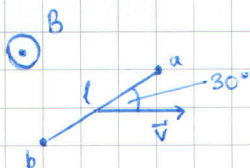


3



$$l = 1 \text{ m}$$

$$B = 0.5 \text{ T}$$

$$\vec{v} = 6 \text{ m/s}$$

$$\alpha = 30^\circ$$

$$U_{ab} = ?$$

$$|U_{ab}| = |B \cdot l \cdot v \cdot \sin(\alpha)|$$

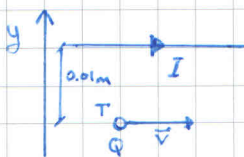
$$|U_{ab}| = |0.5 \cdot 6 \cdot 1 \cdot \sin(30^\circ)|$$

$$|U_{ab}| = 1.5 \text{ V}$$

$$U_{ab} = -1.5 \text{ V} \quad \textcircled{B}$$



2



$$I = 10 \text{ A}$$

$$d = 0.01 \text{ m}$$

$$Q = -20 \text{ nAs} = -2 \cdot 10^{-10} \text{ As}$$

$$\vec{v} = 10^4 \text{ m/s}$$

$$\mu_0 = 4\pi \cdot 10^{-7} \text{ Vs/Am}$$

$$\vec{F} = ?$$

$$B = \mu \frac{I}{2\pi d}$$

$$B = 4\pi \cdot 10^{-7} \cdot \frac{10}{2\pi \cdot 0.01}$$

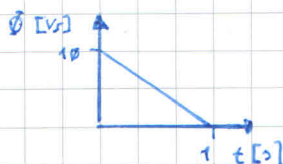
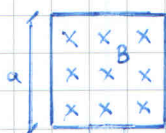
$$B = 2 \cdot 10^{-4} \text{ T} \quad \textcircled{B} \quad (\text{po pravilu ruke})$$

$$F = qvB = -2 \cdot 10^{-10} \cdot 10^4 \cdot 2 \cdot 10^{-4}$$

$$F = -4 \cdot 10^{-10} \text{ N} \quad \uparrow \quad (\text{po pravilu ruke})$$

$$F = 40 \text{ nN} \quad \downarrow \quad \textcircled{E}$$

6



$$\Delta t = 1 \text{ s}$$

$$a = 25 \text{ cm} = 0.25 \text{ m}$$

$$S = 16 \text{ mm}^2 = 1.6 \cdot 10^{-5} \text{ m}^2$$

$$\rho = 0.0169 \cdot 10^{-6} \Omega \text{ m}$$

$$Q = ?$$

$$U_i = \frac{d\Phi}{dt} = \frac{-10}{1} = -10 \text{ V}$$

$$R = \rho \frac{l}{S} = 0.0169 \cdot 10^{-6} \cdot \frac{0.25 \cdot 4}{1.6 \cdot 10^{-5}}$$

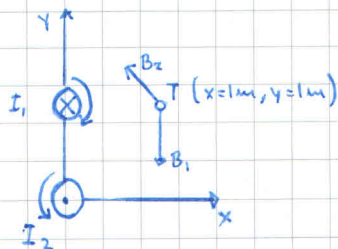
$$R = 1.05625 \cdot 10^{-3} \Omega$$

$$I = \frac{U}{R} = \frac{10}{1.06 \cdot 10^{-3}} = 9467.455621 \text{ A}$$

$$I = \frac{\Delta Q}{\Delta t} \Rightarrow Q = I \cdot \Delta t = 9467.5$$

$$Q = 9467.5 \text{ As} \quad \textcircled{A}$$

6



$$I_1(x=0, y=1) = 2 \text{ A}$$

$$I_2(x=0, y=0) = 4 \text{ A}$$

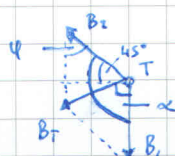
$$B_T = ?$$

$$B_1 = \mu_0 \frac{I_1}{2\pi d_1} = 4\pi \cdot 10^{-7} \cdot \frac{2}{\pi \cdot 2 \cdot 1}$$

$$B_1 = 4 \cdot 10^{-7} \text{ T}$$

$$B_2 = \mu_0 \frac{I_2}{2\pi d_2} = 4\pi \cdot 10^{-7} \cdot \frac{4}{2\pi \cdot 1} = 5.66 \cdot 10^{-7} \text{ T}$$

$$\vec{B}_T = \vec{B}_1 + \vec{B}_2$$



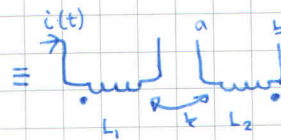
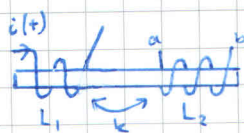
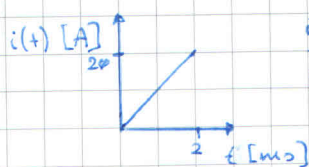
$$\alpha = 90^\circ + 45^\circ = 135^\circ$$

