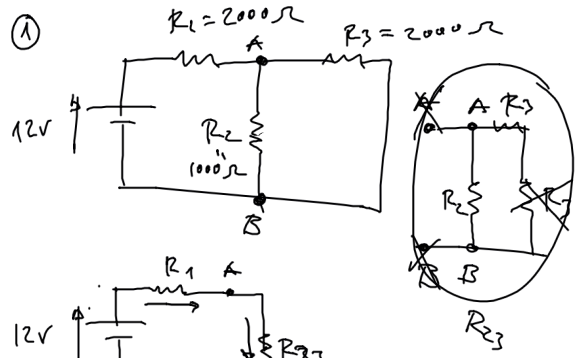
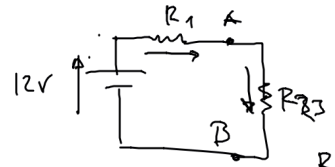
(1)





$R_T = R_1 + R_{23}$

$\frac{1}{R_{23}} = \frac{1}{R_2} + \frac{1}{R_3}$

$R_T \rightarrow I_T = \frac{12V}{R_T}$

$I_T \rightarrow V_{R_1} \rightarrow V_{R23} \rightarrow I_{R2} = \frac{V_{R23}}{R_2}$

$\rightarrow I_{R3} = \frac{V_{R23}}{R_3}$

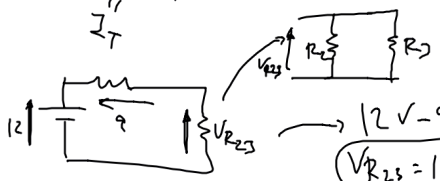
$R_T = 2000 + \underset{666\,\Omega}{R_{23}} = 2666\,\Omega$

$\frac{1}{R_{23}} = \frac{1}{1000} + \frac{1}{2000} = \frac{3}{2000}$

$I_T = \frac{V_T}{R_T} = \frac{12V}{2666\,\Omega} = 0'0045\,A$

$R_{23} = \frac{2000}{3} = 666\,\Omega$

$V_{R1} = \underset{I_T}{I_{R1}} \cdot R_1 = 0'0045\,A \cdot 2000\,\Omega = 9$ volt



$12V - 9V - V_{R23} = 0$

$V_{R23} = 12 - 9 = 3$ volt

$I_{R2} = \frac{V_{R2}}{R_2} = \frac{3\text{ volt}}{1000\,\Omega} = 0'003\,A$

$I_{R3} = \frac{V_{R3}}{R_3} = \frac{3\text{ volt}}{2000\,\Omega} = 0'0015\,A$

$I_1 = I_2 + I_3$

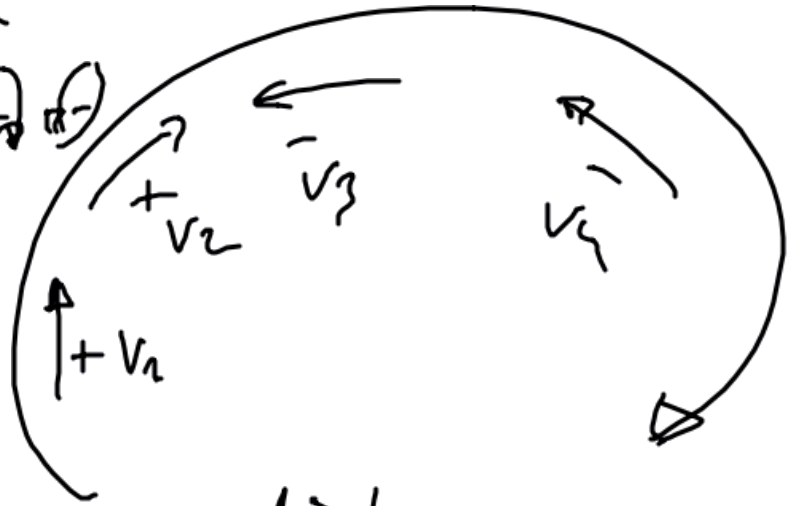
$P_1 = V_{R1} \cdot I_1 = 9$ volt $\cdot\ 0'0045\,A =$ watt

