ANEXOS LABORATORIO 5

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Laboratorio de Circuitos Eléctricos NRC: 8703
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ANEXOS

Cálculos circuito equivalente Thévenin

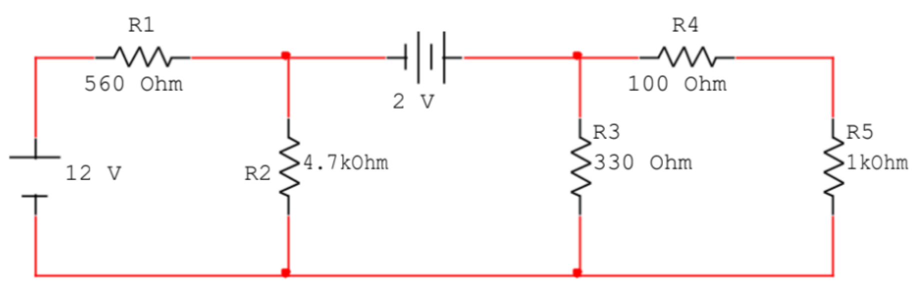

Figure 1. Circuito para comprobar el Teorema de Thévenin

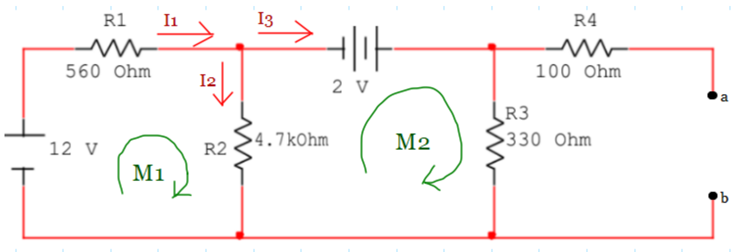

Figure 2. Primer paso, quitamos R5 y lo convertimos en una tensión en circuito abierto

A

$$I_1 - I_2 - I_3 = 0 \tag{0.1}$$

M1

$$\begin{aligned} 12V - 560I_1 - 4700I_2 = 0 \\ 560I_1 + 4700I_2 = 12V \\ \frac{560I_1 + 4700I_2 = 12V}{4} \\ 140I_1 + 1175I_2 = 3V \end{aligned} \tag{0.2}$$

M2

$$\begin{aligned} -2V - 330I_3 + 4700I_2 = 0 \\ 4700I_2 - 330I_3 = 2V \\ \frac{4700I_2 - 330I_3 = 2V}{2} \\ 2350I_2 + 165I_3 = 1V \end{aligned} \tag{0.3}$$

I_1	I_2	I_3	RTA
1	-1	-1	0
140	1175	0	3
0	2350	165	1

$$I_1 = 0,012A \tag{0.4}$$

$$I_2 = 0,0012A \tag{0.5}$$

$$I_3 = 0,011A \tag{0.6}$$

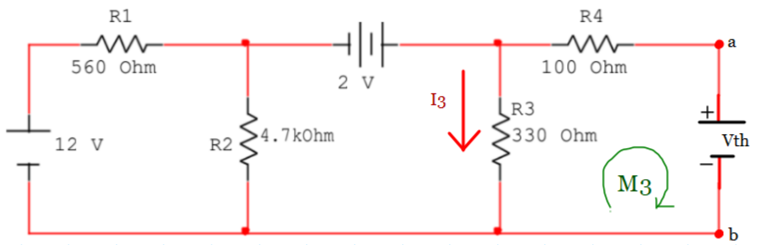

Figure 3. Calculamos el voltaje de Thévenin

$$\begin{aligned} -Vth + 330I_3 &= 0 \\ Vth &= 330I_3 \\ Vth &= 330(0,011) \\ Vth &= 3.63V \end{aligned} \tag{0.7}$$

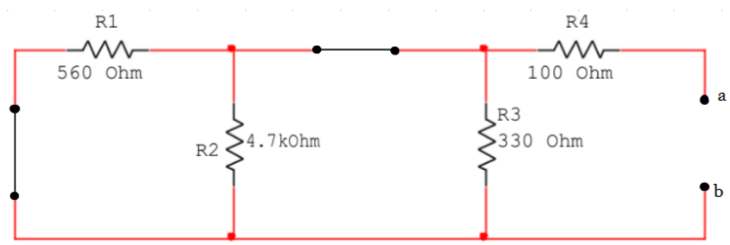

Figure 4.