$$\varphi = \frac{360 - 2 \cdot 135}{2} = 45^\circ$$

$$B_T = \sqrt{B_1^2 + B_2^2 - 2B_1B_2 \cos(\varphi)}$$

$$B_T = 4 \cdot 10^{-7} = 4 \mu \text{ T} \quad \textcircled{C}$$

3



$$L_1 = L_2 = 2 \text{ mH}$$

$$k = 0.5$$

$$U_{ab} = ?$$

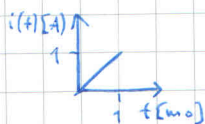
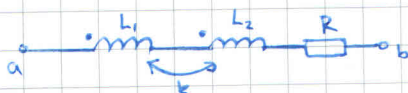
$$M = k \sqrt{L_1 L_2} = 0.5 \sqrt{2 \cdot 2} = 1 \text{ mH}$$

$$|U_{ab}| = U_M = M \frac{di}{dt} = 1 \cdot 10^{-3} \cdot 1 \cdot 10^4 = 10 \text{ V}$$

$$\frac{di}{dt} = \frac{20}{2 \cdot 10^{-3}} = 1 \cdot 10^4 \text{ A/s}$$

$$U_{ab} = -10 \text{ V} \quad (\text{Lentzovo pravilo}) \quad \textcircled{A}$$

4



$$t = 0.5 \text{ ms}$$

$$L_1 = 1 \text{ mH}$$

$$L_2 = 4 \text{ mH}$$

$$k = 0.5$$

$$R = 2 \Omega$$

$$U_{ab} = ?$$

$$i(t) = 0.5 \text{ A}$$

$$U_R = i \cdot R = 0.5 \cdot 2 = 1 \text{ V}$$

$$M = k \sqrt{L_1 L_2} = 0.5 \sqrt{1 \cdot 4} = 1 \text{ mH}$$

$$L_{uk} = L_1 + L_2 + 2M = 1 + 4 + 2 \cdot 1 = 7 \text{ mH}$$

$$\frac{di}{dt} = \frac{1}{1 \cdot 10^{-3}} = 1 \cdot 10^3$$

$$U_{Luk} = L_{uk} \frac{di}{dt} = 7 \cdot 10^{-3} \cdot 10^3 = 7 \text{ V}$$

$$U_{ab} = U_R + U_{Luk} = 1 + 7 = 8 \text{ V} \quad \textcircled{A}$$

Alternativno

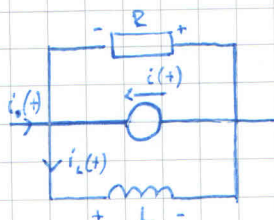
$$U_{L1} = (L_1 + M) \frac{di}{dt} = 2 \text{ V}$$

$$U_{L2} = (L_2 + M) \frac{di}{dt} = 5 \text{ V}$$

$$U_{ab} = U_R + U_{L1} + U_{L2}$$

$$= 1 + 2 + 5 = 8 \text{ V}$$

4



$$t = 2 \text{ s}$$

$$R = 5 \Omega$$

$$L = 2.5 \text{ H}$$

$$i(t) = 2 \text{ A}$$

$$i_L(t) = -2t \text{ A}$$

$$i_0(t) = ?$$

$$U_L = L \frac{di_L}{dt} = 2.5 \cdot (-2) = -5 \text{ V}$$

$$U_L = U_R = -5 \text{ V}$$

$$i_R = \frac{U}{R} = \frac{-5}{5} = -1 \text{ A}$$

$$i_0 = i_L - i_R = -2 \cdot 2 - (-1) = -7 \text{ A} \quad \textcircled{A}$$

4



(Sujer prepostavljam
i nije važno)

$$\Delta t = 1 \text{ s}$$

$$\Delta \Phi = 1 \text{ Vb}$$

$$R = 0.5 \Omega$$

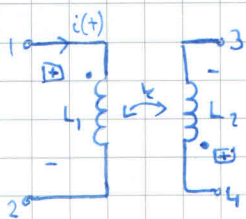
$$Q = ?$$

$$U_i = \frac{d\Phi}{dt} = \frac{1}{1} = 1 \text{ V}$$

$$I = \frac{U}{R} = \frac{1}{0.5} = 2 \text{ A}$$

$$Q = I \cdot \Delta t = 2 \cdot 1 = 2 \text{ As} \quad \textcircled{D}$$

5



$$L_1 = 4 \text{ mH}$$

$$L_2 = 1 \text{ mH}$$

$$k = 0.8$$

$$\Delta I = -2 \text{ A}$$

$$\Delta t = 0.1 \text{ ms} = 1 \cdot 10^{-4} \text{ s}$$

$$U_{34} = ?$$

$$M = k \sqrt{L_1 L_2} = 0.8 \sqrt{4 \cdot 1} = 1.6 \text{ mH} = 1.6 \cdot 10^{-3} \text{ mH}$$

$$\frac{di}{dt} = \frac{-2}{1 \cdot 10^{-4}} = -2 \cdot 10^4$$

$$U_i = M \frac{di}{dt} = 1.6 \cdot 10^{-3} \cdot (-2) \cdot 10^4 = -32 \text{ V}$$

$$U_i = U_{43} \text{ (Letzovo pravilo)}$$

$$U_{43} = -U_{34} \Rightarrow U_{34} = 32 \text{ V} \quad \textcircled{D}$$