Practica Nº6 Teorema de la Máxima transferencia de potencia

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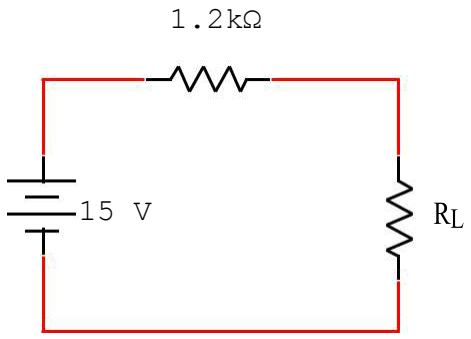
1º-Material y equipo necesario.

Cantidad	Elemento
1	Fuente de Voltaje de C.D.
1	Multímetro Digital
1	Resistor de 220
1	Resistor de 470
1	Resistor de 680
1	Resistor de 820
1	Resistor de 1 k
1	Resistor de 1.5 k
1	Resistor de 1.8 k
1	Resistor de 2.2 k
1	Resistor de 3.9 k
1	Resistor de 4.7 k
1	Protoboard

2º- Arme el circuito que se muestre en la figura.



3º Parámetros eléctricos del circuito de la figura.

R_L (Ω)	Corriente medida (mA)	Voltaje medido (V)	Potencia calculada experimentalmente (W)	Potencia calculada teóricamente (W)
220	10.6mA	2.32V	24.7192mW	$24.5483mW$
470	8.98mA	4.22V	37.9009mW	$37.9178mW$
680	7.98mA	5.43V	43.3026mW	$43.2885mW$
820	7.43mA	6.09V	45.2680mW	$45.2156mW$
1000	6.81mA	6.81V	46.3761mW	$46.4864mW$

1500	5.56mA	8.33V	46.3704mW	$46.2953mW$
1800	5mA	9V	45mW	$45mW$
2200	4.41 mA	9.71 V	42.7858mW	$42.8188mW$
3900	2.94 mA	11.5V	33.7104mW	$33.7352mW$
4700	2.54mA	11.9V	30.3225mW	$30.3774mW$

4º Cálculos.

Usando la ley de ohm $I = \frac{V}{R}$ y la formula de la potencia $P = I^2 * R$ Para determinar la potencia suministrada a la carga, Pl, con cada uno de los valores de resistencia de carga.

