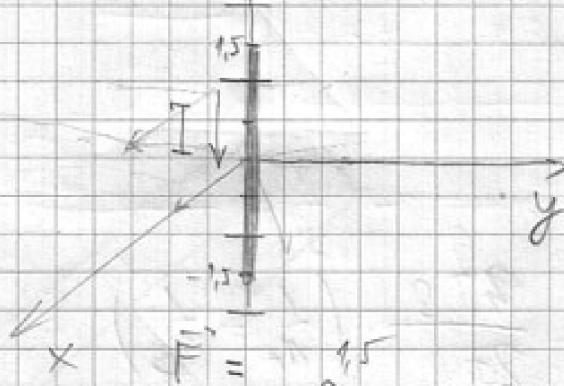


EMP - MS 3

1. ~WOLFMAN



$$\vec{F} = 1.5$$

$$\vec{F} = -I \vec{a}_x \int_{-0.2}^{0.2} 3 \cdot 10^{-4} \cdot e^{-0.2x} dz = -I \cdot 3 \cdot 10^{-4} \cdot e^{-0.2x} \cdot 3 \vec{a}_x$$

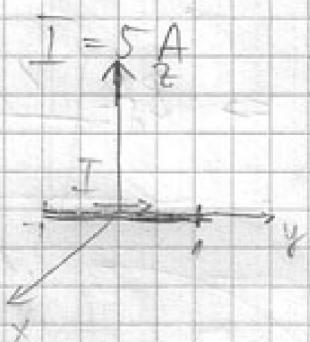
MORAMO DJELOVATI

STOMISLOM U

KONTRASMIERU

$$N = \int_{-0.2}^{0.2} \vec{F} ds = \int_0^0 9I \cdot 10^{-4} \cdot e^{-0.2x} dx = 9 \cdot 10^{-4} \cdot \frac{e^{-0.2x}}{-0.2} = -45 \cdot 10^{-3} \cdot (1 - e^{-0.4}) = 1.4835 \cdot 10^{-3} = 0.015 \text{ J}$$

2.



$$I = 5 \text{ A}$$

$$1.0607 (\vec{a}_x + \vec{a}_y) = 5 \cdot 2 \cdot (B_z \vec{a}_x - B_x \vec{a}_z)$$

$$10 \cdot B_z = 1.0607$$

$$-10 B_x = 1.0607$$

$$B_x = -0.10607$$

$$B_z = 0.10607$$

$$\vec{B} = 0.10607 (-\vec{a}_x + \vec{a}_z)$$

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

$$\vec{B} = 3 \cdot 10^{-4} \cdot e^{-0.2x} \cdot \vec{a}_x [T]$$

$$d\vec{l} \times \vec{B} = \begin{vmatrix} \vec{a}_x & \vec{a}_y & \vec{a}_z \\ 0 & 0 & -1 \\ 0 & 3 \cdot 10^{-4} e^{-0.2x} & 0 \end{vmatrix} =$$

$$= -\vec{a}_x (3 \cdot 10^{-4} e^{-0.2x})$$

$$\vec{F} = -I \vec{a}_x \int_{-0.2}^{0.2} 3 \cdot 10^{-4} \cdot e^{-0.2x} dz = -I \cdot 3 \cdot 10^{-4} \cdot e^{-0.2x} \cdot 3 \vec{a}_x$$

$$= -9I \cdot 10^{-4} e^{-0.2x} \vec{a}_x$$

$$= -9 \cdot 10^{-4} \cdot 5 \cdot e^{-0.2x} \vec{a}_x$$

$$= -45 \cdot 10^{-4} \cdot e^{-0.2x} \vec{a}_x$$

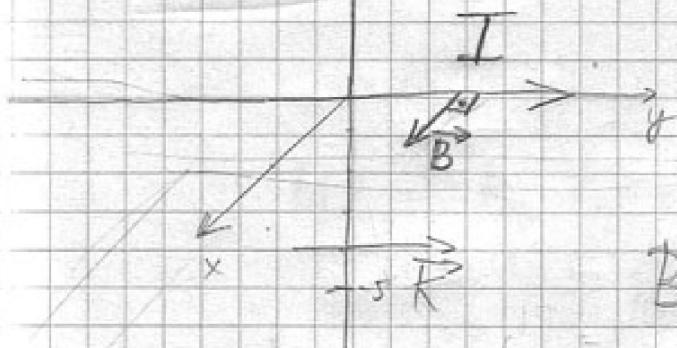
$$= -45 \cdot 10^{-4} \cdot (1 - e^{-0.4}) \vec{a}_x$$

$$= 1.4835 \cdot 10^{-3} \vec{a}_x = 0.015 \text{ J}$$

3. $\vec{F} = 30 \vec{a}_y [A/m]$

$z = -5 [m]$

$I = 5 A, \vec{a}_y$



\vec{B} je shonom i može se mijenjati u vremenu
 Tako je $F = BI \cdot l$

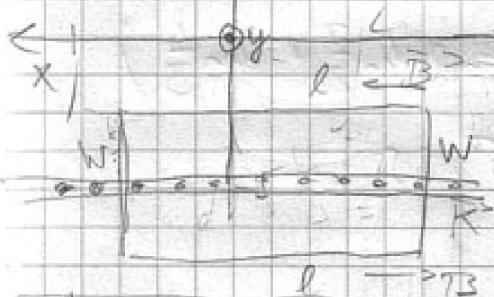
$$B = \mu_0 \frac{K}{2}, \text{ slijedi proporcionalnost}$$

$$\vec{B} = \frac{\mu_0 \cdot 30}{2} \vec{a}_x = \mu_0 \cdot 15 \vec{a}_x$$

IZVOD FORMULE ZA B:

