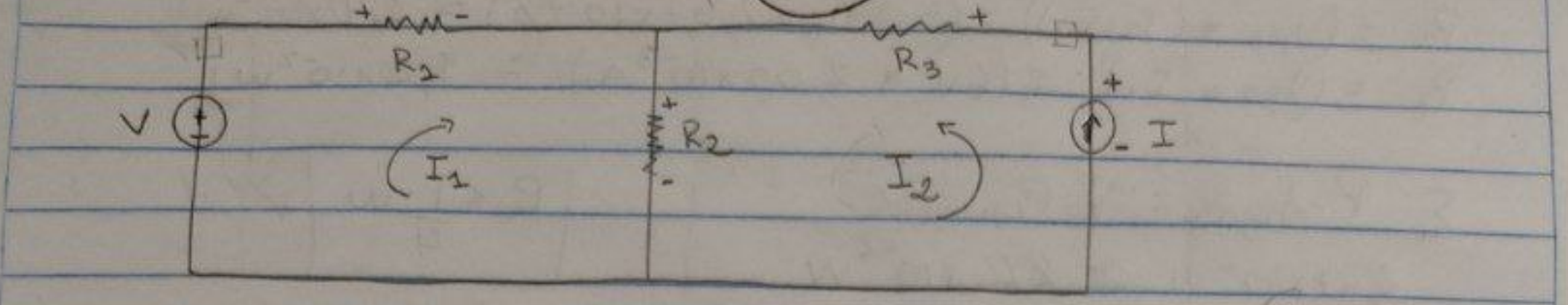
Práctica 1 - Instrumentación (20) José Castro ; Carlos Hurtado



(A) * Método de Mallas

$$\begin{cases} I_{R1} = I_1 = I_V \\ I_{R2} = I_1 + I_2 \\ I_{R3} = I_2 = I \end{cases} \quad (3)$$

Malla 1:

$-V + V_{R1} + V_{R2} = 0$

$-V + R_1 I_1 + R_2 (I_1 + I_2)$

$-V + I_1(R_1 + R_2) + I_2 R_2 = 0$ (1)

$$I_1 = \frac{V - I R_2}{(R_1 + R_2)}$$

Malla 2:

$-V_i + V_{R3} + V_{R2} = 0$

$-V_i + R_3 I_2 + R_2 (I_1 + I_2) = 0$ (2)

$-V_i + R_3 I + R_2 (I_1 + I) = 0$

$V_i = R_3 I + R_2 I_1 + R_2 I$

* Valores teoricos:

- $R_1 = 1000\,\Omega$
- $R_2 = 2000\,\Omega$
- $R_3 = 3000\,\Omega$
- $V = 6\,V$
- $I = 2{,}00 \times 10^{-3}\,A$

$$I_1 = \frac{6V - 0{,}002A(2000\Omega)}{3000\Omega} = 6{,}67 \times 10^{-4}\,A$$

- $I_1 = 6{,}67 \times 10^{-4}\,A$
- $I_V = I_1 = 6{,}67 \times 10^{-4}\,A$
- $I_{R1} = I_1 = 6{,}67 \times 10^{-4}\,A$
- $I_{R2} = (I_1 + I_2) = (I_1 + I) = 2{,}67 \times 10^{-3}\,A$
- $I_{R3} = 2{,}00 \times 10^{-3}\,A$

- $P = (V * I_V) = (6V * 6{,}67 \times 10^{-4}\,A) = 4{,}00 \times 10^{-3}\,W$
- $P_i = (V_i * I) = (11{,}33V * 2{,}00 \times 10^{-3}\,A) = 2{,}27 \times 10^{-2}\,W$

$V_i = 3000\Omega(2{,}00 \times 10^{-3}\,A) + 2000\Omega(6{,}67 \times 10^{-4}\,A) + 2600\Omega(3{,}00 \times 10^{-3})A$

- $V_i = 11{,}33\,V$

$V_{R1} = R_1 I_1$

$V_{R1} = 1000\Omega(6{,}67 \times 10^{-4}\,A)$

- $V_{R1} = 0{,}67\,V$

$V_{R2} = R_2 (I_1 + I_2)$

$V_{R2} = 2000\Omega * (2{,}67 \times 10^{-3})$

- $V_{R2} = 5{,}33\,V$

$V_{R3} = R_3 I_2$

$V_{R3} = 3000\Omega(2{,}00 \times 10^{-3}\,A)$

- $V_{R3} = 6\,V$

CARIBE

$P_1 = (V_{R1} * I_1) = (0,67V * 6,67x10^{-4}A) = 4,05x10^{-4} W$
$P_2 = (V_{R2} * (I_3+I_2)) = (5,33V * 2,67x10^{-3}A) = 1,42x10^{-2} W$
$P_3 = (V_{R3} * I_2) = (6V * 2,00x10^{-3}A) = 1,20x10^{-2} W$