- Para RL=220Ω

$$I = \frac{Vs}{Rs + Rl} = \frac{15v}{1.2k\Omega + 0.22k\Omega} = 10.5633mA$$

$$V = I * Rl = 10.5633ma * 0.22k\Omega = 2.3239V$$

$$P = I^2 * Rl = (10.5633ma)^2 * 0.22k\Omega = 24.5483mW$$

- Para RL=470Ω

$$I = \frac{Vs}{Rs + Rl} = \frac{15v}{1.2k\Omega + 0.47k\Omega} = 8.9820mA$$

$$V = I * Rl = 8.9820mA * 0.47k\Omega = 4.2215V$$

$$P = I^2 * Rl = (8.9820mA)^2 * 0.47k\Omega = 37.9178mW$$

- Para RL=680Ω

$$I = \frac{Vs}{Rs + Rl} = \frac{15v}{1.2k\Omega + 0.68k\Omega} = 7.9787mA$$

$$V = I * Rl = 7.9787mA * 0.68k\Omega = 5.4255V$$

$$P = I^2 * Rl = (7.9787mA)^2 * 0.68k\Omega = 43.2885mW$$

- Para RL=820Ω

$$I = \frac{Vs}{Rs + Rl} = \frac{15v}{1.2k\Omega + 0.82k\Omega} = 7.4257mA$$

$$V = I * Rl = 7.4257mA * 0.82k\Omega = 6.0891V$$

$$P = I^2 * Rl = (7.4257mA)^2 * 0.82k\Omega = 45.2156mW$$

- Para RL=1000Ω

$$I = \frac{Vs}{Rs + Rl} = \frac{15v}{1.2k\Omega + 1k\Omega} = 6.8181mA$$

$$V = I * Rl = 6.8181mA * 1k\Omega = 6.8181V$$

$$P = I^2 * Rl = (6.8181mA)^2 * 1k\Omega = 46.4864mW$$

- Para RL=1500Ω

$$I = \frac{Vs}{Rs + Rl} = \frac{15v}{1.2k\Omega + 1.5k\Omega} = 5.5555mA$$

$$V = I * Rl = 5.5555mA * 1.5k\Omega = 8.3333V$$

$$P = I^2 * Rl = (5.5555mA)^2 * 1.5k\Omega = 46.2953mW$$

- Para RL=1800Ω

$$I = \frac{Vs}{Rs + Rl} = \frac{15v}{1.2k\Omega + 1.8k\Omega} = 5mA$$

$$V = I * Rl = 5mA * 1.8k\Omega = 9V$$

$$P = I^2 * Rl = (5mA)^2 * 1.8k\Omega = 45mW$$

- Para RL=2200Ω

$$I = \frac{Vs}{Rs + Rl} = \frac{15v}{1.2k\Omega + 2.2k\Omega} = 4.4117mA$$

$$V = I * Rl = 4.4117mA * 2.2k\Omega = 9.7058V$$

$$P = I^2 * Rl = (4.4117mA)^2 * 2.2k\Omega = 42.8188mW$$

- Para RL=3900Ω

$$I = \frac{Vs}{Rs + Rl} = \frac{15v}{1.2k\Omega + 3.9k\Omega} = 2.9411mA$$

$$V = I * Rl = 2.9411ma * 3.9k\Omega = 11.4705V$$

$$P = I^2 * Rl = (2.9411mA)^2 * 3.9k\Omega = 33.7352mW$$

- Para RL=4700Ω

$$I = \frac{Vs}{Rs + Rl} = \frac{15v}{1.2k\Omega + 4.7k\Omega} = 2.5423mA$$

$$V = I * Rl = 2.5423mA * 4.7k\Omega = 11.9491V$$

$$P = I^2 * Rl = (2.5423mA)^2 * 4.7k\Omega = 30.3774mW$$

5º Cálculo del error.

$$Error = \frac{Valor\ teorico - Valor\ medido}{Valor\ teorico} * 100\%$$

- Para RL=220Ω

$$Error(I) = \frac{10.5633mA - 10.6mA}{10.5633mA} * 100\% = 0.00347\%$$

$$Error(V) = \frac{2.3239V - 2.32V}{2.3239V} * 100\% = 0.00168\%$$

$$Error(P) = \frac{24.5483mW - 24.7192mW}{24.5483mW} * 100\% = 0.00696\%$$

- Para RL=470Ω

$$Error(I) = \frac{8.9820mA - 8.98mA}{8.9820mA} * 100\% = 0.000222\%$$

$$Error(V) = \frac{4.2215V - 4.22V}{4.2215V} * 100\% = 0.000355\%$$

$$Error(P) = \frac{37.9178mW - 37.9009\text{mW}}{37.9178mW} * 100\% = 0.000445\%$$

- Para RL=680Ω

$$Error(I) = \frac{7.9787mA - 7.98mA}{7.9787mA} * 100\% = 0.000162\%$$

$$Error(V) = \frac{5.4255V - 5.43V}{5.4255V} * 100\% = 0.000829\%$$

$$Error(P) = \frac{43.2885mW - 43.3026\text{mW}}{43.2885mW} * 100\% = 0.000325\%$$

- Para RL=820Ω

$$Error(I) = \frac{7.4257mA - 7.43\ mA}{7.4257mA} * 100\% = 0.000579\%$$

$$Error(V) = \frac{6.0891V - 6.09\ V}{6.0891V} * 100\% = 0.000147\%$$

$$Error(P) = \frac{45.2156mW - 45.2680\text{mW}}{45.2156mW} * 100\% = 0.00115\%$$

- Para RL=1000Ω

$$Error(I) = \frac{6.8181mA - 6.82\ mA}{6.8181mA} * 100\% = 0.000278\%$$

$$Error(V) = \frac{6.8181V - 6.82\ V}{6.8181V} * 100\% = 0.000278\%$$

$$Error(P) = \frac{46.4864mW - 46.3761\text{mW}}{46.4864mW} * 100\% = 0.00237\%$$

- Para RL=1500Ω

$$Error(I) = \frac{5.5555mA - 5.56\ mA}{5.5555mA} * 100\% = 0.000810\%$$

$$Error(V) = \frac{8.3333V - 8.33\ V}{8.3333V} * 100\% = 0.000396\%$$

$$Error(P) = \frac{46.2953mW - 46.3704\text{mW}}{46.2953mW} * 100\% = 0.00162\%$$

- Para RL=1800Ω

$$Error(I) = \frac{5mA - 5\ mA}{5mA} * 100\% = 0\%$$

$$Error(V) = \frac{9V - 9V}{9V} * 100\% = 0\%$$

$$Error(P) = \frac{45mW - 45mW}{45mW} * 100\% = 0\%$$

- Para RL=2200Ω

$$Error(I) = \frac{4.4117mA - 4.41\ mA}{4.4117mA} * 100\% = 0.000385\%$$

$$Error(V) = \frac{9.7058V - 9.71\,V}{9.7058V} * 100\% = 0.000432\%$$

$$Error(P) = \frac{42.8188mW - 42.7858\text{mW}}{42.8188mW} * 100\% = 0.000770\%$$

- Para RL=3900Ω

$$Error(I) = \frac{2.9411mA - 2.94\,mA}{2.9411mA} * 100\% = 0.000374\%$$

$$Error(V) = \frac{11.4705V - 11.5\,V}{11.4705V} * 100\% = 0.00257\%$$

$$Error(P) = \frac{33.7352mW - 33.7104\text{mW}}{33.7352mW} * 100\% = 0.000735\%$$

- Para RL=4700Ω

$$Error(I) = \frac{2.5423mA - 2.54\,mA}{2.5423mA} * 100\% = 0.000904\%$$

$$Error(V) = \frac{11.9491V - 11.9\,V}{11.9491V} * 100\% = 0.000410\%$$

$$Error(P) = \frac{30.3774mW - 30.3225\text{mW}}{30.3774mW} * 100\% = 0.00180\%$$