

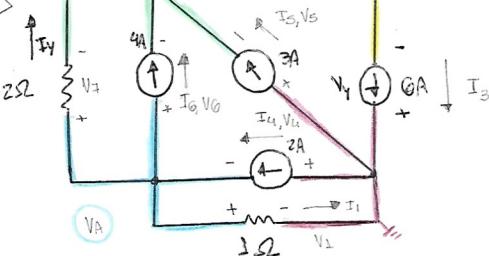
V_2, I_2

+ 3A

- m -

(V_B)

(V_C)



• usando o algoritmo lógico da análise nodal

① definir tensões nodais V_A, V_B, V_C

$$V_A) I_4 = I_1 + I_6 + I_2$$

$$V_B) I_4 + I_6 + I_5 = I_2$$

$$V_C) I_2 = I_3$$

$$\text{mas } I_3 = 6A; I_4 = 2A; I_5 = 3A; I_6 = 4A$$

então:

$$V_A) \Omega = I_1 + 4 + I_2$$

$$V_B) I_1 + 4 + 3 = I_2$$

$$V_C) I_2 = 6$$

② definir tensões sobre os resistores (Ω hm)

$$I_2 = \frac{V_A - \Omega}{3} = \frac{V_A}{3} \Rightarrow [I_2 = V_A]$$

$$I_2 = \frac{V_B - V_C}{3}; \quad I_4 = \frac{V_A - V_B}{2}$$

③ elevar em função da tensão nodal

$$V_A) \Omega = \left(\frac{V_A - V_B}{2} \right) + 4 + V_A$$

$$V_B) \left(\frac{V_A - V_B}{2} \right) + 4 + 3 = \left(\frac{V_B - V_C}{3} \right)$$

$$V_C) \left(\frac{V_B - V_C}{3} \right) = 6$$

→ ① isolando cada um

$$V_A) \Omega = \frac{V_A - V_B + 8 + 2V_A}{2}$$

$$4 = 3VA - VB + 8$$

$$3VA - VB = -4$$

$$V_B) \frac{V_A - V_B + 8 + 6}{2} = \frac{V_B - V_C}{3}$$

$$\frac{VA - VB + 8 + 6}{2} - \frac{VB + VC}{3} = 0$$

$$\frac{3VA - 3VB + 24 + 18 - 2VB + 2VC}{6} = 0$$

$$\frac{3VA - 5VB + 2VC}{6} = -7$$

$$3VA - 5VB + 2VC = -42$$

$$V_C) \boxed{VB - VC = 18}$$

③ sistema algébrico

$$\begin{cases} 3VA - VB = -4 \\ 3VA - 5VB + 2VC = -42 \\ VB - VC = 18 \end{cases}$$

