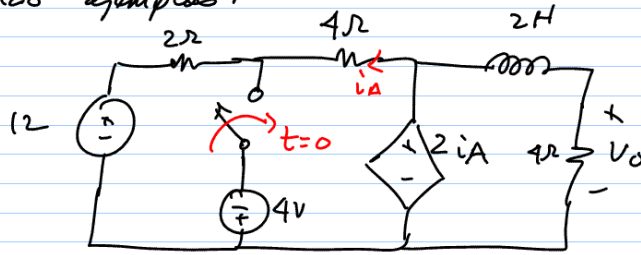


INEL 3105 Lecture #12:

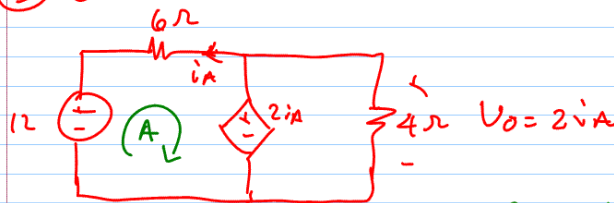
Note Title

10/2/2009

Más ejemplos:

Eval $v_o(t)$ para $t \geq 0^+$

Solución

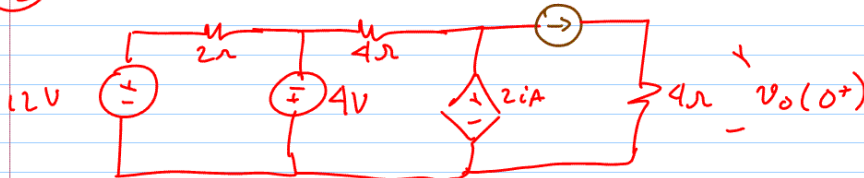
① Evaluación de $i_L(0^-)$ 

KVL: A

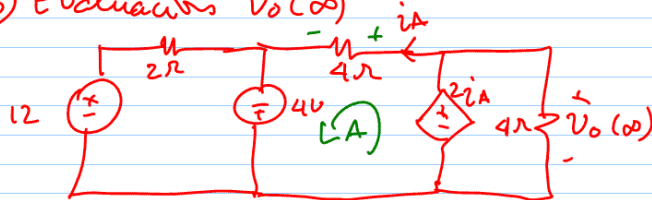
$$12 - 6i_A - 2i_A = 0 ;$$

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

$$v_o = 2i_A = -6V ; i_L(0^-) = \frac{-6V}{4\Omega} = \frac{-3}{2} A$$

 $i_L(0^-) = i_L(0^+)$ ② Evaluación de $v_o(0^+)$ $-\frac{3}{2} A$ 

$$v_o(0^+) = 4\Omega \left(\frac{-3}{2} A \right) = -6V$$

③ Evaluación $v_o(\infty)$ 

$$v_o(\infty) = 2i_A$$

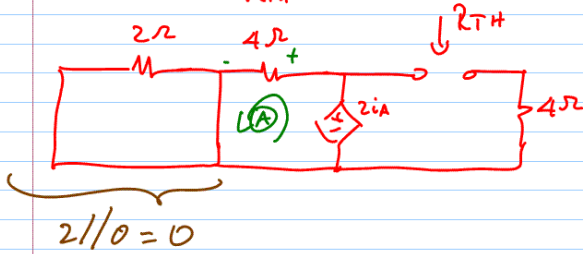
KVL (A):

$$-4 + 4i_A - 2i_A = 0$$

$$-2i_A = -4 \quad i_A = +2A$$

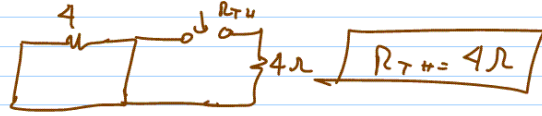
$$v_o(\infty) = 2(2) = 4V$$

④ Eval $\tau = \frac{L}{R_{TH}}$



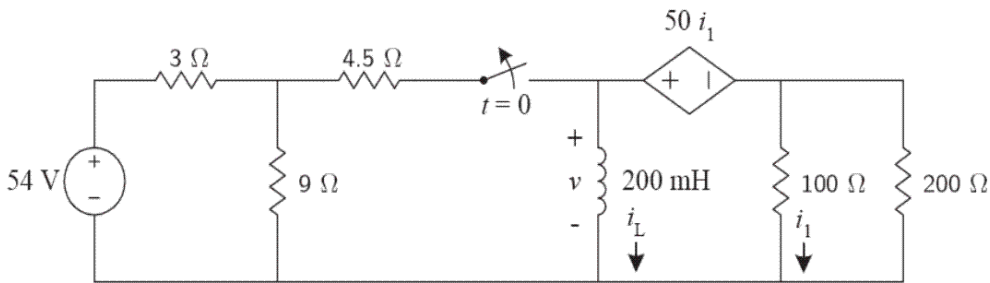
KUL @ A:

$2i_A - 4i_A = 0$
 $-2i_A = 0 \quad ; \quad i_A = 0$

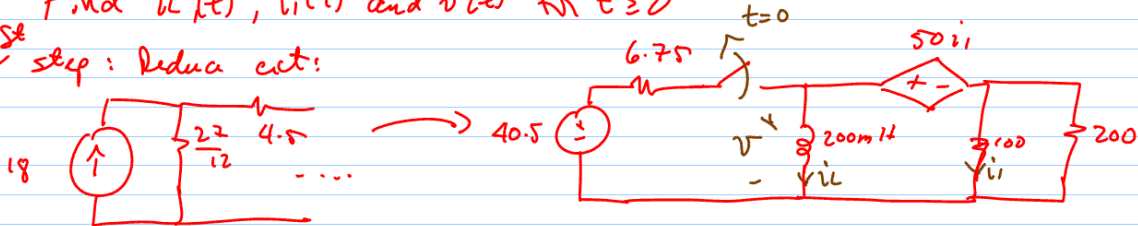


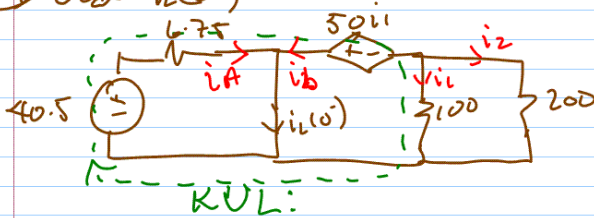
$\tau = \frac{L}{R_{TH}} = \frac{2H}{4\Omega} = \frac{1}{2} \text{ seg.}$

⑤ Finally; $v_o(t) = v_o(\infty) + [v_o(0^+) - v_o(\infty)] e^{-t/\tau}$
 $= 4 + [-6 - 4] e^{-t/0.5} = 4 - 10e^{-2t}$



Find $i_L(t)$, $i_1(t)$ and $v(t)$ for $t \geq 0$
 1st step: Reduce ckt:



① Eval $i_L(0^-)$ 

$$i_L(0^-) = i_A + i_B$$

$$i_A = \frac{40.5}{6.75} = 6 \text{ A}$$

$$i_B = -i_1 - i_2$$

$$\text{KVL: } 40.5 - 40.5 - 50i_1 - 100i_1 = 0$$

$$i_1 = 0 \Rightarrow i_2 = 0$$

$$i_L(0^-) = 6 \text{ A}$$

② Eval $i_L(0^+)$, $i_1(0^+)$, $v(0^+)$ 

$$i_L(0^+) = 6 \text{ A}$$

$$i_1(0^+) = -6 \left(\frac{200}{300} \right) = -4 \text{ A}$$

$$\text{KVL: } 50i_1 - v(0^+) + 100(-4) = 0$$

$$50(-4) - 400 = v(0^+)$$

$$v(0^+) = -600 \text{ V}$$

③ Eval $i_L(\infty)$, $i_1(\infty)$, $v(\infty)$ 

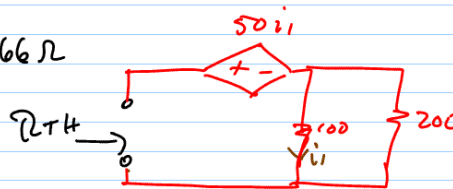
$$v(\infty) = 0$$

$$i_1(\infty) = \frac{-50 i_1(\infty)}{100} = \frac{-i_1(\infty)}{2}$$

$$i_1(\infty) = 0 \Rightarrow i_L(\infty) = 0$$

④ Eval $\tau = \frac{L}{R_{TH}}$

$$R_{TH} = \frac{(100)(200)}{300} = 66.66 \Omega$$



$$\tau = \frac{200 \times 10^{-3}}{66.66} = 3 \times 10^{-6} \text{ sec.}$$

$$\text{Finally: } x(t) = x(\infty) + [x(0^+) - x(\infty)] e^{-t/\tau}$$

$$v(\infty) = 0; \quad i_1(\infty) = 0, \quad i_L(\infty) = 0$$

$$i_L(0^+) = 6A; \quad i_1(0^+) = -4A; \quad v(0^+) = -600V \quad \tau = 3 \times 10^{-6} \text{ secs.}$$

$$v(t) = -600 e^{-t/3 \times 10^{-6} \text{ secs}} V.$$

$$i_L(t) = 6 e^{-t/3 \times 10^{-6} \text{ secs}} A.$$

$$i_1(t) = -4 e^{-t/3 \times 10^{-6} \text{ secs}} A.$$