“Leyes de Kirchhoff”

Practice 3

Cabañas Baxcajay Jesús Francisco

Hernández Velázquez Ángel

Martínez Coronel Brayan Yosafat

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# Practice development

## Checking the Kirchhoff’s law for voltage

With the voltage source turned off, build the circuit of the figure 1 over the protoboard. Once it is armed, set the values of the voltajes sources from the table below.

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I

Power

Value

Element

Figure 1. Circuit and values for the first circuit

Set the direction of the electric current and fill the table below with the data you recovered from the circuit.

Table 1. Values of theoretical values and experimental values

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Measures | Theoretical value (Voltage) | Measured value (Voltage) | Theoretical power | Measured power | Absorb (A) / Supply (S) |
| V0A | 9 V | 9 V | 0.26 W | 0.2646 W | S |
| VAB | -1.38 V | -1.386 V | 4 mW | 4.07 mW | A |
| VBC | -5 V | -5 V | 0.0145 W | 0.0197 W | A |
| VCD | -0.97 V | -0.961 V | 2.85 mW | 2.82 mW | A |
| VD0 | -1.64 V | -1.65 V | 4.82 mW | 4.851 mW | A |
|  |  |  |  |  |  |
|  | ∑V = 0.01 V | ∑V = 0.033 V | ∑P = 0.299 W | ∑P = 0.296 W |  |

Now we put the data on a graph to look at the differences of the empiric way and the math way.

## Checking the Kirchhoff’s law for electric current

With the voltage source turned off, build the circuit of the figure 2 over the protoboard. Once it is armed, set the values of the voltajes sources showed on the table below and connect the circuit.

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Descripción generada automáticamente

Power

Value

Element

Figure 2. Circuit 2 and values for the second circuit

For the electric currents, set directions on every branch of the circuit. Now fill the tables below.

Table 2. Values of electric currents

|  |  |  |
| --- | --- | --- |
| Measures | Theoretical value (amps) | Measured value (amps) |
| I1 (left branch) | 11 milliamps | 0.010 amps |
| I2 (middle branch) | 11.6 milliamps | 0.013 amps |
| I3 (right branch) | -0.6 milliamps | -1.708 milliamps |

Table 3. Values of voltages (theoretical and measured)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Measures | Theoretical value (Voltage) | Measured value (Voltage) | Theoretical power | Measured power | Absorb (A) / Supply (S) |
| V0A | 9 V | 9 V | 0.099 W | .099 W | S |
| VAB | -5.1 V | -4.956 V | 0.561 W | .0545 W | A |
| VB0 | -3.82 V | -4.094 V | 0.443 W | 0.0433 W | A |
| VBC | -0.336 V | -0.961 V | 0.0002 W | 0.1632 W | A |
| VC0 | 5 V | 5 V | 3 W | 4.78 W | S |
|  |  |  | ∑P = 4.99 W | ∑P = 5.14 W |  |

# Questionary

## what is a node in an electric circuit?

It is a point (not necessarily but easier to look at), where two (or more) electric elements are connected.

## What is an electric circuit?

It is an electrical network, which contains at least a closed path.

## Express in a mathematic form the kirchhoff’s law for electric current

where ∀I, I is in the studied node.

## What is a closed path in an electric circuit?

It is a path where you start from one of the nodes and using some paths of the circuit you return to the same node.

## What is an electric fall?

It is a point where voltage drops.

# Conclusions

## Cabañas Baxcajay Jesús Francisco

In this practice, we observed how currents work in circuits, it is hard to measure current on every single part from the circuit. Theoretical and measured are always different, but this does not affect too much. We hope to use this knowledge for better things in the future.

## Hernández Velázquez Ángel

In practice 3, we could observe the physical demonstration of Kirchhoff's laws, both current and voltage, we could observe how the voltage would be conserved when the circuit is in parallel, however, the problem was that we had more sources altering this value. The electric current, in the same way, was the sum of these in the nodes. This is how Kirchhoff's laws are proven.

## Martínez Coronel Brayan Yosafat

It is amazing the way we are improving, I think these topics should be obligatory with practices in all the school of our nation. If everyone knows how the electricity works, we could make more efficient our consuming of energy. As the other topics, this one is as important as those, now we can say that we can do analysis of our circuits, I think, one day, if we need to pay to an electrician engineer, we can easily know what to pay to him.

# Calculations

For 1st Circuit:

From LCK:

