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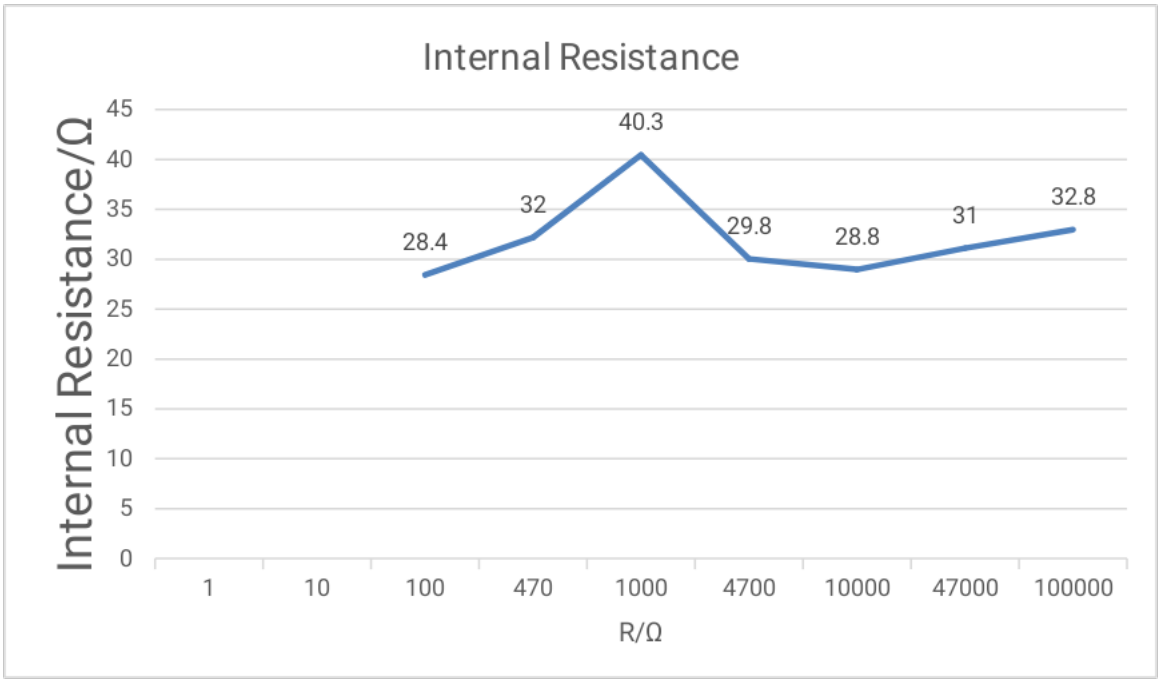
# Laboratory 3:
# Source and Thevenin's Theorem

## Part 1: Measuring a Battery

| | 100 Ω | 470 Ω | 1000 Ω |
|---|---|---|---|
| $V_o$ | 3.3V | 3.1V | 3.20V |
| $V_R$ | 2.48V | 3.01V | 3.11V |
| Internal Resistance | 28.4Ω | 32.0Ω | 40.3Ω |
| $I_R$ | 27.3mA | 6.3mA | 3.2mA |

| | 4700 Ω | 10 k Ω | 47k Ω | 100 k Ω |
|---|---|---|---|---|
| $V_o$ | 3.18V | 3.08V | 3.12V | 2.91V |
| $V_R$ | 3.16V | 3.07V | 2.98V | 2.90V |
| Internal Resistance | 29.8Ω | 28.8Ω | 31Ω | 32.8Ω |
| $I_R$ | 0.67mA | 0.36mA | 63μA | 28.μA |

Graph your results using a log scale for the X axis (ie one that goes 1,10,100,1000, 10,000).



Comment on the obtained results.

ANSWER： Ignore small errors, the internal resistance is 33Ω

## *Part 2: Theorem of Superposition*

| $V_1$ | $V_2$ | Voltage Across $R_T$ |
|---|---|---|
| 5 V | 3 V | 1.900V |
| 0 V | 3 V | 1.298V |
| 5 V | 0 V | 0.561V |

Comment on the algebraic sum of the voltages measured and compare with the original measurement.

ANSWER： Within the error range, the algebraic sum of the resistance measured when two power sources work alone is equal to the voltage when two power sources work together

| V1 | V2 | V1 and V2 active | V1 active and V2=0 | V1=0 and V2 active | V1+V2 effect |
|---|---|---|---|---|---|
| 5 | -2 | 0.923 | 1.328V | -0.384 | 0.944 |
| 5 | -1 | 1.088 | 1.327V | -0.183 | 1,144 |
| 5 | +1 | 1.485 | 1.326V | 0.182 | 1.508 |
| 5 | +2 | 1.680 | 1.332V | 0.369 | 1.701 |
| 5 | +3 | 1.897 | 1.329 | 0.570 | 1.899 |

Comment on your results：

ANSWER：For a linear system, the response (voltage or current) of any branch of a two-sided linear circuit containing multiple independent sources is equal to the algebraic sum of the response of each independent source acting independently, where all other independent sources are replaced by their respective impedances.

## *Part3: Thevenin's Theorem*

| $V_{thevenin}$ | 0.315V |
|---|---|
| $R_{thevenin}$ | 15873Ω |

Measure the voltage flowing through the 1k resistor. Comment on the degree of similarity (or not) with the results from Part 7.

ANSWER：The voltage through 1k resistance is 0.302.

CONCIUSION： Within the error range, the data obtained by the two measurements are basically similar and conform to Thevenin s Theorem.