$P_2 = V_{R2} \cdot I_2 = 3$ volt $\cdot\ 0'003\,A =$ watt

$P_3 = V_{R3} \cdot I_3 = 3$ volt $\cdot\ 0'0015\,A =$ watt

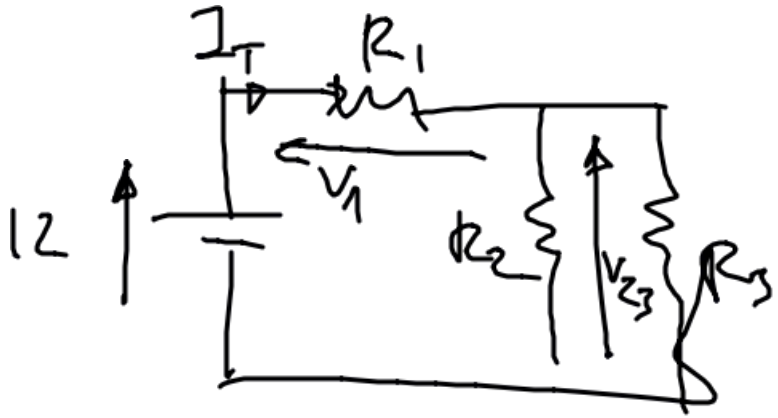
V_g (+ → R −)

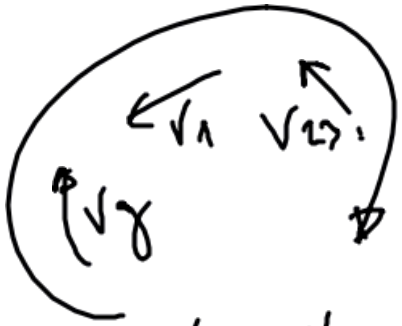
$V_2 = I \cdot R$ (+ → R −)

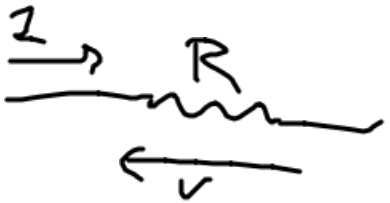


1° KIRCHOFF → (+ → + R −) = 0

$V_1 + V_2 - V_3 - V_4 = 0$



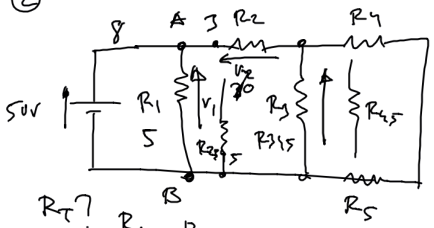




$V_g - V_1 - V_{23} = 0$

$V_1 = I_T \cdot R_1 = 9V$

②



R_T?

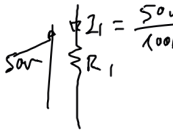
R_4 y R_5 → serie $R_{45} = 2000\,\Omega$

R_3 y R_{45} → paralelo R_{345} → $\frac{1}{R_{345}} = \frac{1}{R_3} + \frac{1}{R_{45}} = \frac{1}{1000} + \frac{1}{2000} = \frac{3}{2000}$ → $R_{345} = 666\,\Omega$

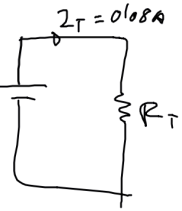
R_2 y R_{345} → serie $R_{2345} = 1000\,\Omega + 666\,\Omega = 1666\,\Omega$

R_1 y R_{2345} → paralelo R_T → $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_{2345}} = \frac{1}{1000} + \frac{1}{1666}$

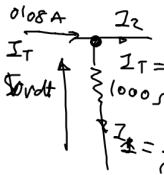
→ $R_T \simeq 625\,\Omega$



$I_1 = \frac{50\text{ volt}}{1000\,\Omega} = 0'05\,A$



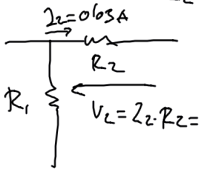
$I_T = \frac{V}{R} = \frac{50\,V}{625\,\Omega} = 0'08\,A$