**-Vs1+ R1\*I + Vs2 +R2\*I + R3\*I = 0**

-9V+470I+5V+30I+560I=0

I=4/1360=0.0029A=2.9mA

Then, from Ohm Law, we substitute I in V=IR for each branch, and then P = VI

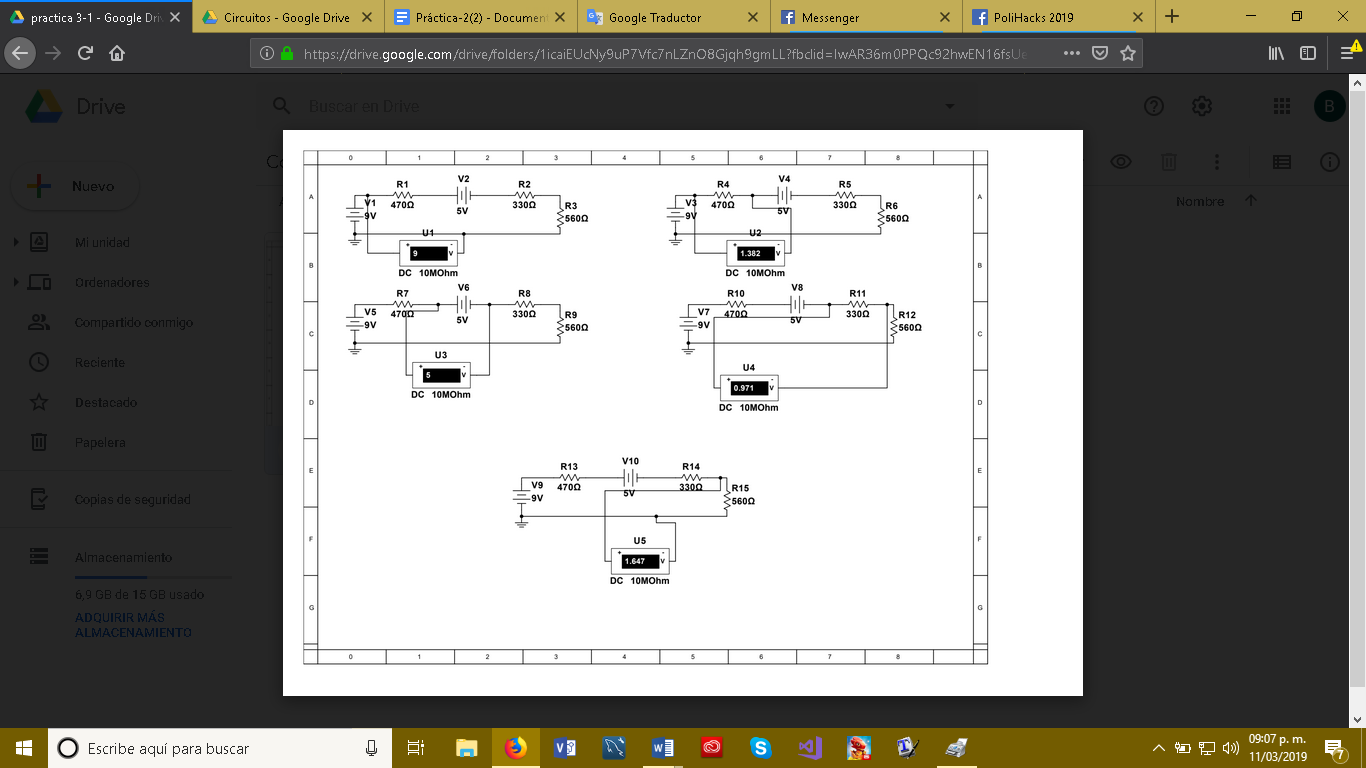
For 2nd Circuit:

