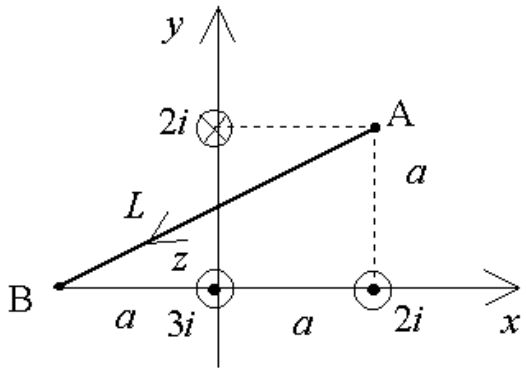
Izračunajte magnetno napetost vzdolž krivulje L med točko A in točko B v okolici treh vodnikov s tokovi na sliki (i = 50 A, a = 0.5 m)!



Rešitev:

$$\Theta_{AB} = \int_A^B \vec{N} \cdot \mathrm{d}\vec{l} = \frac{1}{2\pi}\left(2i\frac{3\pi}{4} + 3i\frac{3\pi}{4} + 2i\frac{\pi}{2}\right) = \frac{19}{8}i$$

$$\Theta_{AB} = 118.75\,\mathrm{A}$$

Na tokovni vir s tokom

$$i_0 = \begin{cases} 1\text{A} & ; \quad 0 < t < 2/3\ T \\ -2\text{A} & ; \quad 2/3T < t < T \end{cases}$$

in se ponavlja s periodo $T = 3$ ms, je priključeno breme, pri katerem je napetost odvisna od toka po funkciji

$u = 10\left(i + 10^3 \int i\,\mathrm{d}t\right)$; $\quad u(0) = 0$.

Kolikšna je trenutna moč vira in kolikšna je trenutna moč na kraju prve periode?

Rešitev:

$$p = u \cdot i$$

$$u = \begin{cases} 10\left(1 + 10^3 \int 1\,\mathrm{d}t\right) = 10 + 10^4\, t \text{ V} & 0 < \text{t} < 2/3T \\ -20 + 10^4 \int_{2/3\,T}^{t} (-2)\,\mathrm{d}t + U(2/3T) = -2 \cdot 10^4 \left(t - 2/3T\right)\text{V} & 2/3\text{T} < \text{t} < T \end{cases}$$

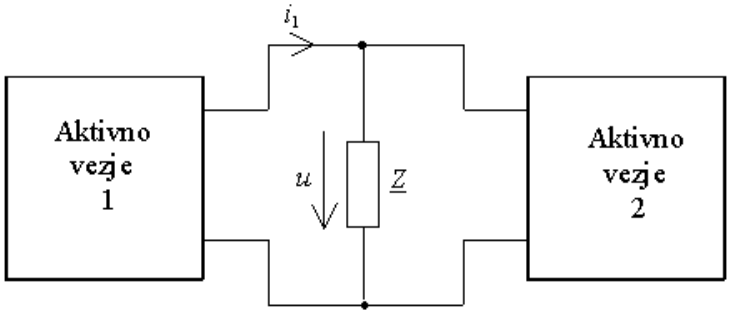
$$u(t = 2/3T) = 10^4 \cdot 2 \cdot 10^{-3} = 20 \text{ V}$$

$$u(\text{t=T}) = -2 \cdot 10^4 \left(3 \cdot 10^{-3} - 2 \cdot 10^{-3}\right) = -20 \text{ V}$$

$$p = u \cdot i = \begin{cases} 10 + 10^4 \text{ W} & 0 < \text{t} < 2/3T \\ 4 \cdot 10^4 \left(t - 2/3T\right)\text{W} & 2/3T < \text{t} < T \end{cases}$$

$$p(t = T) = 4 \cdot 10^4 \left(3 \cdot 10^{-3} - 2 \cdot 10^{-3}\right) = 40\text{W}$$

Aktivni vezji (vira) 1 in 2 sta vezani vzporedno, na njiju pa je priključena impedanca $\underline{Z}=(10+\mathrm{j}10)\Omega$. Pri napetosti $u=22\sin(\omega t-60^0)$ V je tok $i_1=4\sin(\omega t+70^0)$A . Določite moč, ki jo prejema impedanca in moč, ki jo oddaja aktivno vezje 1!



