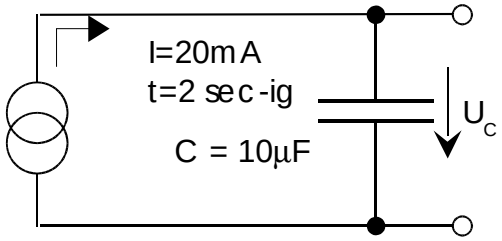
V

1.



Q=……As
W_C=……J
U_C=……V
$U_C(t)$=……, ábrázolás

$I = 20mA = 20 \cdot 10^{-3} A = 2 \cdot 10^{-2} A = 0.02$

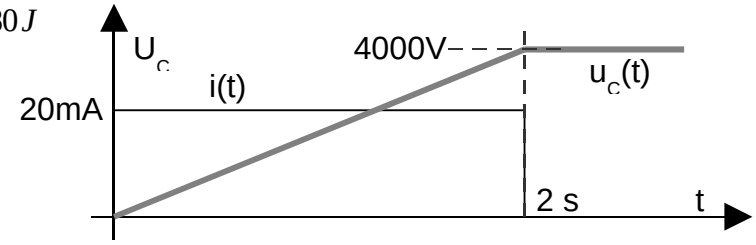
$C = 10\mu F = 10 \cdot 10^{-6} F = 10^{-5} F$

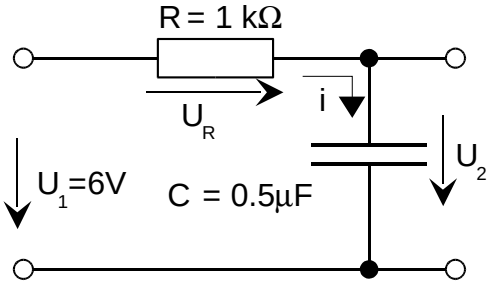
$Q = I \cdot t = 0.02 \cdot 2 = 0.04As$

$U_C = \frac{Q}{C} = \frac{0.04}{10^{-5}} = 4000V$

$W_C = \frac{1}{2} Q \cdot U = \frac{1}{2} \frac{Q^2}{C} = \frac{1}{2} \frac{0.04^2}{10^{-5}} = 80J$

$U_C(t) = \frac{Q}{C} = \frac{I \cdot t}{C} = \frac{I}{C} t \quad \Rightarrow$





2.

f_h=……..Hz

f = 1.5 f_h esetén

U_2 = ……V

φ_{12}=……U_1 és U_2 között

I = ……A

vektorabra

$R = 1k\Omega = 10^3\Omega$

$C = 0.5\mu F = 0.5 \cdot 10^{-6} F = 5 \cdot 10^{-7} F$

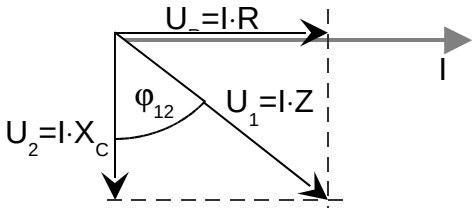
$f_h = \frac{1}{2\pi \cdot RC} = \frac{1}{2\pi \cdot 10^3 \cdot 5 \cdot 10^{-7}} = 318.3Hz$ $\qquad f = 1.5 \cdot f_h = 477.46Hz$

$X_C = \frac{1}{2\pi \cdot f \cdot C} = \frac{1}{2\pi \cdot 477.46 \cdot 5 \cdot 10^{-7}} = 666.6\Omega$

$Z = \sqrt{R^2 + X_C{}^2} = \sqrt{(10^3)^2 + 666.66^2} = 1202\Omega$

$I = \frac{U}{Z} = \frac{6}{1202} = 0.00499 = 4.99 \cdot 10^{-3} A \approx 5mA$

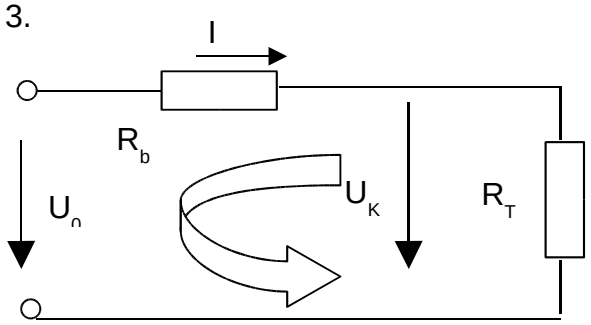
$U_2 = X_C \cdot I = 666.66 \cdot 4.99 \cdot 10^{-3} = 3.328V$



$\mathrm{tg}(\varphi_{12}) = \frac{U_R}{U_2}$

$\varphi_{12} = \mathrm{arctg}\left(\frac{U_R}{U_C}\right) = \mathrm{arctg}\left(\frac{I \cdot R}{I \cdot X_C}\right) = \mathrm{arctg}\left(\frac{R}{X_C}\right) = \mathrm{arctg}\left(\frac{10^3}{666.66}\right) = 56.31°$

3.



I_1=4A ⇒ U_{K1}=12V
U_{K2}=10V ⇒ I_2=14A
U_0=……V
R_b=……Ω
R_{T1}=……Ω
I_Z=……A
Ábrázolandó U_K I függvényében + képlet

Kirchoff huroktörvény: $U_0 - I \cdot R_b - U_K = 0 \Rightarrow U_0 = I \cdot R_b + U_K$

$$\begin{matrix} I.: U_0 = I_1 \cdot R_b + U_{K1} \\ II.: U_0 = I_2 \cdot R_b + U_{K2} \end{matrix} \Rightarrow \begin{matrix} I.: U_0 = 4 \cdot R_b + 12 \\ II.: U_0 = 14 \cdot R_b + 10 \end{matrix} \Rightarrow U_0 = 4 \cdot R_b + 12 = 14 \cdot R_b + 10 \Rightarrow$$
$$\Rightarrow 2 = 10 \cdot R_b \Rightarrow R_b = 0.2\Omega$$

$U_0 = 4 \cdot R_b + 12 = 4 \cdot 0.2 + 12 = 12.8V$ (ellenőrzés: $U_0 = 14 \cdot R_b + 10 = 12.8V$)

$$R_{T1} = \frac{U_{K1}}{I_1} = \frac{12}{4} = 3\Omega$$

I_Z zárlati áram, amikor R_T = 0:

$$I_Z = \frac{U_0}{R_b + R_T} = \frac{U_0}{R_b + 0} = \frac{U_0}{R_b} = \frac{12.8}{0.2} = 64A$$

U_K(I): Kirchoff huroktörvény: $U_0 - I \cdot R_b - U_K = 0 \Rightarrow U_0 - I \cdot R_b = U_K$