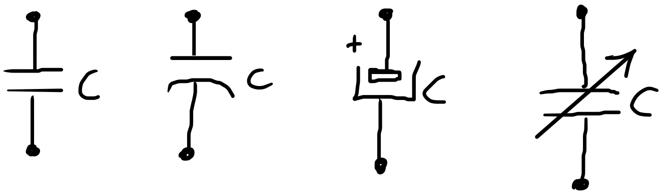
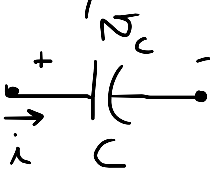
Capacitores e Indutores | Circuitos de primeira ordem.

CAPACITORES [F]



RELAÇÃO TENSÃO - CORRENTE:

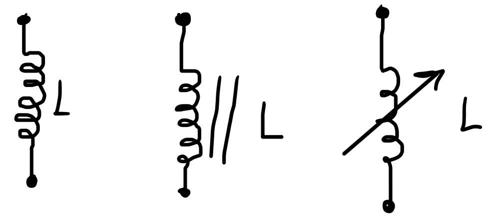


$$v_c(t) = \frac{1}{C}\int_{-\infty}^{t} i\,dt$$

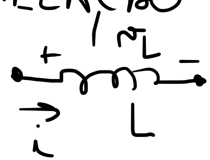
$$\begin{cases} v_c(t) = v_c(0) + \dfrac{1}{C}\displaystyle\int_0^t i\,dt \\ v_c(t) = \dfrac{1}{C}\displaystyle\int_0^t i\,dt \end{cases}$$

$$\boxed{i = C\frac{dv_c(t)}{dt}}$$

INDUTORES [H]



RELAÇÃO TENSÃO - CORRENTE:

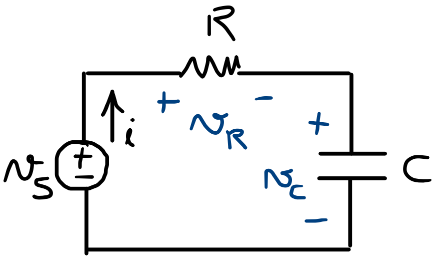


$$\boxed{v_L(t) = L\frac{di(t)}{dt}}$$

$$\begin{cases} i(t) = \dfrac{1}{L}\displaystyle\int_0^t v_L\,dt \\ i(t) = i(0) + \displaystyle\int_0^t v_L\,dt \end{cases}$$

Análise no domínio do tempo

CIRCUITO RC SÉRIE



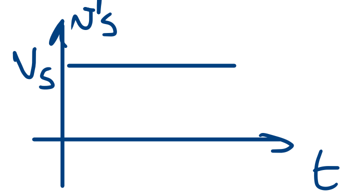
$$v_R + v_C = v_S$$

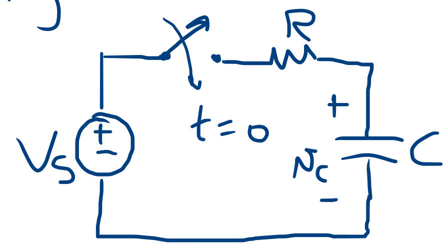
$$R.i + v_C = v_S$$

$$RC\frac{dv_C}{dt} + v_C = v_S$$

$$\boxed{\frac{dv_C}{dt} + \frac{1}{RC}v_C = \frac{v_S}{RC}}$$

Resposta ao degrau.





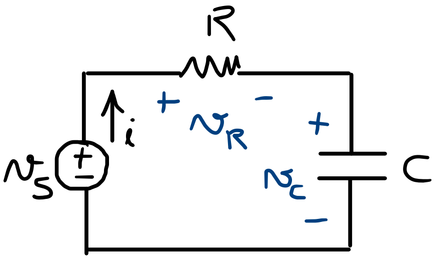
$$\frac{dv_C}{dt} + \frac{1}{RC}v_C = \frac{1}{RC}V_S$$

