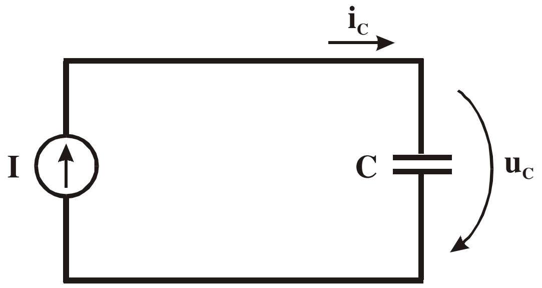
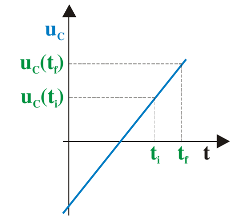
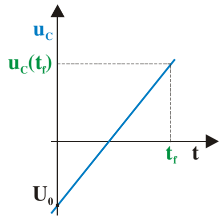
Condensador Percorrido por uma Corrente Constante



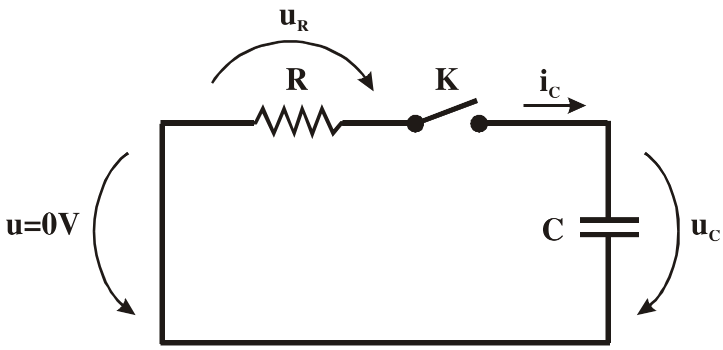
$$i_C(t) = I \quad \Rightarrow \quad \frac{d[u_C(t)]}{dt} = \frac{I}{C} \quad (V/s)$$





$$u_C(t_f) = \frac{I}{C}\cdot(t_f - t_i) + u_C(t_i) \qquad\qquad u_C(t_f) = \frac{I}{C}\cdot t_f + U_0$$

Resposta Natural do Circuito RC de 1ª Ordem



$$t \geq t_0 \quad \Rightarrow \quad \begin{cases} u_C(t) = U_0 \cdot e^{-\frac{1}{RC}\cdot(t-t_0)} \\ i_C(t) = -\dfrac{U_0}{R}\cdot e^{-\frac{1}{RC}\cdot(t-t_0)} \end{cases}$$

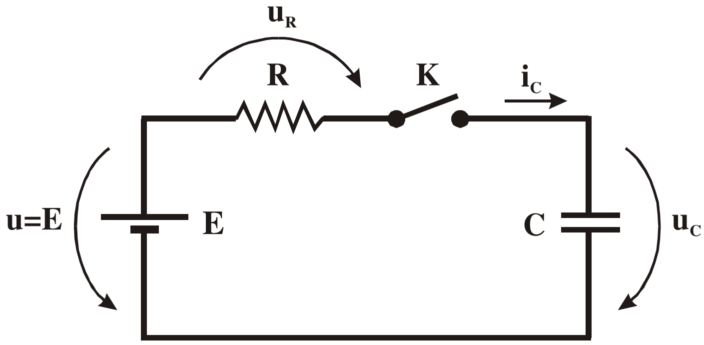
Constante de tempo do circuito: $\tau = RC$ (s)

$t - t_0 = \tau$	$u_C(t) = U_0 \cdot e^{-1} = 0{,}368 \cdot U_0$
$t - t_0 = 3\tau$	$u_C(t) = U_0 \cdot e^{-3} = 0{,}049 \cdot U_0$
$t - t_0 = 5\tau$	$u_C(t) = U_0 \cdot e^{-5} = 0{,}007 \cdot U_0$

$$\begin{cases} u_C(t) = U_0 \text{ em } t = t_0 \\ \text{K é fechado em } t = t_0 \end{cases}$$