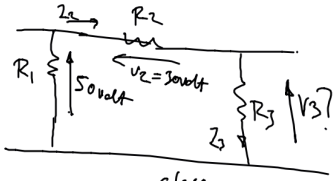
$I_T = I_1 + I_2$ → $0'08 = 0'05 + I_2$

$I_2 = 0'03\,A$

$I_1 = \frac{50\,V}{1000\,\Omega} = 0'05\,A$



$V_2 = I_2 \cdot R_2 = 0'03\,A \cdot 1000\,\Omega = 30\text{ volt}$

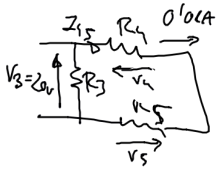


$50\,V - 30\,V - V_3 = 0$

$V_3 = 20\text{ volt}$

→ $I_3 = \frac{V_3}{R_3} = \frac{20\text{ volt}}{1000\,\Omega}$

$I_3 = 0'02\,A$



$V_3 - V_4 - V_5 = 0$ ($-V_4$, $-V_5$)

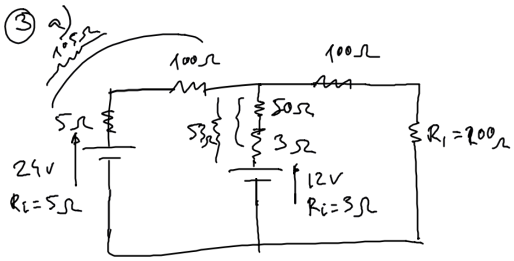
$20\,V - V_{45} = 0$ → $V_5 = 20\text{ volt}$

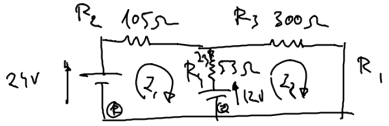
→ $I_{45} = \frac{V_{45}}{R_{45}} = \frac{20\text{ volt}}{2000\,\Omega} = 0'01\,A$

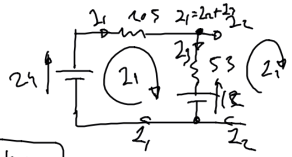
$V_4 = I_4 \cdot R_4 = 0'01\,A \cdot 1000\,\Omega = 10\text{ volt}$

$V_5 = I_5 \cdot R_5 = 0'01\,A \cdot 1000\,\Omega = 10\,V$

③ a)







① $24V - 105 \cdot I_1 - 53 \cdot I_3 - 12V = 0$

$24 - 12 - 105 I_1 - 53 \cdot I_3 = 0$

$12 - 105 I_1 - 53 I_3 = 0$

② $12V + 53 \cdot I_3 - 300 \cdot I_2 = 0 \longrightarrow I_2 = f(I_3)$

I_1, I_2, I_3?

3 mallas.

$I_1 = I_2 + I_3$

$12 - 105 \cdot (I_2 + I_3) - 53 \cdot I_3 = 0$ $\qquad \frac{a+b}{c} = d$

$12 - 105 I_2 - 105 I_3 - 53 I_3 = 0$

$12 - 105 I_2 - 158 I_3 = 0$

$12 + 53 \cdot I_3 - I_2 300 = 0$ $\Big\}\ I_2, I_3$

$12 + 53 \cdot I_3 = I_2 \cdot 300$

$\frac{12 + 53 \cdot I_3}{300} = I_2 \longrightarrow 12 - 105 \overbrace{\left(\frac{12 + 53 \cdot I_3}{300}\right)}^{I_2} - 158 I_3 = 0$

$12 - \underbrace{\frac{105 \cdot 12}{300}}_{4'2} - \underbrace{\frac{105 \cdot 53}{300}}_{18'5} I_3 - 158 \cdot I_3 = 0$

$I_2 = \frac{12 + 53 \cdot 0'044}{300} = 0'047A$ $\qquad 7'8 - 176'5\, I_3 = 0 \longrightarrow I_3 = \frac{7'8}{176'5} = 0'044A$

$I_1 = I_2 + I_3$

$I_1 = 0'047 + 0'044 = 0'091A$

P_{R1}? $\nearrow I_2$

$\rightarrow V_{R1} = I_2 \cdot R_1 = 0'047A \cdot 200\Omega = 9'4$ volt

$P_{R1} = V_{R1} \cdot I_2 = 9'4$ volt $\cdot\ 0'047A = 0'44$ watt