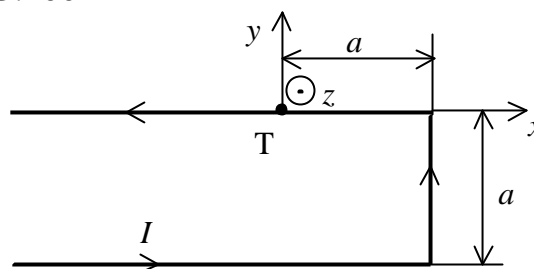


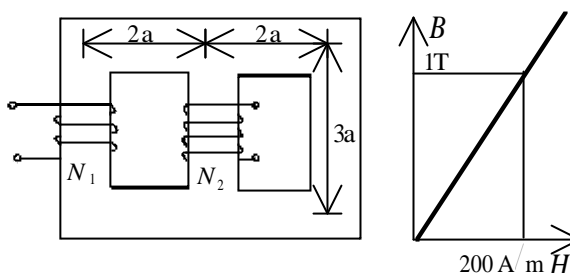
## OSNOVE ELEKTROTEHNIKE II

Izpit, 29.03.2004

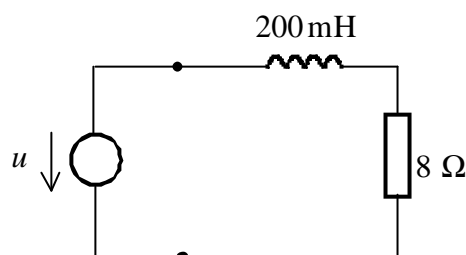
1. Določite vektor sile  $\frac{d\vec{F}}{d\ell}$  na enoto dolžine v točki T pravokotno lomljenega vodnika s tokom  $I$ .



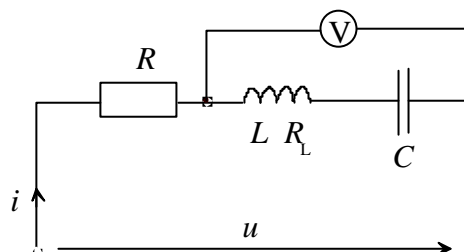
2. Dano je magnetno jedro z aproksimativno magnetilno krivuljo,  $N_1 = 250$  ovojev,  $N_2 = 300$  ovojev,  $a = 10$  cm,  $A = 10$  cm<sup>2</sup>. Izračunajte medsebojno induktivnost obeh navitij!



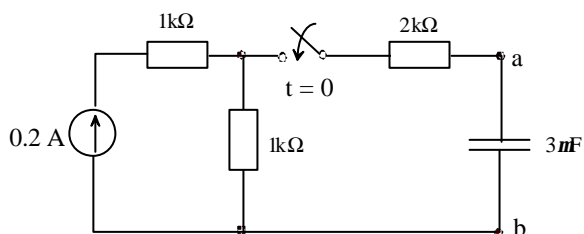
3. Izračunajte delovno moc na bremenu;  $u(t) = 100 \cos 300t$  V.



4. Zaporedni nihajni krog z  $R = 1 \Omega$ ,  $L = 20$  mH,  $R_L = 0.1 \Omega$  in  $C = 2 \mu\text{F}$  je priključen na harmonično napetost  $u = 10 \cos \omega t$  resonančne frekvence (napetost  $u$  in tok  $i$  sta v fazi). Kolikšno efektivno napetost kaže idealni voltmeter?



5. Kolikšna je napetost na kondenzatorju 10 ms po vklopu stikala S?



Rešitve so objavljene na naslovu: <http://torina.fe.uni-lj.si/oe>

## OSNOVE ELEKTROTEHNIKE II

Izpit, 29. 03. 2004 - Rešitve

1.  $d\vec{F} = I d\vec{l} \times \vec{B} = I d\ell B (-\vec{e}_x \times \vec{e}_z) = \vec{e}_y I d\ell B$

$$\vec{B} = \vec{B}_1 + \vec{B}_2 = \vec{e}_z \left( \frac{\mu_0 I}{4\pi a} \left( 1 + \frac{\sqrt{2}}{2} \right) + \frac{\mu_0 I}{4\pi a} \cdot \frac{\sqrt{2}}{2} \right)$$

$$\vec{B} = \vec{e}_z \frac{\mu_0 I}{4\pi a} (1 + \sqrt{2})$$

$$\frac{d\vec{F}}{d\ell} = \vec{e}_y \frac{\mu_0 I^2}{4\pi a} (1 + \sqrt{2})$$

2.  $M = \frac{\Phi_{21} N_1}{I_2}$

$$\Phi_{21} = \frac{1}{2} \Phi_2 = \frac{1}{2} \frac{\Theta_2}{R_{m2}}$$

$$\Theta_2 = I_2 N_2$$

$$R_{m2} = \frac{3a}{\mu_0 N_2} + \frac{1}{2} \frac{7a}{\mu_0 N_2} = \frac{13a}{2\mu_0 N_2}$$

$$\mu = \frac{B}{H} = \frac{1}{200} \text{ Vs/Am}$$

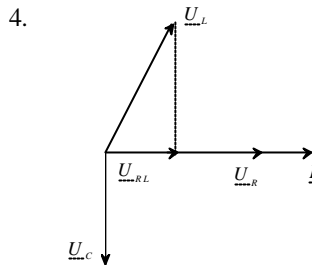
$$M = \frac{\mu_0 N_1 N_2}{13a} = \frac{200}{130.1} \cdot 10^{-3} \cdot 250 \cdot 300 = 0.288 \text{ H}$$

3.  $\underline{Z} = R + j\omega L = 8 + j60 \Omega$

$$\underline{I}_m = \frac{\underline{U}_m}{\underline{Z}} = \frac{100}{8 + j60} = 0.22 - j1.64 \text{ A}$$

$$\underline{S} = \frac{1}{2} \underline{U}_m \cdot \underline{I}_m^* = \frac{1}{2} \cdot 100 \cdot (0.22 + j1.64) = 11 + j82 \text{ VA}$$

$$P = 11 \text{ W}$$

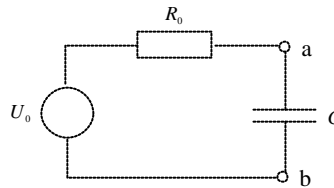


$$\underline{U}_V = \underline{U}_L + \underline{U}_C = \underline{U}_{RL}$$

$$I = \frac{U}{R + R_L} = \frac{7.1}{1.1} = 6.43 \text{ A}$$

$$U_V = I \cdot R_L = 0.64 \text{ V}$$

5. Vezje med sponkama a in b, ki nastane po vklopu stikala, nadomestimo z nadomestnim napetostnim virom  $U_0 = 200 \text{ V}$  in  $R_0 = 3 \text{ k}\Omega$ .



$$u_C = U_0 (1 - e^{-t/\tau})$$

$$\tau = R_0 C = 3 \cdot 10^3 \cdot 3 \cdot 10^{-6} = 9 \text{ ms}$$

$$t/\tau = 10 \cdot 10^{-3} / 9 \cdot 10^{-3} = 1.11$$

$$u_C = 200 (1 - e^{-1.11}) = 134 \text{ V}$$