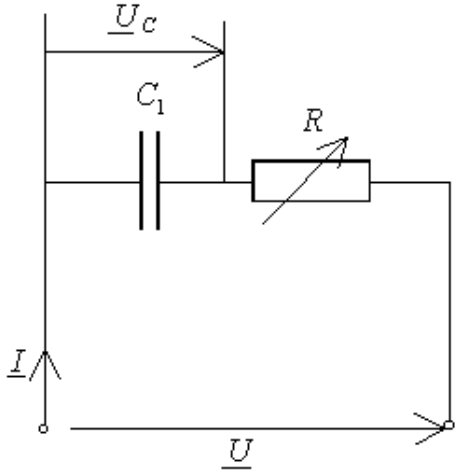
Rešitev:

$$\underline{U}=\frac{22}{\sqrt{2}}\cdot e^{-\mathrm{j}60^0}\ \mathrm{V}$$

$$\underline{I}_1=\frac{4}{\sqrt{2}}\cdot e^{\mathrm{j}70^0}\ \mathrm{A}$$

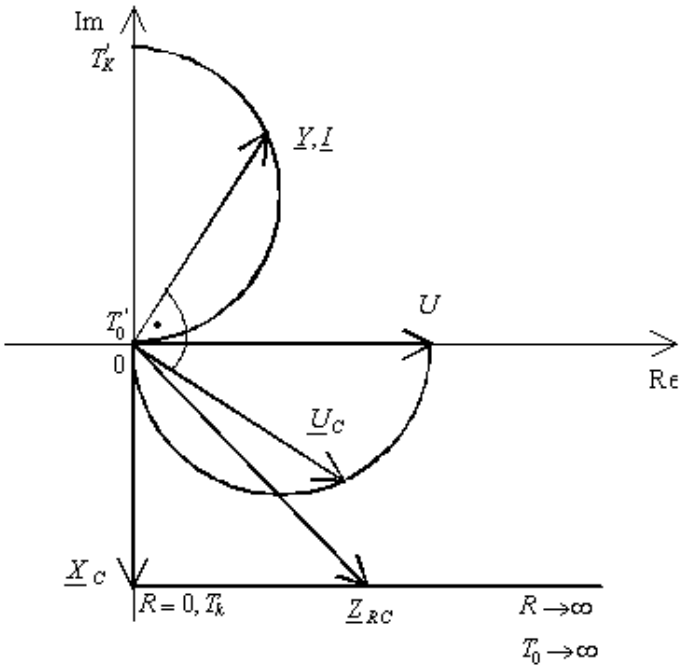
$$\underline{S}_1=\underline{U}\cdot\underline{I}_1^*=\frac{22}{\sqrt{2}}\cdot\frac{4}{\sqrt{2}}\cdot e^{-\mathrm{j}60^0-\mathrm{j}70^0}=44\,e^{-\mathrm{j}130^0}\ \mathrm{VA}=-28.28-\mathrm{j}33.7\,\mathrm{VA}$$ vezje je potrošnik

$$\underline{S}_z=\underline{U}\cdot\left(\frac{\underline{U}}{\underline{Z}}\right)^*=\frac{22}{\sqrt{2}}\cdot e^{-\mathrm{j}60^0}\left(\frac{22/\sqrt{2}\cdot e^{-\mathrm{j}60}}{10\sqrt{2}\cdot e^{\mathrm{j}45}}\right)^*=17.1e^{\mathrm{j}45^0}=12.1+\mathrm{j}12.1\mathrm{VA}$$



V danem vezju se spreminja R v mejah $0 \le R < \infty$. Narišite tirnico napetosti $\underline{U}_c$ v vezju pri $\underline{U} = U = \text{konst.}$!

Rešitev:



$$\underline{U}_c = -\mathrm{j} X_c \cdot \underline{I} = -\mathrm{j} X_c \underline{U} \cdot \underline{Y}$$

Simetrično trifazno omrežje napetosti 3x400/231 V napaja tri simetrične potrošnike: peč moči 100 kW, motor, ki rabi 80 kW s $\cos\varphi = 0.85$ in motor, ki daje na gredi 118 kW pri $\cos\varphi = 0.8$ ter izkoristku $\eta = 0.9$. Določite skupni $\cos\varphi$ in linijski tok!

Rešitev:

$$\underline{S}_1 = P + \mathrm{j}0 = 100(1 + \mathrm{j}0)\,\mathrm{kVA}$$

$$\underline{S}_2 = \frac{80}{0.85}\left(0.85 + \mathrm{j}\sqrt{1 - 0{,}85^2}\right) = 80 + \mathrm{j}49.6\,\mathrm{kVA}$$

$$\underline{S}_3 = \frac{118}{0.9 \cdot 0.8}\left(0.8 + \mathrm{j}\sqrt{1 - 0{,}8^2}\right) = 131 + \mathrm{j}98.3\,\mathrm{kVA}$$

$$\underline{S} = \underline{S}_1 + \underline{S}_2 + \underline{S}_3 = 311 + \mathrm{j}147.9\,\mathrm{kVA},\ \mathrm{S} = 362.5\,\mathrm{kVA}$$

$$\cos\varphi = \frac{P}{S} = \frac{311}{\sqrt{311^2 + 147.9^2}} = 0.86$$

$$S = \sqrt{3}\,U\,I$$

$$I = \frac{S}{\sqrt{3}\,U} = \frac{362.5 \cdot 10^3}{\sqrt{3} \cdot 400} = 523\ \mathrm{A}$$