$$v_C(t) = v_{C_n}(t) + v_{C_F}(t)$$

$$v_C(t) = K + K_1 e^{pt}$$

Análise no domínio do tempo

CIRCUITO RC SÉRIE



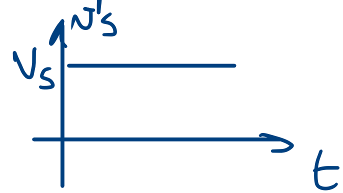
$$v_R + v_c = v_s$$

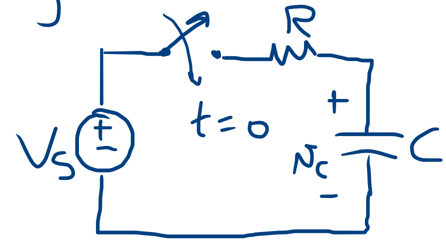
$$R.i + v_c = v_s$$

$$RC\frac{dv_c}{dt} + v_c = v_s$$

$$\boxed{\frac{dv_c}{dt} + \frac{1}{RC}v_c = \frac{v_s}{RC}}$$

Resposta ao degrau.





$$\frac{dv_c}{dt} + \frac{1}{RC}v_c = \frac{1}{RC}V_s$$

$$v_c(t) = v_{c_n}(t) + v_{c_F}(t)$$

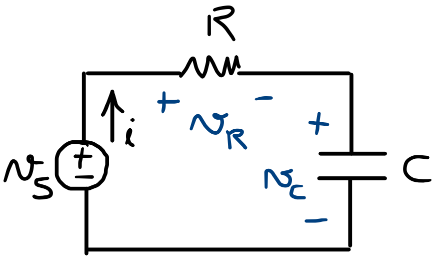
$$v_c(t) = K + K_1 e^{pt}$$

CÁLCULO de K:

$$\frac{1}{RC}K = \frac{1}{RC}V_s \rightarrow \underline{K = V_s}$$

Análise no domínio do tempo

CIRCUITO RC SÉRIE



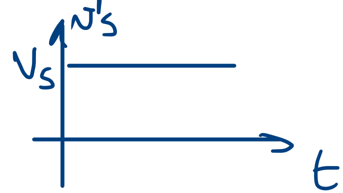
$$v_R + v_C = v_S$$

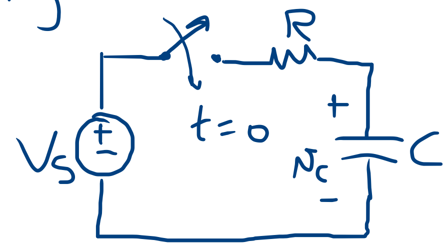
$$R.i + v_C = v_S$$

$$RC\frac{dv_C}{dt} + v_C = v_S$$

$$\boxed{\frac{dv_C}{dt} + \frac{1}{RC}v_C = \frac{v_S}{RC}}$$

Resposta ao degrau.





$$\frac{dv_C}{dt} + \frac{1}{RC}v_C = \frac{1}{RC}V_S$$

$$v_C(t) = v_{C_n}(t) + v_{C_F}(t)$$

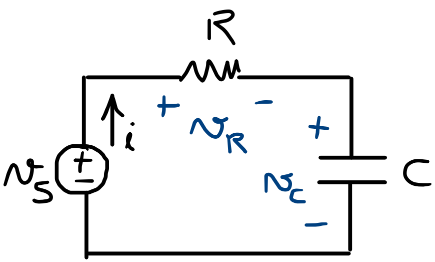
$$v_C(t) = K + K_1 e^{pt}$$

CÁLCULO de p:

$$p + \frac{1}{RC} = 0 \rightarrow \underline{p = -\frac{1}{RC}}$$

Análise no domínio do tempo

CIRCUITO RC SÉRIE



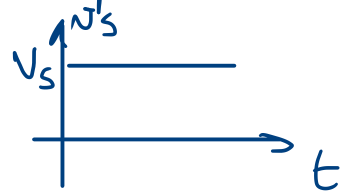
$$v_R + v_c = v_s$$

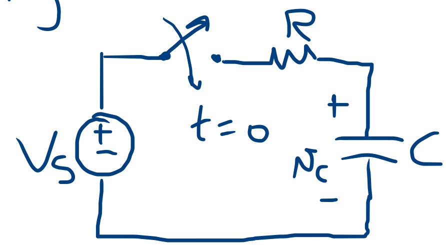
$$R.i + v_c = v_s$$

$$RC\frac{dv_c}{dt} + v_c = v_s$$

$$\boxed{\frac{dv_c}{dt} + \frac{1}{RC}v_c = \frac{v_s}{RC}}$$

Resposta ao degrau.