$t - t_0 = \tau$	$i_C(t) = -\dfrac{U_0}{R}\cdot e^{-1} = -0{,}368\cdot\dfrac{U_0}{R}$
$t - t_0 = 3\tau$	$i_C(t) = -\dfrac{U_0}{R}\cdot e^{-3} = -0{,}049\cdot\dfrac{U_0}{R}$
$t - t_0 = 5\tau$	$i_C(t) = -\dfrac{U_0}{R}\cdot e^{-5} = -0{,}007\cdot\dfrac{U_0}{R}$

Resposta Forçada do Circuito RC de 1ª Ordem



$$t \geq t_0 \quad \Rightarrow \quad \begin{cases} u_C(t) = E - E \cdot e^{-\frac{1}{RC}\cdot(t-t_0)} \\ i_C(t) = \dfrac{E}{R}\cdot e^{-\frac{1}{RC}\cdot(t-t_0)} \end{cases}$$

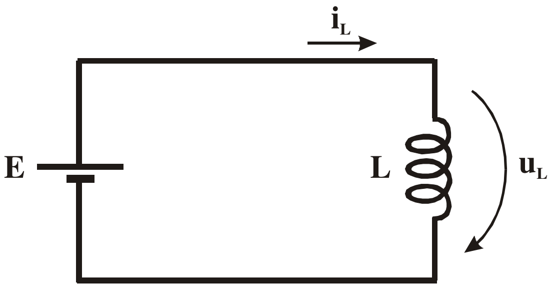
Constante de tempo do circuito: $\tau = RC$ (s)

$t - t_0 = \tau$	$u_C(t) = E - E \cdot e^{-1} = 0{,}632 \cdot E$
$t - t_0 = 3\tau$	$u_C(t) = E - E \cdot e^{-3} = 0{,}950 \cdot E$
$t - t_0 = 5\tau$	$u_C(t) = E - E \cdot e^{-5} = 0{,}993 \cdot E$

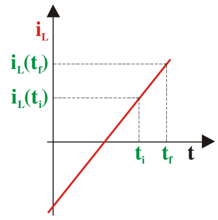
$$\begin{cases} u_C(t) = 0 \text{ em } t = t_0 \\ \text{K é fechado em } t = t_0 \end{cases}$$

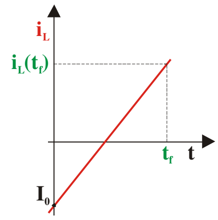
$t - t_0 = \tau$	$i_C(t) = \dfrac{E}{R}\cdot e^{-1} = 0{,}368\cdot\dfrac{E}{R}$
$t - t_0 = 3\tau$	$i_C(t) = \dfrac{E}{R}\cdot e^{-3} = 0{,}049\cdot\dfrac{E}{R}$
$t - t_0 = 5\tau$	$i_C(t) = \dfrac{E}{R}\cdot e^{-5} = 0{,}007\cdot\dfrac{E}{R}$

Bobina Submetida a uma Tensão Constante



$u_L(t) = E \quad \Rightarrow \quad \frac{d[i_L(t)]}{dt} = \frac{E}{L} \quad (A/s)$

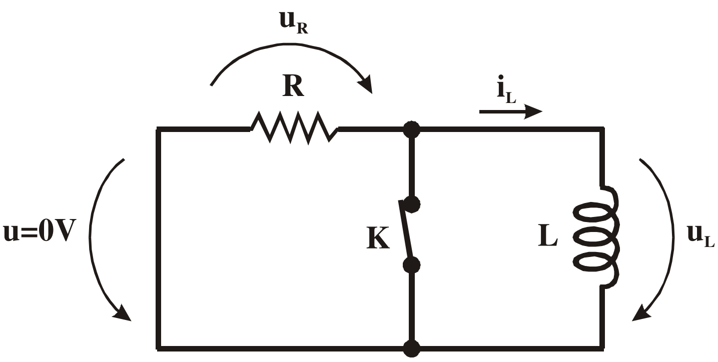




$i_L(t_f) = \frac{E}{L} \cdot (t_f - t_i) + i_L(t_i)$

$i_L(t_f) = \frac{E}{L} \cdot t_f + I_0$

Resposta Natural do Circuito RL de 1ª Ordem



$$t \geq t_0 \quad \Rightarrow \quad \begin{cases} i_L(t) = I_0 \cdot e^{-\frac{R}{L}\cdot(t-t_0)} \\ u_L(t) = -\,R \cdot I_0 \cdot e^{-\frac{R}{L}\cdot(t-t_0)} \end{cases}$$