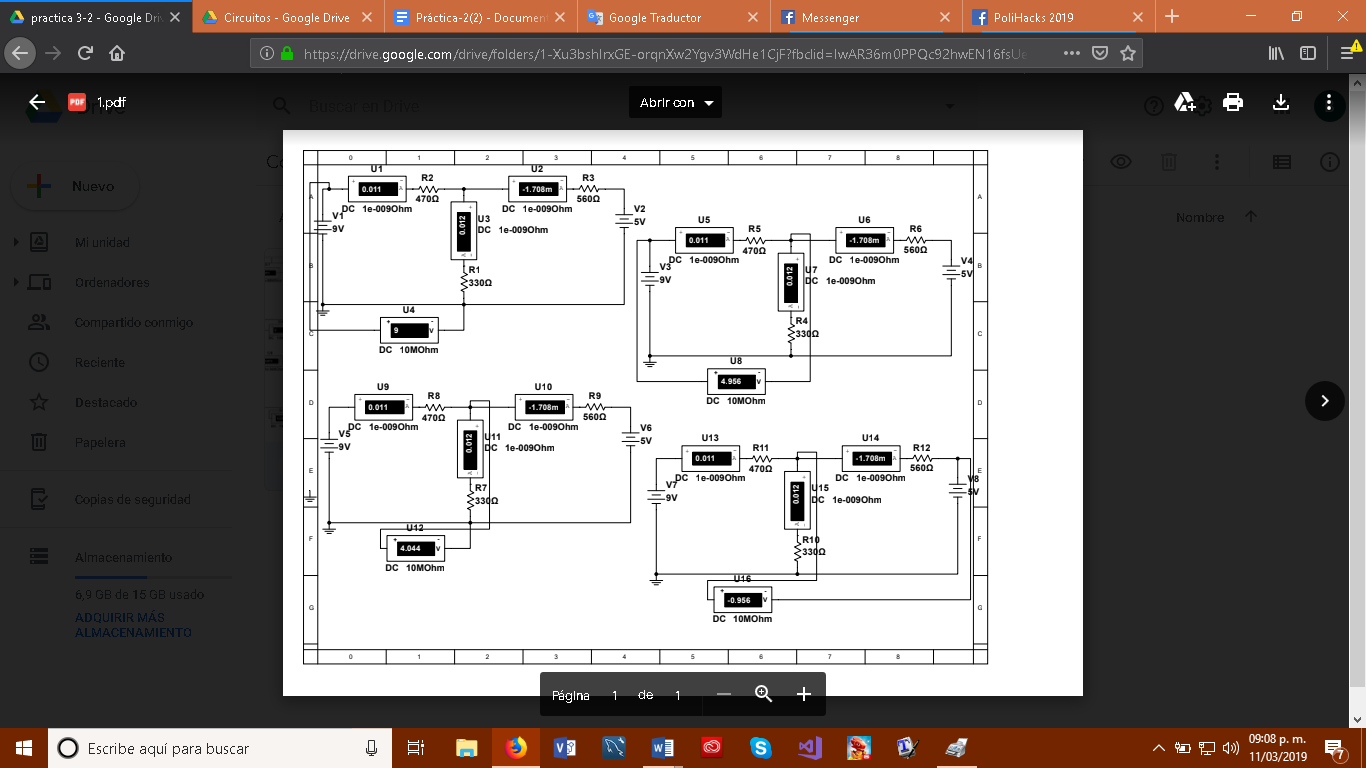
**I1+I2+I3=0**

For I2: -Vs1+R1\*I-R2\*I=0, -9V+470Ω\*11mA-330I=0, I2 = 11.60 and we already have I=11mA, so I3 = -0.60mA.

Then we use Ohm law for each branch, V=IR.

# Simulations





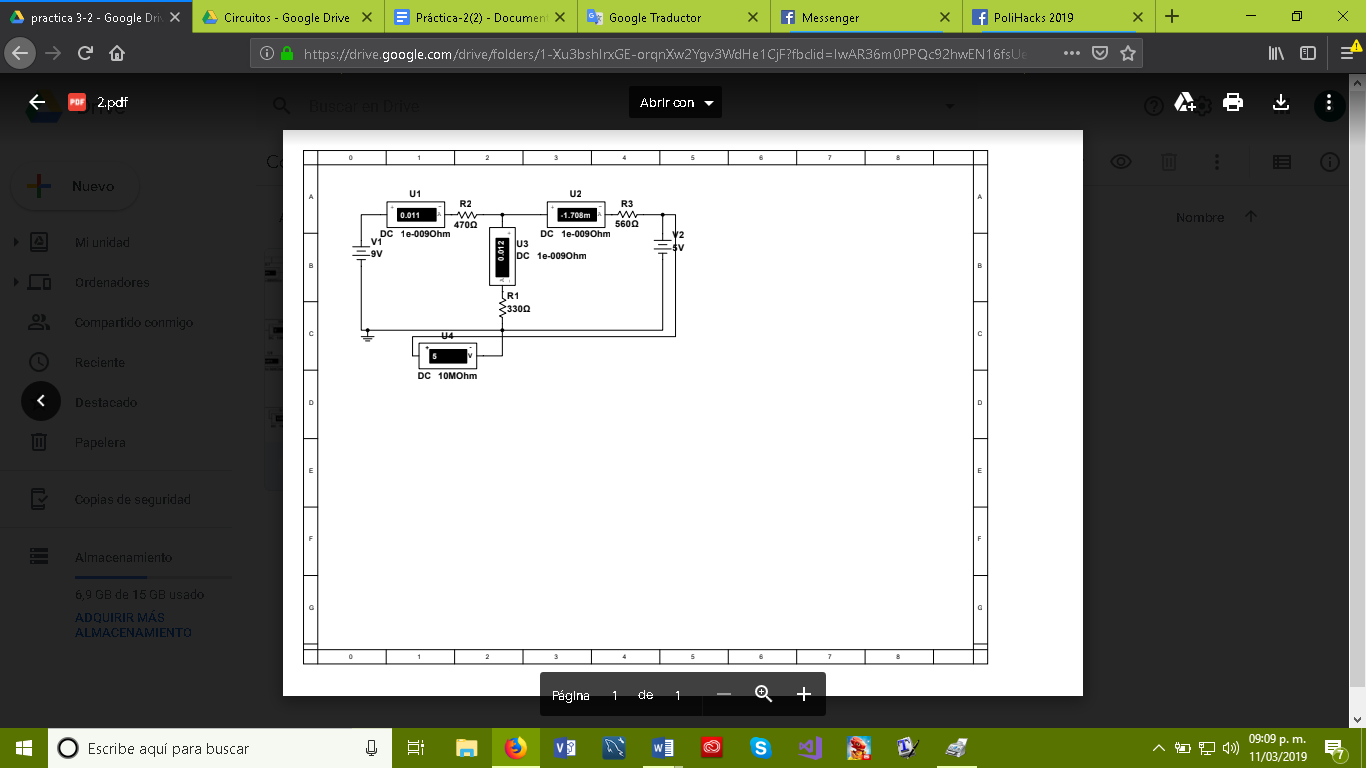


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