

**Calcule el voltaje y corriente en el resistor R5**

**A:**  $560 I_1 + 4700 I_1 - 4700 I_2 = 12$

**B:**  $4700 I_2 - 4700 I_1 + 330 I_2 - 330 I_3 = 2$

**C:**  $100 I_3 + 1000 I_3 + 330 I_3 - 330 I_2 = 0$

**Resolvemos la ecuación**

**A:**  $5260 I_1 - 4700 I_2 = 12$

**B:**  $-4700 I_1 + 5030 I_2 - 330 I_3 = 2$

**C:**  $-330 I_2 + 1430 I_3 = 0$

**$I_1 = 17.3537 \text{ mA}$**

**$I_2 = 16.868 \text{ mA}$**

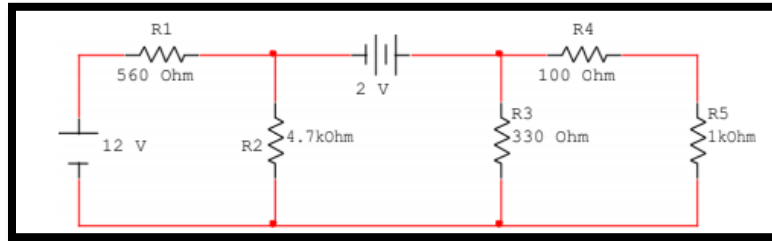
**$I_3 = 3.892 \text{ mA}$**

El voltaje y corriente que pasa por R5 es:

**$I_{R5} = 3.892 \text{ mA}$**

**$V_{R5} = 3.892 \text{ mA} * 1 \text{ k}\Omega$**

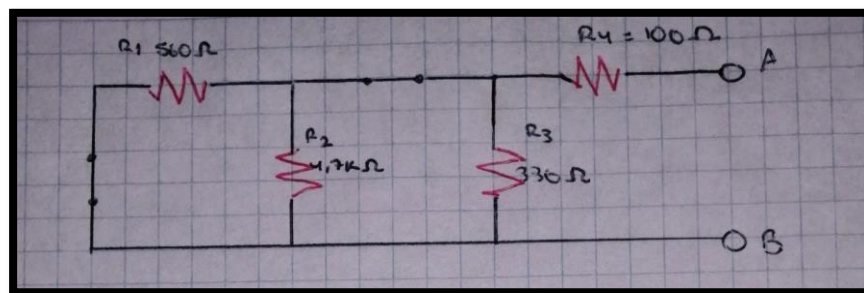
**$V_{R5} = 3.892 \text{ V}$**



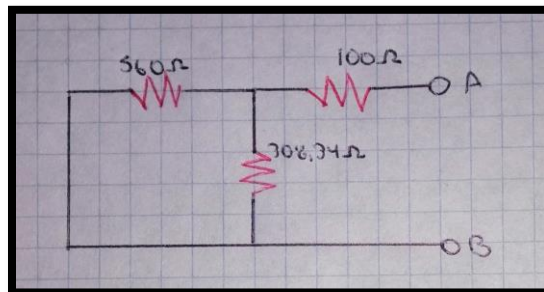
**Cálculos de la resistencia y del voltaje de Thévenin**

### Resistencia de Thévenin

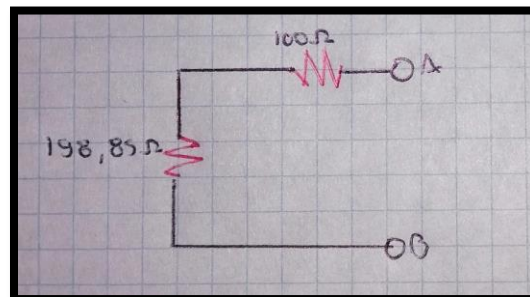
Para calcular la resistencia equivalente de Thevenin cortocircuitamos las fuentes de voltaje