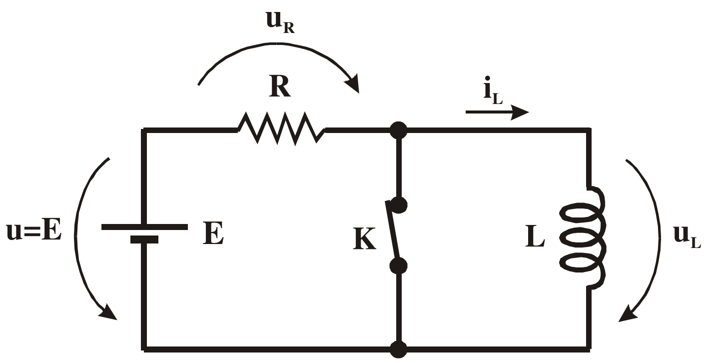
Constante de tempo do circuito: $\tau = \frac{L}{R}$ (s)

$t - t_0 = \tau$	$i_L(t) = I_0 \cdot e^{-1} = 0{,}368 \cdot I_0$
$t - t_0 = 3\tau$	$i_L(t) = I_0 \cdot e^{-3} = 0{,}049 \cdot I_0$
$t - t_0 = 5\tau$	$i_L(t) = I_0 \cdot e^{-5} = 0{,}007 \cdot I_0$

$$\begin{cases} i_L(t) = I_0 \text{ em } t = t_0 \\ \text{K é aberto em } t = t_0 \end{cases}$$

$t - t_0 = \tau$	$u_L(t) = -\,RI_0 \cdot e^{-1} = -\,0{,}368 \cdot RI_0$
$t - t_0 = 3\tau$	$u_L(t) = -\,RI_0 \cdot e^{-3} = -\,0{,}049 \cdot RI_0$
$t - t_0 = 5\tau$	$u_L(t) = -\,RI_0 \cdot e^{-5} = -\,0{,}007 \cdot RI_0$

Resposta Forçada do Circuito RL de 1ª Ordem



$$t \geq t_0 \quad \Rightarrow \quad \begin{cases} i_L(t) = \frac{E}{R} - \frac{E}{R} \cdot e^{-\frac{R}{L}\cdot(t-t_0)} \\ u_L(t) = E \cdot e^{-\frac{R}{L}\cdot(t-t_0)} \end{cases}$$

Constante de tempo do circuito: $\tau = \frac{L}{R}$ (s)

$t - t_0 = \tau$	$i_L(t) = \frac{E}{R} - \frac{E}{R} \cdot e^{-1} = 0{,}632 \cdot \frac{E}{R}$
$t - t_0 = 3\tau$	$i_L(t) = \frac{E}{R} - \frac{E}{R} \cdot e^{-3} = 0{,}950 \cdot \frac{E}{R}$
$t - t_0 = 5\tau$	$i_L(t) = \frac{E}{R} - \frac{E}{R} \cdot e^{-5} = 0{,}993 \cdot \frac{E}{R}$

$$\begin{cases} i_L(t) = 0 \text{ em } t = t_0 \\ \text{K é aberto em } t = t_0 \end{cases}$$

$t - t_0 = \tau$	$u_L(t) = E \cdot e^{-1} = 0{,}368 \cdot E$
$t - t_0 = 3\tau$	$u_L(t) = E \cdot e^{-3} = 0{,}049 \cdot E$
$t - t_0 = 5\tau$	$u_L(t) = E \cdot e^{-5} = 0{,}007 \cdot E$