$\sum P_{entregada} = \sum P_{consumida}$
$2,67x10^{-2} W \simeq 2,66x10^{-2} W$

$P_n < \frac{1}{4} W$ ✓

* Valores Medidos

$R_2 = 1,010\Omega$	$V_{R2} = 0,70V$
$R_3 = 3,010\Omega$	$V_{R2} = 5,29V$
$V = 6,01V$	$V_{R3} = 5,77V$
$I = 2,01x10^{-3}A$	$V_i = 10,90V$

Errores: $E\% \left| \frac{V_{teorico} - V_{medido}}{V_{teorico}} \right| x100$

Voltajes:

- $E_{V_1} = 4,47\%$
- $E V_2 = 0,75\%$
- $E_{V_3} = 2,16\%$
- $E V = 0,16\%$
- $E_{V_i} = 3,83\%$

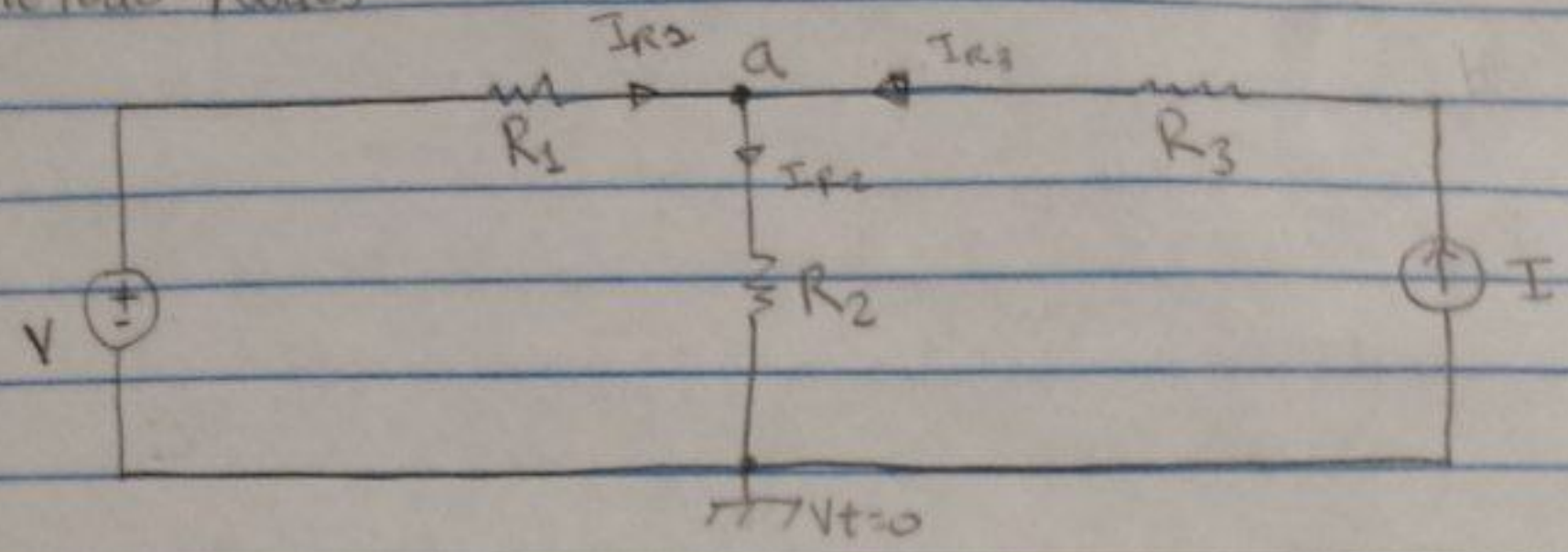
$I_{R2} = 6,99x10^{-3}A$
$I_{R2} = 2,72x10^{-3}A$
$I_{R3} = 2,00x10^{-3}A$

Corrientes:

- $E_{I_1} = 2,98\%$
- $E_{I_2} = 0\%$
- $E_{I_{R1}} = 2,98\%$
- $E_{I_{R2}} = 1,87\%$
- $E_{I_{R3}} = 0\%$
- $E_{IV} = 2,98\%$

$E_I = 0,5\%$

(B) Método Nodos



* Nodo a:

$I_{R1} - I_{R2} + I_{R3} = 0$

$I_{R3} = I$

$\frac{V_{R1}}{R_1} - \frac{V_{R2}}{R_2} + \frac{V_{R3}}{R_3}$

$\frac{V - V_a}{R_1} - \frac{V_a - V_t}{R_2} + I = 0$

$\frac{V}{R_1} - \frac{V_a}{R_1} - \frac{V_a}{R_2} = -I$

$-V_a \left(\frac{1}{R_1} + \frac{1}{R_2}\right) = -I - \frac{V}{R_1}$

$V_a = \frac{I + V/R_1}{\frac{1}{R_1} + \frac{1}{R_2}} = 5,33V$

$I_{R1} = 6,70 \times 10^{-4} A$

$I_{R2} = 2,67 \times 10^{-3} A$

$I_{R3} = I = 2,00 \times 10^{-3} A$

$V_{R1} = 0,67V$

$V_{R2} = 5,34V$

$V_{R3} = 6,00V$