$$VA = -2$$

$$VB = 1$$

$$VC = -17$$

$$\cdot \text{ como } V_B = -V_C - 0$$

$$V_B = -VC$$

$$\boxed{V_B = +17V}$$

• como

$$I_4 = \frac{VA - VB}{2}$$

$$I_4 = \frac{-2 - 1}{2}$$

$$\boxed{I_4 = -3A}$$

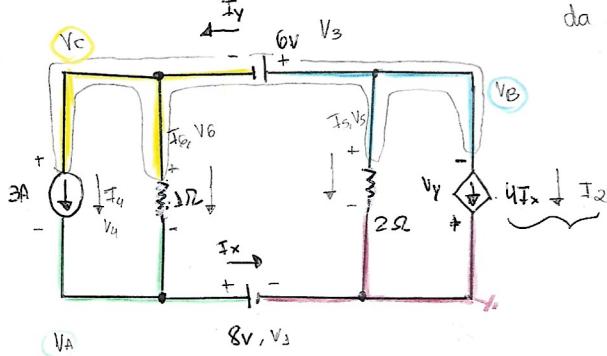
• algoritmo melhorado
da análise nodal

L.C.K em V_A

$$I_q + I_6 = I_x$$

$$I_4 = 3$$

$$I_x = 3 + I_6$$



Itens: $V_A, V_Y; V_B, V_4, V_S, V_6$

Nodos medidos: V_A, V_B, V_C

correntes: $I_x, I_2, I_y, I_4, I_6, I_S$

2.c.1) no mó parcial fonte condensada

$$2.c.2) V_A - 0 = 8 \quad (1)$$

$$2.c.3a) V_B - V_C = 6 \quad (2)$$

$$2.c.3b) I_2 + I_S + I_6 + I_4 = 0 \quad (3)$$

renumerando

$$(1) V_A = 8$$

$$(2) V_B - V_C = 6$$

$$(3) 4(3 + I_6) + I_S + I_6 + 3 = 0$$

$$\therefore 4I_6 + I_S + I_6 = -15$$

$$\therefore 5I_6 + I_S = -15$$

correntes sobre resistores

$$I_S = \frac{V_B - 0}{2} \Rightarrow \boxed{\frac{V_B}{2} = I_S}$$

$$\boxed{I_6 = V_C - V_A}$$

$$V_A = 8$$

$$V_B - V_C = 6$$

$$5(V_C - V_A) + \frac{V_B}{2} = -15$$

$$\textcircled{1} \quad V_A = 8$$

$$\textcircled{2} \quad V_B - V_C = 6$$

$$\textcircled{3} \quad 5V_C - 5V_A + \frac{V_B}{2} = -15$$

$$V_A = 8 // \quad V_B = 10 // \quad V_C = 4 //$$

$$V_Y = -V_B + 0 =$$

$$\boxed{V_Y = -30 \text{ V}}$$

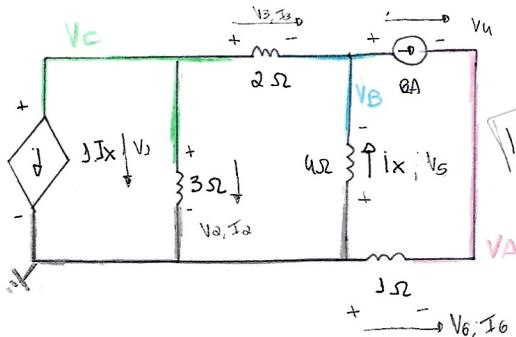
L.C.K no mó VC

$$I_y = I_q + I_6$$

$$I_y = 3 + V_C - V_A$$

$$I_y = 3 + 4 - 8$$

$$\boxed{I_y = -3 \text{ A}}$$



$$J_x = \frac{0 - V_B}{4} = -\frac{V_B}{4}$$

$$I_6 = \frac{0 - V_A}{1} = -V_A$$

$$\text{de}) \quad I_x = \frac{0 - V_B}{4} = -\frac{V_B}{4}$$

Densões: $V_x, V_a, V_b, V_u, V_s, V_0$

correntes: J_x, I_2, I_3, I_A, I_6

Múltiplos medidos: V_A, V_B, V_C

Quais: correntes
Novas

I_A, I_3, I_x, I_6

2b)

$$(1) \quad -V_A + 6 = 0$$

$$(2) \quad -\frac{V_B}{4} + \frac{V_C}{2} - \frac{V_B}{2} = 6$$

$$-\frac{V_B - 2V_B + V_C}{4} = 6$$

$$V_A = 6$$

2c) LCK

$$V_A) \quad I_6 + 6 = 0 \quad (1)$$

$$V_B) \quad I_x + I_3 = 0 \quad (2)$$

$$V_C) \quad I_x + I_2 + I_3 = 0 \quad (3)$$

$$-\frac{3V_B}{4} + \frac{V_C}{2} = 6 \quad (1)$$

$$\left\{ \begin{array}{l} -3V_B + 2V_C = 24 \\ \hline \end{array} \right. \quad (2) //$$

$$3) \quad -\frac{V_B}{4} + \frac{V_C}{3} + \frac{V_C}{2} - \frac{V_B}{2} = 0$$

$$-\frac{V_B - 2V_B + 2V_C + 3V_C}{6} = 0$$

$$-\frac{3V_B}{4} + \frac{5V_C}{6} = 0 \quad (3)$$

$$-9V_B + 20V_C = 0 \quad (3)$$

$$V_A = 6V$$

$$V_B = -20V$$

$$V_C = -18V$$

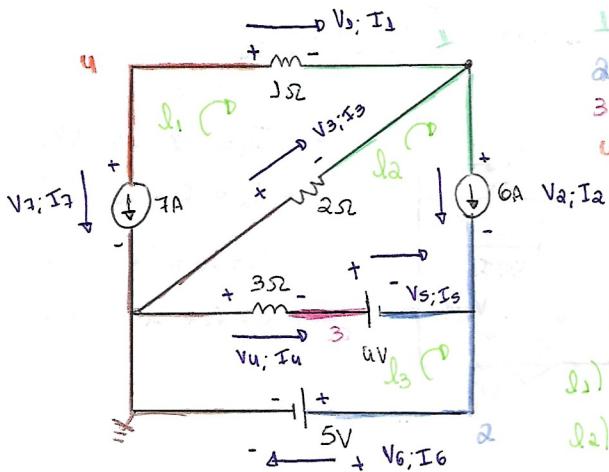
$$I_3 = \frac{V_C - V_B}{2} \Rightarrow \frac{V_C}{2} - \frac{V_B}{2}$$

$$I_2 = \frac{V_C}{3}$$

14/02 → EXERCÍCIO 1

Obter $2b \times 2b$

aplicar LCK mas
(n-1) equações



- 1 $I_1 + I_3 = I_2 \quad (8)$
- 2 $I_2 + I_5 = I_6 \quad (9)$
- 3 $I_4 = I_5 \quad (10)$
- 4 $0 = I_1 + I_7 \quad (11)$