$$\frac{dv_c}{dt} + \frac{1}{RC}v_c = \frac{1}{RC}V_s$$

$$v_c(t) = v_{c_n}(t) + v_{c_F}(t)$$

$$v_c(t) = K + K_1 e^{pt}$$

CÁLCULO de K_1:

$$v_c(t) = V_s + K_1 e^{-\frac{1}{RC}t}$$

$v_c(0)$: CAPAC. DESCARREGADO

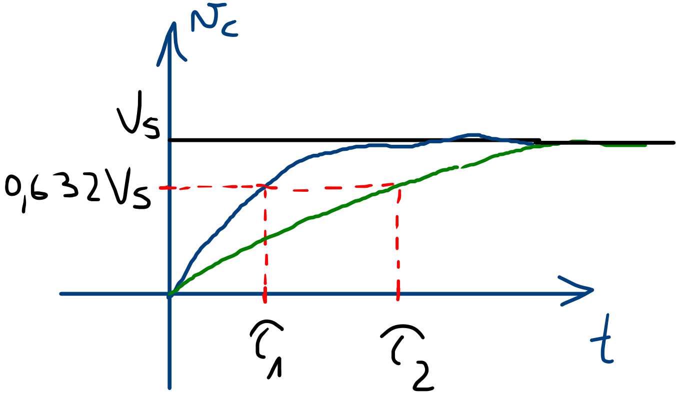
$v_c(0^-) = v_c(0^+) = 0V$

$$v_c(t) = V_S + k_1 e^{-\frac{1}{RC}t}$$

$$v_c(0) = 0V \rightarrow V_S + k_1 = 0 \rightarrow k_1 = -V_S$$

→ RESPOSTA:

$$v_c(t) = V_S\left(1 - e^{-\frac{1}{RC}t}\right).u(t)$$



→ Fazendo $\tau = RC$ (constante de tempo do circ. RC)

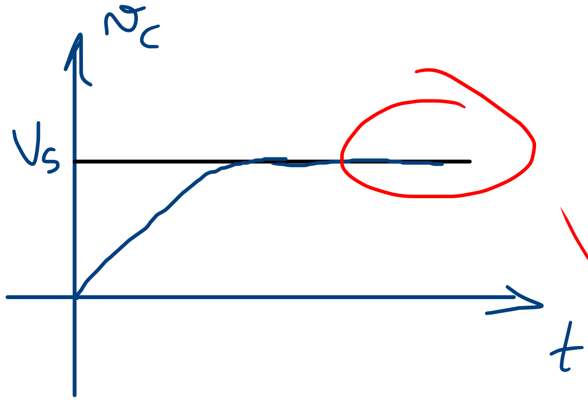
$$v_c(t) = V_S\left(1 - e^{-1}\right) = 0{,}632.V_S$$

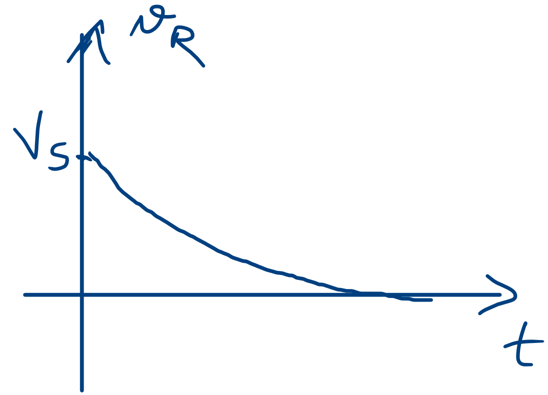
→ Corrente:

$$i(t) = C\frac{dv_c(t)}{dt} = \frac{V_S}{R}e^{-\frac{1}{RC}t}.u(t)$$

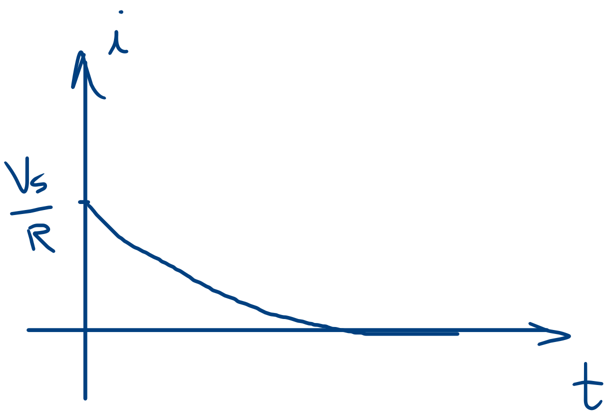
→ Tensão no Resistor:

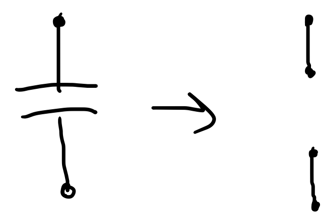
$$v_R(t) = R.i(t) = V_S e^{-\frac{1}{RC}t}.u(t)$$



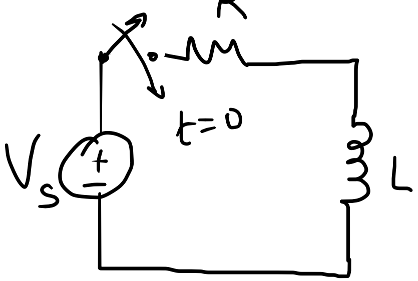


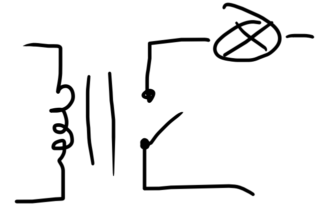
* REGIME PERMANENTE DE CORRENTE CONTÍNUA





* Circuito RL série:



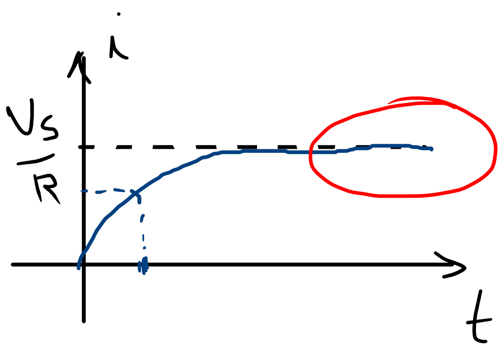


$$v_L + v_R = v_s$$

$$L\frac{di}{dt} + Ri = v_s$$

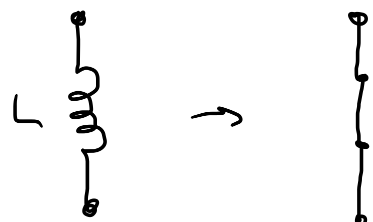
$$\frac{di}{dt} + \frac{R}{L}i = \frac{1}{L}V_s$$

$$i(t) = \frac{V_s}{R}\left(1 - e^{-\frac{R}{L}t}\right)$$



→ REGIME PERMANENTE DE CORRENTE CONTÍNUA!

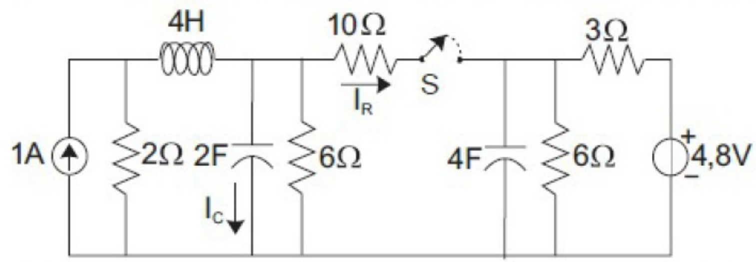
$$\tau = \frac{L}{R}$$



COMPONENTE ESPECÍFICO
NÚCLEO DE CONTEÚDOS PROFISSIONALIZANTES ESPECÍFICOS DO GRUPO II
QUESTÕES DE MÚLTIPLA ESCOLHA de 18 a 29

18

Na figura, a chave S foi mantida aberta por um tempo suficiente para o circuito alcançar o regime permanente.



Imediatamente após fechar a chave S, os valores em ampères das correntes I_c e I_R, respectivamente, serão:

(A) 0,75 e 0,80
(B) 0,25 e – 0,10
(C) 0,17 e – 0,17
(D) 0,17 e 1,00
(E) – 0,75 e – 0,10

chave aberta