Resolución de circuito

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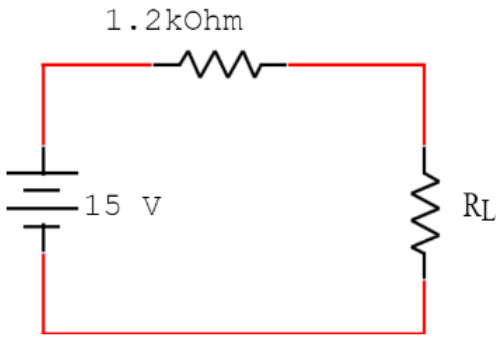
1 Voltaje, Corriente y Potencia



Se procede a calcular el voltaje, la corriente y la potencia de RL, con cada uno de los siguientes valores de RL.

Resistor de 220 Ω
Resistor de 470 Ω
Resistor de 680 Ω
Resistor de 820 Ω
Resistor de 1 kΩ
Resistor de 1.5 kΩ
Resistor de 1.8 kΩ
Resistor de 2.2 kΩ
Resistor de 3.9 kΩ
Resistor de 4.7 kΩ

Para hallar el voltaje se utiliza divisor de voltaje en la resistencia RL

$$V_{RL} = \frac{RL}{1200 + RL} \cdot 15$$

Para hallar la corriente se utiliza la Ley de Ohm con el voltaje hallado V_{RL}.

$$I = \frac{15}{RL + 1200}$$

Para hallar la potencia de RL se utiliza la ecuación

$$P_{RL} = \left(\frac{15}{RL + 1200}\right)^2 \cdot RL$$

1. **Resistencia 220 Ω**
   - Voltaje

$$V_{220} = \frac{220}{1200 + 220} \cdot 15$$
$$V_{220} = 2.3239\,[V]$$

- Corriente

$$I_{220} = \frac{15}{1200 + 220}$$
$$I_{220} = 10.56\,[mA]$$

- Potencia

$$P_{220} = \left(\frac{15}{220 + 1200}\right)^2 \cdot 220$$
$$P_{220} = 24,5487\,[mW]$$

2. **Resistencia 470 Ω**

- Voltaje

$$V_{470} = \frac{470}{1200 + 470} \cdot 15$$
$$V_{470} = 4.2216\,[V]$$

- Corriente

$$I_{470} = \frac{15}{1200 + 470}$$
$$I_{470} = 8.9820\,[mA]$$

- Potencia

$$P_{470} = \left(\frac{15}{470 + 1200}\right)^2 \cdot 470$$
$$P_{470} = 37.9182\,[W]$$

3. **Resistencia 680 Ω**

- Voltaje

$$V_{680} = \frac{680}{1200 + 680} \cdot 15$$
$$V_{680} = 5.4255\,[V]$$

- Corriente

$$I_{680} = \frac{15}{1200 + 680}$$
$$I_{680} = 7.9787\,[mA]$$

- Potencia

$$P_{680} = \left(\frac{15}{680 + 1200}\right)^2 \cdot 680$$
$$P_{680} = 43.2888\,[W]$$

4. **Resistencia 820 Ω**

- Voltaje

$$V_{820} = \frac{820}{1200 + 820} \cdot 15$$
$$V_{820} = 6.08\ [V]$$

- Corriente

$$I_{820} = \frac{15}{820 + 1200}$$
$$I_{820} = 7.42\ [mA]$$

- Potencia

$$P_{820} = \left(\frac{15}{820 + 1200}\right)^2 \cdot 820$$
$$P_{820} = 45.2161\ [mW]$$

5. **Resistencia 1000 Ω**

- Voltaje

$$V_{1000} = \frac{1000}{1200 + 1000} \cdot 15$$
$$V_{1000} = 6.8181\ [V]$$

- Corriente

$$I_{1000} = \frac{15}{1000 + 1200}$$
$$I_{1000} = 6.8181\ [mA]$$

- Potencia

$$P_{1000} = \left(\frac{15}{1000 + 1200}\right)^2 \cdot 1000$$
$$P_{1000} = 46.4876\ [mW]$$

6. **Resistencia 1500 Ω**

- Voltaje

$$V_{1500} = \frac{1500}{1200 + 1500} \cdot 15$$
$$V_{1500} = 8.3333\ [V]$$

- Corriente

$$I_{1500} = \frac{15}{1500 + 1200}$$
$$I_{1500} = 5.5555\ [mA]$$

- Potencia

$$P_{1500} = \left(\frac{15}{1500 + 1200}\right)^2 \cdot 1500$$
$$P_{1500} = 46.2962\ [mW]$$

