

Regles de Kirchhoff

Grup: 7 13

Cognoms: TRAVEPIA MARTI

Lloc de treball (A1,B2,...): C1 Nom: ALEJANDRA

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Qualificació:

Mesura de resistències i forces electromotrius

| | |
|---------------------------------|---------------------------------|
| $R_1 (200\Omega) = 202,4\Omega$ | $R_4 (50\Omega) = 54,6\Omega$ |
| $R_2 (25\Omega) = 30\Omega$ | $R_5 (200\Omega) = 203,6\Omega$ |
| $R_3 (100\Omega) = 104,9\Omega$ | $R_6 (50\Omega) = 56,6\Omega$ |

$$\varepsilon_1 (15V) = 15,02V$$

$$\varepsilon_2 (5V) = 5,01V$$

1. Intensitats teòriques i experimentals. Comprovació de la llei d'Ohm

| | |
|---------------------|---------------------|
| $I_1^{te} = 56,2mA$ | $I_1^{ex} = 55,5mA$ |
| $I_2^{te} = 37,8mA$ | $I_2^{ex} = 37,0mA$ |
| $I_3^{te} = 27,2mA$ | $I_3^{ex} = 26,2mA$ |
| $I_4^{te} = 45,6mA$ | $I_4^{ex} = 43,5mA$ |
| $I_5^{te} = 18,3mA$ | $I_5^{ex} = 18,0mA$ |

| | |
|---------------------|-------------------------|
| $V_1^{ex} = 11,16V$ | $R_1 I_1^{ex} = 11,23V$ |
| $V_2^{ex} = 0,916V$ | $R_2 I_2^{ex} = 1,11V$ |
| $V_3^{ex} = 2,74V$ | $R_3 I_3^{ex} = 2,75V$ |
| $V_4^{ex} = 2,32V$ | $R_4 I_4^{ex} = 2,37V$ |
| $V_5^{ex} = 3,64V$ | $R_5 I_5^{ex} = 3,66V$ |
| $V_6^{ex} = 2,88V$ | $R_6 I_6^{ex} = 3,14V$ |

2. Verificació de les regles de Kirchhoff

Regla dels nusos

| | | |
|-------|--------------------------------|--------------------------------|
| Nus A | $I_1^{ex} + I_3^{ex} = 81,7mA$ | $I_2^{ex} + I_4^{ex} = 80,5mA$ |
| Nus C | $I_5^{ex} + I_3^{ex} = 44,2mA$ | $I_4^{ex} = 43,5mA$ |

Regla de les malles

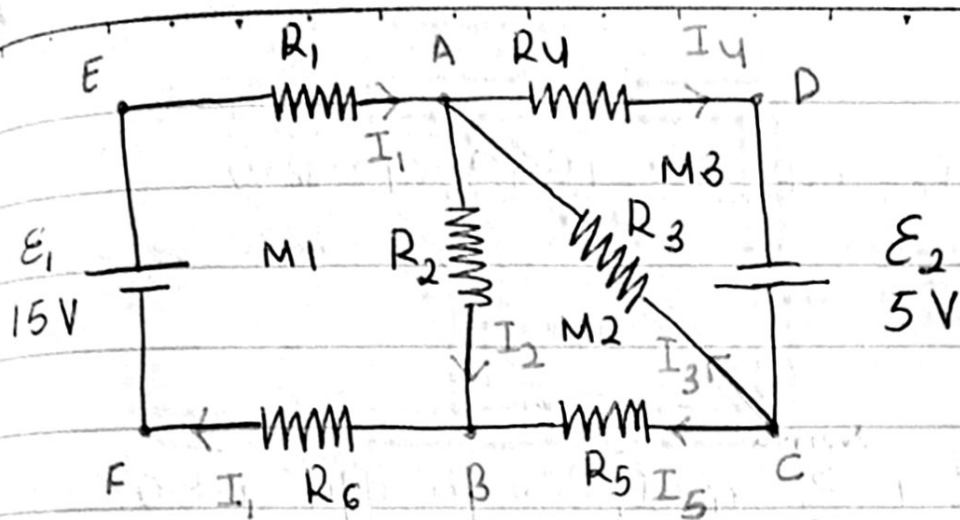
| | | |
|---------|-------------------------------------------------------|--------------------------|
| Malla 1 | $R_1 I_1^{ex} + R_2 I_2^{ex} + R_6 I_6^{ex} = 15,48V$ | $\varepsilon_1 = 15,02V$ |
| Malla 2 | $R_2 I_2^{ex} + R_3 I_3^{ex} = 3,85V$ | $R_5 I_5^{ex} = 3,66V$ |
| Malla 3 | $R_4 I_4^{ex} + R_3 I_3^{ex} = 5,12V$ | $\varepsilon_2 = 5,01V$ |

