

Osnove V. tjedna

1) $B = 0.5 \text{ T}$
 $I = 20 \text{ A}$
 $l = 0.1 \text{ m}$
 $\alpha = 30^\circ$

$$F = B \cdot I \cdot l \cdot \sin \alpha$$

$$F = 0.5 \cdot 20 \cdot 0.1 \cdot \sin 30^\circ$$

$$F = 0.5 \text{ N}$$

najmanja kada $\sin \alpha = 0 \rightarrow F = 0$

najveća kada $\sin \alpha = 1 \rightarrow F = 1 \text{ N}$

2) $l = 1 \text{ m}$
 $d = 1 \text{ m}$
 $I = 2 \text{ A}$
 $\uparrow \downarrow$

$$F = B \cdot I \cdot l$$

za 2 paralelna vodica $F = \mu \frac{I_1 I_2}{2\pi r} \cdot l$

$$F = 4 \cdot 10^{-7} \cdot \pi \cdot \frac{4}{2 \cdot 1} \cdot 1 = 8 \cdot 10^{-7} \text{ N}$$

odbijaju se - suprotnu smjer

3) $l = 2 \text{ m}$
 $d = 0.01 \text{ cm}$
 $I = 2$
 $F = 4 \cdot 10^{-5} \text{ N}$

$$F = \mu \frac{I_1 I_2}{2\pi r} \cdot l$$

$$4 \cdot 10^{-5} = 4 \cdot 10^{-7} \pi \cdot \frac{I^2}{2\pi \cdot 0.01} \cdot 2$$

$$8\pi \cdot 10^{-5} = 8 \cdot 10^{-7} \pi \cdot I^2$$

$$I^2 = 10^2$$

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

4) $N = 300$
 $l = 0.12 \text{ m}$
 $r = 0.01 \text{ m}$
 $I = 0.8 \text{ A}$
 $l \gg r$

a) $B = \mu \frac{NI}{l} = \frac{4 \cdot 10^{-7} \cdot \pi \cdot 300 \cdot 0.8}{0.12} = 2.5 \cdot 10^{-3} \text{ T}$

b) za "duge" zavojnice vredi da je polje na krajevima 2 puta manje nego u sredini

$$B = \frac{1}{2} \cdot 2.5 \cdot 10^{-3} = 1.25 \cdot 10^{-3} \text{ T}$$

c) smjer - pravilo desne ruke - $\leftarrow \rightarrow$ ulyeva

g) $\ell = 20 \text{ cm} = 0.2 \text{ m}$ $U_{\text{ind}} = B \cdot \ell \cdot v \cdot \sin \alpha = 0.2 \cdot 15 \cdot 1.2 \cdot 1 = 3.6 \text{ V}$

$v = 12 \text{ m/s}$

$\alpha = 90^\circ$

$B = 1.2 \text{ T}$

$U_{\text{ind}} = ?$

a) $d = 80 \text{ m}$

$U_{\text{ind}} = B \cdot \ell \cdot v = 0.4 \text{ V}$

$v = 500 \text{ km/h} = 139 \text{ m/s}$

$B = 20 \text{ nT} = 2 \cdot 10^{-8} \text{ T}$

$U_{\text{ind}} = ?$

g) $L = 1 \text{ H}$

a) $U = L \cdot \frac{1}{\Delta t} = 1 \cdot \frac{1}{0.1} = 10 \text{ V}$

$I = 1 \text{ A}$

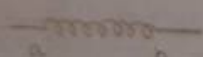
$\Delta t = 100 \text{ ms} = 0.1 \text{ s}$

b) $\frac{10}{100} = 0.1 \text{ V na zaveznicu}$

$U = 100$

g) $\frac{dI}{dt} = 1000 \frac{\text{A}}{\text{s}}$

$U = L \cdot \frac{dI}{dt}$



$U = 1000 \text{ V}$

g) $B = 0.3 \text{ T}$

$\ell = 0.1 \text{ m}$

$R_1 = 1 \Omega$

$R_2 = 2 \Omega$

$v = 10 \text{ m/s}$

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

a) $U_{\text{ind}} = ?$

b) $W = ?$

$U_{\text{ind}} = B \cdot \ell \cdot v = 0.3 \cdot 0.1 \cdot 10 = 0.3 \text{ V}$



$I = \frac{U}{R} = \frac{0.3}{1+2} = 0.1 \text{ A}$

$W = F \cdot s = B \cdot I \cdot \ell \cdot v \cdot \Delta t = 0.3 \cdot 0.1 \cdot 0.1 \cdot 10 \cdot 1$

$W = 0.003 \text{ J}$

moza ispost 2 mJ

g) $a = 0.1 \text{ m}$

$N = 500$

$f = 1200 / \text{min} = 20 / \text{s}$

$B = 40 \text{ nT} = 4 \cdot 10^{-8} \text{ T}$

$w = 2\pi f$, $s = a^2$

$U_m = N \cdot w \cdot B \cdot s = 500 \cdot 2\pi \cdot 4 \cdot 10^{-8} \cdot 0.1^2$