7. **Resistencia 1800 Ω**

- Voltaje

$$V_{1800} = \frac{1800}{1200 + 1800} \cdot 15$$
$$V_{1800} = 9.0\ [V]$$

- Corriente

$$I_{1800} = \frac{15}{1200 + 1800}$$
$$I_{1800} = 5.0\,[mA]$$

- Potencia

$$P_{1800} = \left(\frac{15}{1800 + 1200}\right)^2 \cdot 1800$$
$$P_{1800} = 45.0\,[mW]$$

8. **Resistencia 2200 Ω**

- Voltaje

$$V_{2200} = \frac{2200}{1200 + 2200} \cdot 15$$
$$V_{2200} = 9.7058\,[V]$$

- Corriente

$$I_{2200} = \frac{15}{1200 + 2200}$$
$$I_{2200} = 4.4118\,[mA]$$

- Potencia

$$P_{2200} = \left(\frac{15}{2200 + 1200}\right)^2 \cdot 2200$$
$$P_{2200} = 42.8200\,[mW]$$

9. **Resistencia 3900 Ω**

- Voltaje

$$V_{3900} = \frac{3900}{1200 + 3900} \cdot 15$$
$$V_{3900} = 11.4706\,[V]$$

- Corriente

$$I_{3900} = \frac{15}{1200 + 3900}$$
$$I_{3900} = 2.9812\,[mA]$$

- Potencia

$$P_{3900} = \left(\frac{15}{3900 + 1200}\right)^2 \cdot 3900$$
$$P_{3900} = 33.7370\,[mW]$$

10. **Resistencia 4700 Ω**

- Voltaje

$$V_{4700} = \frac{4700}{1200 + 4700} \cdot 15$$
$$V_{4700} = 11.9491\,[V]$$

- Corriente

$$I_{4700} = \frac{15}{1200 + 4700}$$
$$I_{4700} = 2.5424\,[mA]$$

- Potencia

$$P_{4700} = \left(\frac{15}{4700 + 1200}\right)^2 \cdot 4700$$
$$P_{4700} = 30.3792\,[mW]$$

2 CÁLCULO DE ERROR

Se hace el respectivo cálculo del error porcentual en cada una de las potencias que fueron calculadas. Para esto se utiliza la siguiente ecuación:

$$E\% = \frac{|P_{teorica} - P_{experimental}|}{P_{teorica}} \cdot 100$$

1. **Resistencia 220 Ω**

   $P_{experimental} = 24.7$

$$E\% = \frac{|24.5487 - 24.7|}{24.5487} \cdot 100$$
$$E\% = 0.6163\%$$

2. **Resistencia 470 Ω**

   $P_{experimental} = 37.9$

$$E\% = \frac{|37.9182 - 37.9|}{37.9182} \cdot 100$$
$$E\% = 0.0479\%$$

3. **Resistencia 680 Ω**

   $P_{experimental} = 43.33$

$$E\% = \frac{|43.2888 - 43.33|}{43.2888} \cdot 100$$
$$E\% = 0.0951\%$$

4. **Resistencia 820 Ω**

   $P_{experimental} = 45.19$

$$E\% = \frac{|45.2161 - 45.19|}{45.2161} \cdot 100$$
$$E\% = 0.0577\%$$

5. **Resistencia 1000 Ω**

   $P_{experimental} = 46.51$

$$E\% = \frac{|46.4876 - 46.51|}{46.4876} \cdot 100$$
$$E\% = 0.0481\%$$

6. **Resistencia 1500 Ω**

   $P_{experimental} = 46.23$

$$E\% = \frac{|46.2962 - 46.23|}{46.2962} \cdot 100$$
$$E\% = 0.1429\%$$

7. **Resistencia 1800 Ω**

   $P_{experimental} = 45.00$

$$E\% = \frac{|45.0000 - 45.00|}{45.0000} \cdot 100$$
$$E\% = 0.0000\%$$

8. **Resistencia 2200 Ω**

   $P_{experimental} = 42.82$

$$E\% = \frac{|42.8200 - 42.82|}{42.8200} \cdot 100$$
$$E\% = 0.0000\%$$

9. **Resistencia 3900 Ω**

   $P_{experimental} = 33.81$

$$E\% = \frac{|33.7370 - 33.81|}{33.7370} \cdot 100$$
$$E\% = 0.2163\%$$

10. **Resistencia 4700 Ω**

    $P_{experimental} = 30.23$

$$E\% = \frac{|30.3792 - 30.23|}{30.3792} \cdot 100$$
$$E\% = 0.4911\%$$

El error de la potencia máxima transferida es de 0.0481%, la cual pasa por la resistencia de 1000Ω.