3. Comprovació del principi de conservació de l'energia

| | | | |
|----------------------------------------------------------------------|--------------------|-------------------------------------------------|------------------------------|
| $P_{R_1} = 0,62W$ | $P_{R_2} = 0,034W$ | $P_{R_3} = 0,072W$ | $P_{R_4} = 0,103W$ |
| $P_{R_5} = 0,066W$ | $P_{R_6} = 0,174W$ | $P_{\varepsilon_1} = 0,933W$ | $P_{\varepsilon_2} = 0,217W$ |
| $P_{R_1} + P_{R_2} + P_{R_3} + P_{R_4} + P_{R_5} + P_{R_6} = 1,069W$ | | $P_{\varepsilon_1} + P_{\varepsilon_2} = 1,15W$ | |

$$8 + 15 = 95$$

PRACTICA 3. REGLAS DE KIRCHHOFF



$$\begin{aligned} R_1 &= 200 \, \Omega & R_4 &= 50 \, \Omega \\ R_2 &= 25 \, \Omega & R_5 &= 200 \, \Omega \\ R_3 &= 100 \, \Omega & R_6 &= 50 \, \Omega \end{aligned}$$

NUSA A : $I_1 + I_3 = I_2 + I_4$

NUSA C : $I_4 = I_5 + I_3$

MAIJA 1 : $200 I_1 + 25 I_2 + 50 I_1 - 15 = 0$
 $250 I_1 + 25 I_2 = 15$

MAIJA 2 : $25 I_2 - 200 I_5 + 100 I_3 = 0$

MAIJA 3 : $100 I_3 + 50 I_4 - 5 = 0$
 $100 I_3 + 50 I_4 = 5$

$$\begin{cases} I_1 - I_2 + I_3 - I_4 = 0 \\ I_3 - I_4 + I_5 = 0 \\ 250 I_1 + 25 I_2 = 15 \\ 25 I_2 - 200 I_5 + 100 I_3 = 0 \\ 100 I_3 + 50 I_4 = 5 \end{cases}$$

$$\Rightarrow \begin{pmatrix} I_1 & I_2 & I_3 & I_4 & I_5 & | \\ 1 & -1 & 1 & -1 & 0 & | & 0 \\ 0 & -1 & 0 & 0 & -1 & | & 0 \\ 250 & 25 & 0 & 0 & 0 & | & 15 \\ 0 & 25 & 100 & 0 & -200 & | & 0 \\ 0 & 0 & 100 & 50 & 0 & | & 5 \end{pmatrix}$$

$I_1 = 56,21 \text{ mA}$ ✓

$I_2 = 37,87 \text{ mA}$ ✓

$I_3 = 27,22 \text{ mA}$ ✓

$I_4 = 45,56 \text{ mA}$ ✓

$I_5 = 18,34 \text{ mA}$ ✓

Comprovació?

POTÈNCIES DISSEIPADES ($P_R = R \cdot I^2$)

$P_{R1} = R_1 \cdot I_1^2 = 200 \cdot (56,21 \cdot 10^{-3})^2 = 0,63 \text{ W} = 631,9 \text{ mW}$

$P_{R2} = R_2 \cdot I_2^2 = 25 \cdot (37,87 \cdot 10^{-3})^2 = 0,035 \text{ W} = 35,85 \text{ mW}$

$P_{R3} = R_3 \cdot I_3^2 = 100 \cdot (27,22 \cdot 10^{-3})^2 = 0,074 \text{ W} = 74,09 \text{ mW}$

$P_{R4} = R_4 \cdot I_4^2 = 50 \cdot (45,56 \cdot 10^{-3})^2 = 0,103 \text{ W} = 103,8 \text{ mW}$

$P_{R5} = R_5 \cdot I_5^2 = 200 \cdot (18,34 \cdot 10^{-3})^2 = 0,067 \text{ W} = 67,23 \text{ mW}$

$P_{R6} = R_6 \cdot I_1^2 = 50 \cdot (56,21 \cdot 10^{-3})^2 = 0,157 \text{ W} = 157,98 \text{ mW}$