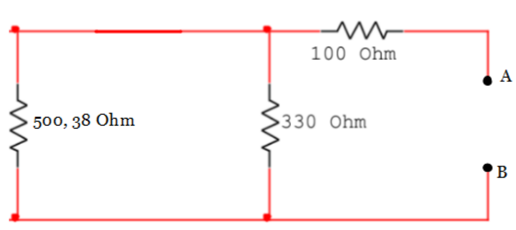

Figure 5.

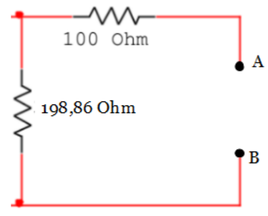

Figure 6.

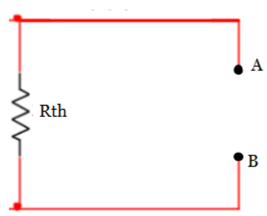

Figure 7.

$$
\begin{aligned}
Rth &= 100 + 198,86 \\
Rth &= 298,86 Ohm
\end{aligned} \tag{0.8}
$$

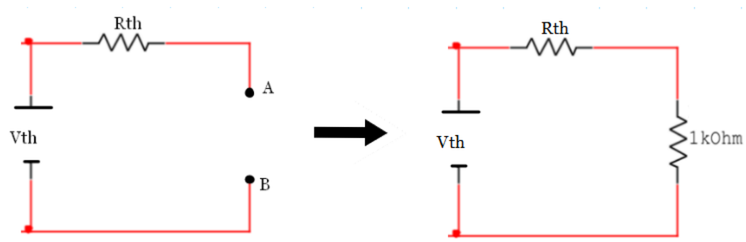

Figure 8.

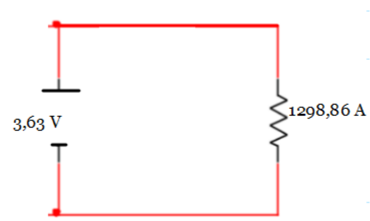

Figure 9.

$$
\begin{aligned}
I &= \frac{V}{R} \\
I &= \frac{3,63V}{1298,86Ohm} \\
I &= 2,79mA
\end{aligned}
\tag{0.9}
$$

$$
\begin{aligned}
V &= I \times R \\
V &= 2,79 \times 10^{-3} A \times 1000Ohm \\
V &= 2,79V
\end{aligned}
\tag{0.10}
$$

Cálculos circuito original

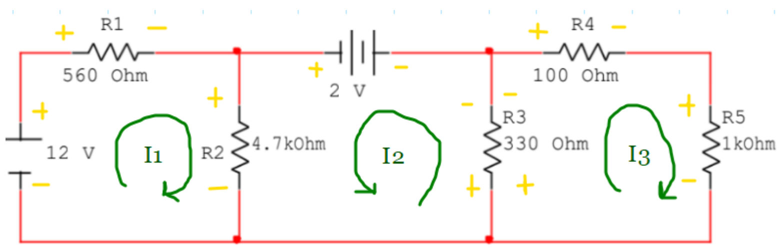

Figure 10. Circuito con direcciones de intensidades definidas

Malla 1

$$
\begin{aligned}
12V - 560I_1 - 4700I_1 - 4700I_2 &= 0 \\
-5260I_1 - 4700I_2 &= -12V
\end{aligned}
\tag{0.11}
$$

Malla 2

$$
\begin{aligned}
-4700I_1 - 4700I_2 + 2V - 330I_2 - 330I_3 &= 0 \\
-4700I_1 - 5030I_2 - 330I_3 &= -2V
\end{aligned}
\tag{0.12}
$$

Malla 3

$$
\begin{aligned}
-330I_3 - 330I_2 - 100I_3 - 1000I_3 &= 0 \\
-330I_2 - 1430I_3 &= 0
\end{aligned}
\tag{0.13}
$$

I_1	I_2	I_3	RTA
-5260	-4700	0	-12
-4700	-5030	-330	-2
0	-330	-1430	0

$$I_1 = 0,0125A \tag{0.14}$$

$$I_2 = 0,00116A \tag{0.15}$$

$$I_3 = 0,00267A \tag{0.16}$$

$$\begin{aligned} I_{R5} &= 0,00267A \\ I_{R5} &= 2,67mA \end{aligned} \tag{0.17}$$

$$\begin{aligned} V_{R5} &= I_{R5} \times R5 \\ V_{R5} &= 2,67 \times 10^{-3}A \times 1000Ohm \\ V_{R5} &= 2,67V \end{aligned} \tag{0.18}$$