$$R_{eq1} = \frac{(4700)(330)}{4700 + 330} = 308.34\Omega$$

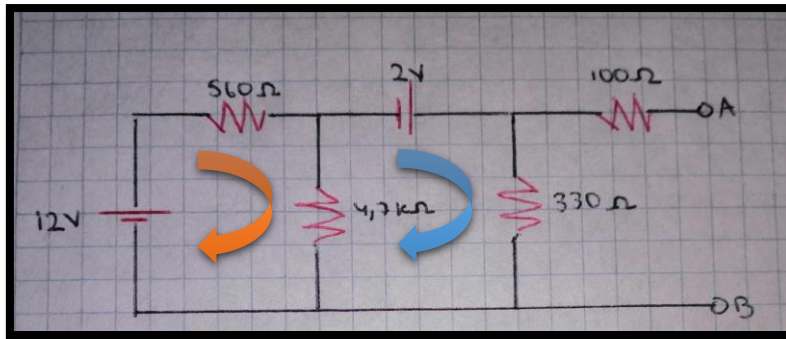


$$R_{eq2} = \frac{(560)(308.34)}{560 + 308.34} = 198.85\Omega$$



$$R_{TH} = 298.86\Omega$$

### Calculo voltaje de Thévenin



**A:**  $560 I_1 + 4700 I_1 - 4700 I_2 = 12$

**B:**  $4700 I_2 - 4700 I_1 + 330 I_2 = 2$

**A:**  $5260 I_1 - 4700 I_2 = 12$

**B:**  $-4700 I_1 + 5030 I_2 = 2$

**I1** = 15.97 mA

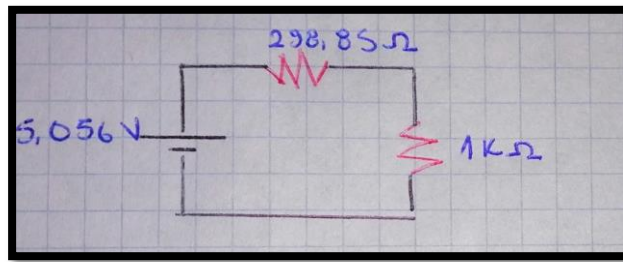
**I2** = 15.32 mA

### Calculamos el voltaje de Thevenin

$$V_{TH} = 0.01532A * 330\Omega$$

$$V_{TH} = 5.056V$$

**Implemente el circuito equivalente de Thévenin, agregue el resistor R5 y mida la corriente y el voltaje en el mismo.**



$$R_T = 1298.85 \, \Omega$$

$$I = \frac{5.056}{1298.85} = 3.8926 \, \text{mA}$$

$$I_{R5} = 3.892 \, \text{mA}$$

$$V_{R5} = 3.892 \, \text{V}$$

**Tabla 5.1.** Valores del circuito Equivalente de Thévenin

| $V_{TH} (V)$ |       | $R_{TH} (\Omega)$ |        |
|--------------|-------|-------------------|--------|
| Calculado    | 5.056 | Calculado         | 298.85 |
| Medido       | 5.06  | Medido            | 299    |

**Tabla 5.2.** Comprobación del teorema de Thévenin

| Parámetro Eléctrico | Circuito Original |        | Circuito Equivalente de Thévenin |        |
|---------------------|-------------------|--------|----------------------------------|--------|
|                     | Calculado         | Medido | Calculado                        | Medido |
| Voltaje (V)         | 3.892             | 3.89   | 3.892                            | 3.85   |
| Corriente (mA)      | 3.892             | 3.89   | 3.892                            | 3.85   |

### Cálculo de errores

#### Error porcentual en Voltaje de Thévenin

$$e\% = \frac{V_t - V_e}{V_t} \times 100 = \frac{5.056 - 5.06}{5.056} = 0.0007\%$$

#### Error porcentual en Resistencia de Thévenin

$$e\% = \frac{V_t - V_e}{V_t} \times 100 = \frac{298.85 - 299}{298.85} \times 100\% = 0.0005\%$$

#### Errores en circuito original

##### Voltaje

$$e\% = \frac{V_t - V_e}{V_t} \times 100 = \frac{3.892 - 3.89}{3.892} = 0.0005\%$$

##### Corriente

$$e\% = \frac{V_t - V_e}{V_t} \times 100 = \frac{3.892 - 3.89}{3.892} = 0.0005\%$$

#### Errores en circuito Equivalente de Thévenin

##### Voltaje

$$e\% = \frac{V_t - V_e}{V_t} \times 100 = \frac{3.892 - 3.85}{3.892} = 0.01\%$$

##### Corriente

$$e\% = \frac{V_t - V_e}{V_t} \times 100 = \frac{3.892 - 3.85}{3.892} = 0.01\%$$