PSI3262 – Fundamentos de Circuitos Eletrônicos Digitais e Analógicos

Solução da Lista 7: Redes de 1ª Ordem

Redes de 1ª Ordem

1 - Temos que:

$$\begin{cases} -4e^{-4t} + 4e^{-4t} + 20 = f_1(t) \\ \\ -4e^{-4t} + 10e^{-10t} + 4e^{-4t} - 4e^{-10t} = f_2(t) \end{cases}$$

$\rightarrow \quad f_1(t) = 20 \qquad\qquad f_2(2) = 6e^{-10t}$

2 - $i(t) = i_0\, e^{-t/\tau} \rightarrow i_0 = 10$ A $\qquad\qquad \tau = 0{,}2$ s $= 200$ ms

$v(t) = Ri_0\, e^{-t/\tau} \rightarrow R = \dfrac{400}{10} = 40\Omega \qquad \tau = \dfrac{L}{R} \rightarrow L = 40 \times 0{,}2 = 8$ H

Energia inicial: $\dfrac{1}{2} L i_0^2 = \dfrac{1}{2} \times 8 \times 100 = 400$ J

Em $t = 50$ ms $\rightarrow i = 7{,}788$ A $\rightarrow W_L = \dfrac{1}{2} L i^2 = 242{,}61$ J

Energia dissipada: $400 - 242{,}61 = 157{,}39$ J

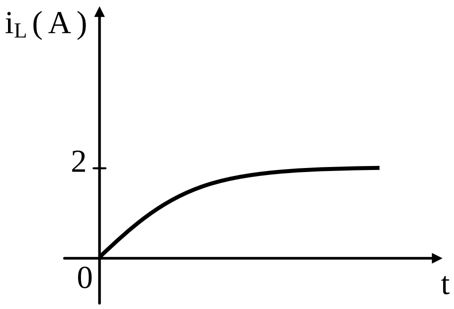
3 - a) $i_L(0_+) = i_L(0_-) = 0$ (admitido)

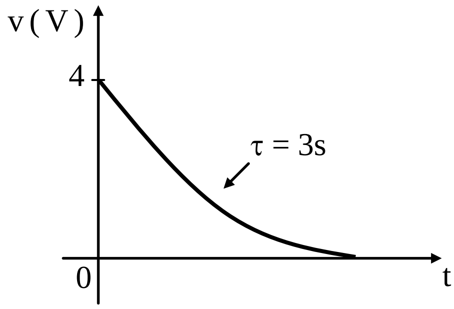
$i_L(\infty) = I$

$i_L(t) = I(1 - e^{-t/\tau}) \qquad\qquad \tau = L/R$

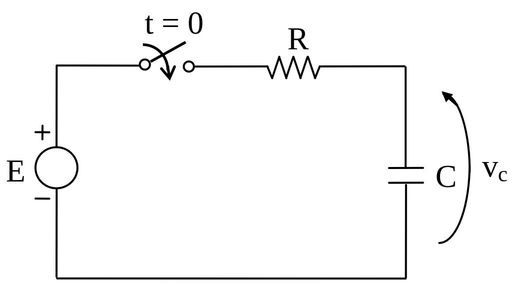
$v(0_+) = RI \qquad\qquad v(\infty) = 0$

$\rightarrow v(t) = RI\, e^{-t/\tau}$





4 –



$$\begin{cases} v_c(0_+) = v_c(0_-) = 0 \ \text{(admitido)} \\ v_c(\infty) = E \end{cases}$$

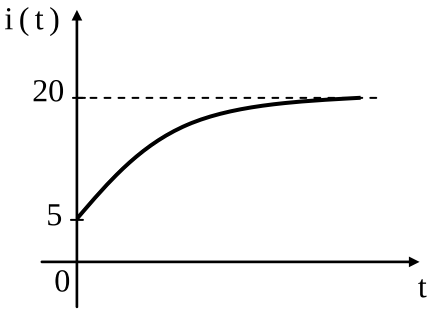
$\rightarrow v_c(t) = E(1 - e^{-t/\tau})$

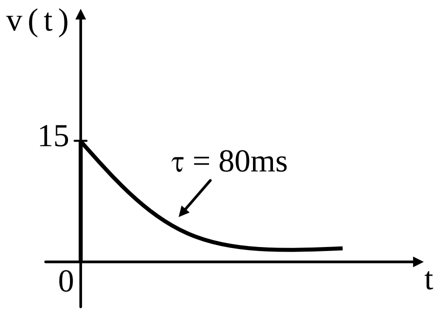
$\tau = RC$

5 - $\begin{cases} i(0_+) = i(0_-) = \dfrac{20}{4} = 5A \\ i(\infty) = \dfrac{20}{1} = 20A \end{cases}$

$\begin{cases} v(0_-) = 0 \\ v(0_+) = 20 - (5 \text{ x } 1) = 15V \\ v(\infty) = 0 \end{cases}$

$t \geq 0 \qquad t = \dfrac{L}{R} = \dfrac{80 \text{ x } 10^{-3}}{1} = 80 \text{ ms}$





$i(t) = (20 - 15e^{-12,5\,t}) \text{ (A)}$
$t \geq 0$

$v(t) = 15\, e^{-12,5\,t} \text{ (V)}$
$t \geq 0$