Mesh Current Analyses

(Reference: Figure 1)

Table 2: Resistance Values

	R₁	R₂	R₃	R₄	R₅	R₆	R₇	
Nominal Values	1.2	2.2	2.7	3.3	3.9	10	15	kΩ
Measured Values	1.188	8.134	2.686	3.344	3.857	9.786	14.942	kΩ

Table 3: Node Voltage Analysis

	Theoretical (Measured R) (V)	Measured (V)	Percent Error (%)
V_a	8.352	8.400	0.575%
V_b	10.058	10.053	-0.050%
V_c	6.058	6.054	-0.066%
V_d	12.000	12.000	0.000%

Table 4: Mesh Current Analysis

	Theoretical (Measured R) (mA) (V)	Measured (mA) (V)	Percent Error (%)
i_1	1.712	1.719	0.409%
i_2	-0.354	-0.355	0.282%
i_3	-1.462	-1.462	0.000%
i_4	-1.920	-1.919	-0.052%
i_5	3.589	3.593	0.111%
V_a	7.966	7.953	-0.163%
V_b	10.843	10.840	-0.028%
V_c	6.843	6.840	-0.044%
V_d	12.000	12.000	0.000%

5. If there are any discrepancies, explain them.
   As demonstrated in Table 3 and 4, we have very small discrepancies between our measured and theoretical values.

Laboratory Part 2: Principle of Superposition
(Reference: Figure 2)

Vs1 Source Only

Table 5: Measured Currents and Voltage

	Theoretical (Measured R) (mA) (V)	Measured (mV, mA)	Percent Error (%)
I_5, V_{s1}	0.525	0.341	-35.048%
I_6, V_{s1}	-0.207	-0.206	-0.483%
I_7, V_{s1}	-0.135	-0.135	0.000%
V_c, V_{s1}	-2.024	-2.021	-0.148%

Vs2 Source Only

Table 6: Measured Currents and Voltage

	Theoretical (Measured R) (mA) (V)	Measured (V)	Percent Error (%)
I_5, V_{s2}	1.046	0.993	-5.067%
I_6, V_{s2}	0.61	0.588	-3.607%
I_7, V_{s2}	0.399	0.406	1.754%
V_c, V_{s2}	5.967	5.972	0.084%

Vs3 Source Only

Table 7: Measured Currents and Voltage

	Theoretical (Measured R) (mA) (V)	Measured (V)	Percent Error (%)
I_5, V_{s3}	1.015	1.024	0.887%

I$_6$,V$_{s3}$	0.826	0.806	-2.421%
I$_7$,V$_{s3}$	-0.261	-0.274	4.981%
V$_c$,V$_{s3}$	-3.914	-3.859	-1.405%

Table 8: Measured Currents and Voltage

	Theoretical (Measured R) (mA) (V)	Measured (mA) (V)	Percent Error (%)
I$_5$	2.586	2.358	-8.817%
I$_6$	1.229	1.188	-3.336%
I$_7$	0.003	0.003	0.000%
V$_c$	0.029	0.031	6.897%

6. If there are any discrepancies, explain them.
   As demonstrated in Table 5 to 8, we have very small discrepancies between our measured and theoretical values.