LCK mas malhas

- 1 $+V_1 - V_3 - V_7 = 0 \quad (12)$
- 2 $+V_2 - V_5 - V_4 + V_3 = 0 \quad (13)$
- 3 $+V_6 + V_4 + V_5 = 0 \quad (14)$

7 elementos, 14 equações

knowns: $V_1; V_2; V_3; V_4; V_5; V_6; V_7$

currents: $I_1; I_2; I_3; I_4; I_5; I_6; I_7$

Equações características

$$V_3 = 1 \cdot I_1 \quad (V = R \cdot i) \quad (1)$$

$$I_2 = 6A \quad (2)$$

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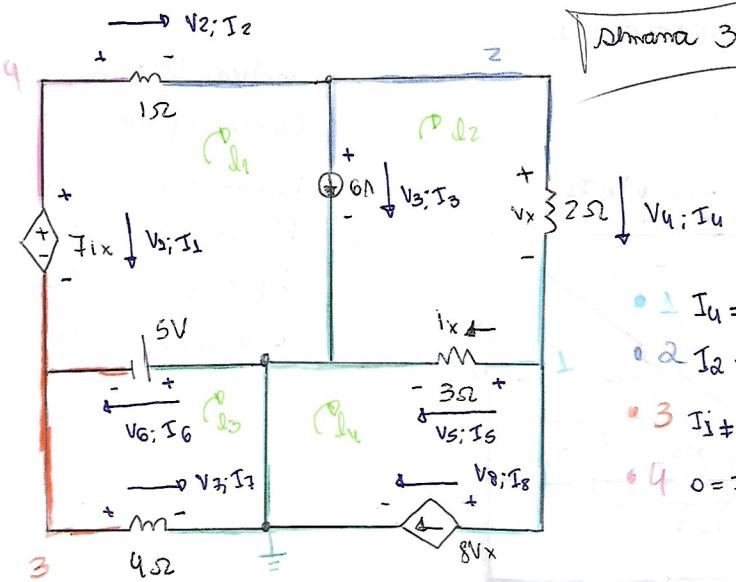
$$V_3 = 2 \cdot I_3 \quad (V = R \cdot i) \quad (3)$$

$$V_4 = 3 \cdot I_4 \quad (V = R \cdot i) \quad (4)$$

$$V_5 = 5V \quad (5)$$

$$V_6 = 5V \quad (6)$$

$$I_7 V_7 = 7A \quad (7)$$



LCK

$$\bullet 1 \quad I_4 = I_8 + I_6 \quad (9)$$

$$\bullet 2 \quad I_2 = I_3 + I_4 \quad (10)$$

$$\bullet 3 \quad I_1 + I_6 = I_7 \quad (11)$$

$$\bullet 4 \quad 0 = I_2 + I_1 \quad (12)$$

LTK

8 elementos, 16 eq.

Juntas: $V_1; V_2; V_3; V_4; V_5; V_6; V_7; V_8$
 $I_{1x}; V_2; V_3; V_x; V_5; V_6; V_7; V_8$

corrientes: $I_1; I_2; I_3; I_4; I_5; I_6; I_7; I_8$
 $I_1; I_2; I_3; I_4; I_8; I_6; I_7; 8V_x$

$$I_x = I_5 \quad V_h = V_x \parallel$$

leyendas características

$$V_1 = I_{1x} \quad (1) \quad (\text{controlada})$$

$$V_2 = 3 \cdot V_1 \quad (2) \quad V = R \cdot i$$

$$I_3 = 6A \quad (3)$$

$$V_x = 2 \cdot I_4 \quad (4) \quad V = R \cdot i$$

$$V_5 = 3 \cdot I_x \quad (5) \quad V = R \cdot i$$

$$V_6 = 5V \quad (6)$$

$$(1) \quad V_3 + V_6 - I_{1x} + V_2 = 0 \quad (13)$$

$$(2) \quad V_x + V_5 - V_3 = 0 \quad (14)$$

$$(3) \quad -V_7 - V_6 = 0 \quad (15)$$

$$(4) \quad -V_5 + V_8 = 0 \quad (16)$$

$$V_7 = 4 \cdot I_7 \quad (7) \quad V = R \cdot i$$

$$I_8 = 8V_x \quad (8) \quad (\text{controlada})$$

14/02