$U_m = 0.025 \text{ V}$

11) $L = 1 \text{ H}$

$I = \frac{U}{R} = 5 \text{ A}$

$U = 10 \text{ V}$

$R_1 = 2 \Omega$

$W = L \cdot \frac{I^2}{2} = 1 \cdot \frac{25}{2} = 12.5 \text{ W}$

a) $I = ?$

b) $W = ?$

12) $\Delta t = 1$

$U = \frac{\Delta \Phi}{\Delta t} = 1 \text{ V}$ $I = \frac{U}{R} = 1 \text{ A}$

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

$R = 1 \Omega$

$\Delta q = I \cdot \Delta t = \Delta \Phi / R = 1 \text{ As}$

$\Delta q = ?$

13) $N = 20$

$S = 4 \text{ cm}^2 = 4 \cdot 10^{-4} \text{ m}^2$

$B = 1 \text{ mT} = 10^{-3} \text{ T}$

$\Delta t = 1 \text{ ms} = 10^{-3} \text{ s}$

$U_{\text{ind}} = ?$

$U = 20 \cdot \frac{B \cdot S}{\Delta t} = \frac{20 \cdot 10^{-3} \cdot 4 \cdot 10^{-4}}{10^{-3}} = 8 \cdot 10^{-2} \text{ V}$

14) $L = 0.1 \text{ H}$

$U_{\text{ind}} = 0.001 \text{ V}$

0.005 s

$U_{\text{ind}} = \frac{\Delta \Phi}{\Delta t} = \frac{L \cdot \frac{I}{\Delta t}}{\Delta t} = \frac{0.1 \cdot 2}{0.001} = 0.2 \text{ V}$

$U_{\text{ind}} = \frac{L \cdot \frac{1}{\Delta t}}{\Delta t} = \frac{0.1}{0.001^2} = 0.2 \text{ mV}$

$U_{\text{ind}} = 0$ u $t = 3$ od $2-3 \text{ ms}$

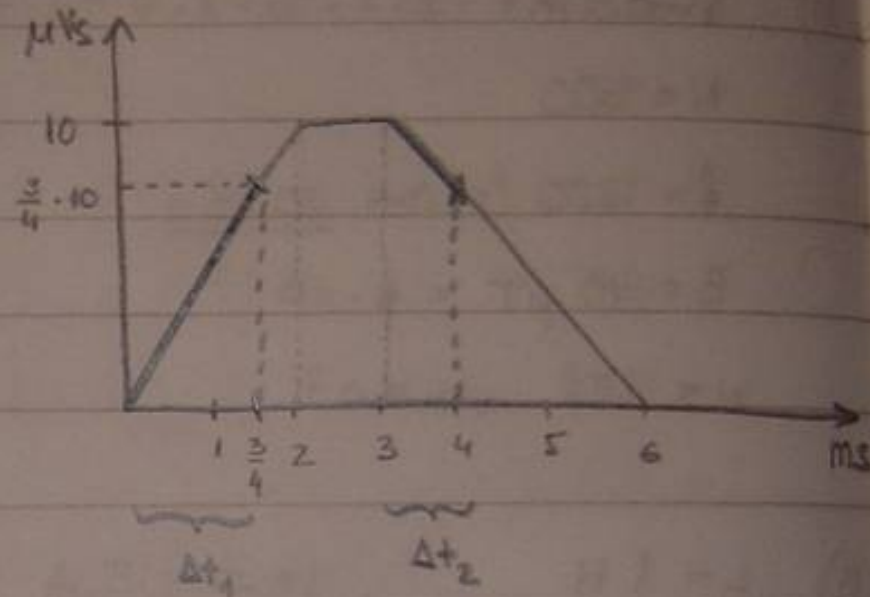
15) $N = 1000$

a) u_{ind} u 1.5 ms

$$u_{ind} = N \cdot \frac{\Delta \Phi}{\Delta t_1} = 1000 \cdot \frac{10 \cdot 10^{-6} \cdot \frac{3}{4}}{0.0015} = 5 \text{ V}$$

b) u_{ind} u 4 ms

$$u_{ind} = N \cdot \frac{\Delta \Phi}{\Delta t_2} = 1000 \cdot \frac{10 \cdot 10^{-6} \cdot 3}{0.001} = 3.33 \text{ V}$$



16) $L_1 = 5 \text{ mH} = 0.005 \text{ H}$

$L_2 = 10 \text{ mH} = 0.01 \text{ H}$

$k = 0.75$

$I = 1 \text{ A}$

$\frac{\Delta I}{\Delta t} = \frac{10 \text{ A}}{\text{s}}$