Impresivni razon

$$F = BIl \rightarrow F' = \frac{F}{l} = BI = 94,25 \mu N$$



4. $r_1 = 2 \text{ mm}$

$r_2 = 9 \text{ mm}$

$$\oint \vec{B} d\vec{l} = \mu_0 I$$

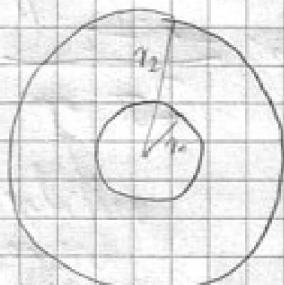
$$BS \cdot 2k = \mu_0 \cdot K \cdot l$$

$$B = \frac{\mu_0 K}{2}$$

OCITO SE TRAJI VANJSKI INDUKTIVITET

FORMULA 12 BERBERONICA:

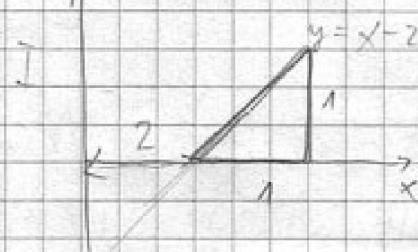
$$L_v = \frac{\mu_0}{2\pi} \cdot \ln\left(\frac{r_2}{r_1}\right) = 300,8 \mu H$$



$$P = \iint \frac{\mu_0 I}{2\pi x} dy dx = \frac{\mu_0 I}{2\pi} \int_{-3}^3 \int_0^{x/2} dy dx =$$

$$= \frac{\mu_0 I}{2\pi} \cdot \int_{-3}^3 \left(1 - \frac{2}{x}\right) dx = \frac{\mu_0 I}{2\pi} \left(1 - 2 \ln \frac{3}{2}\right)$$

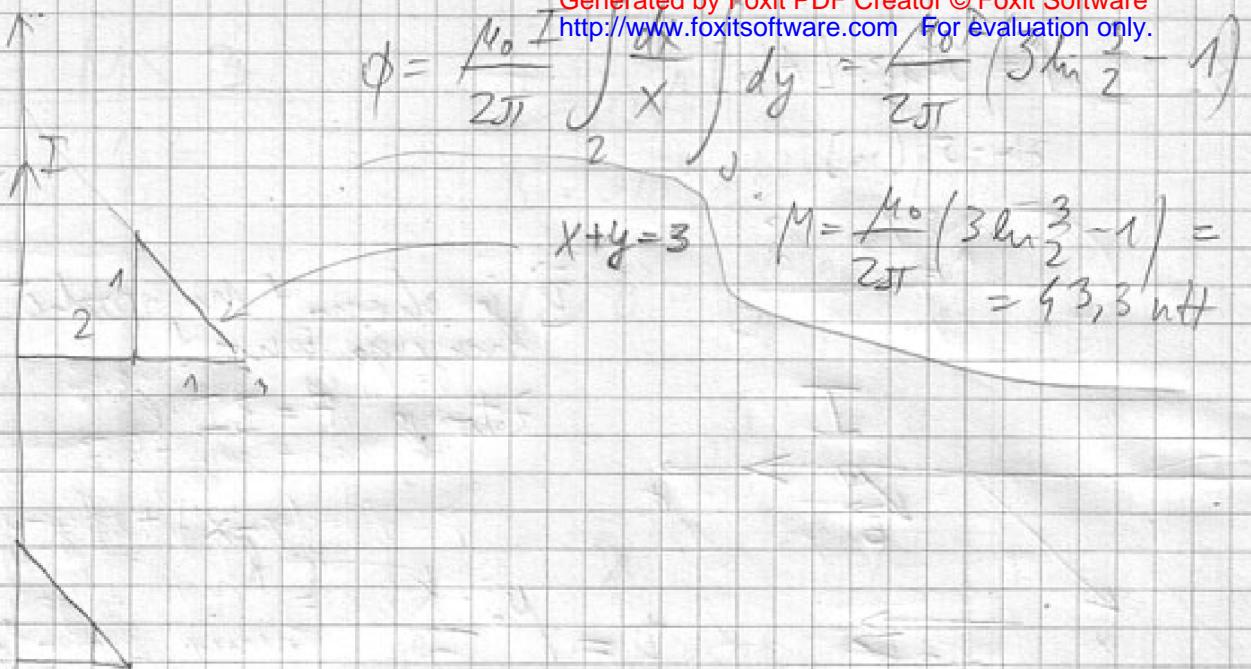
5.



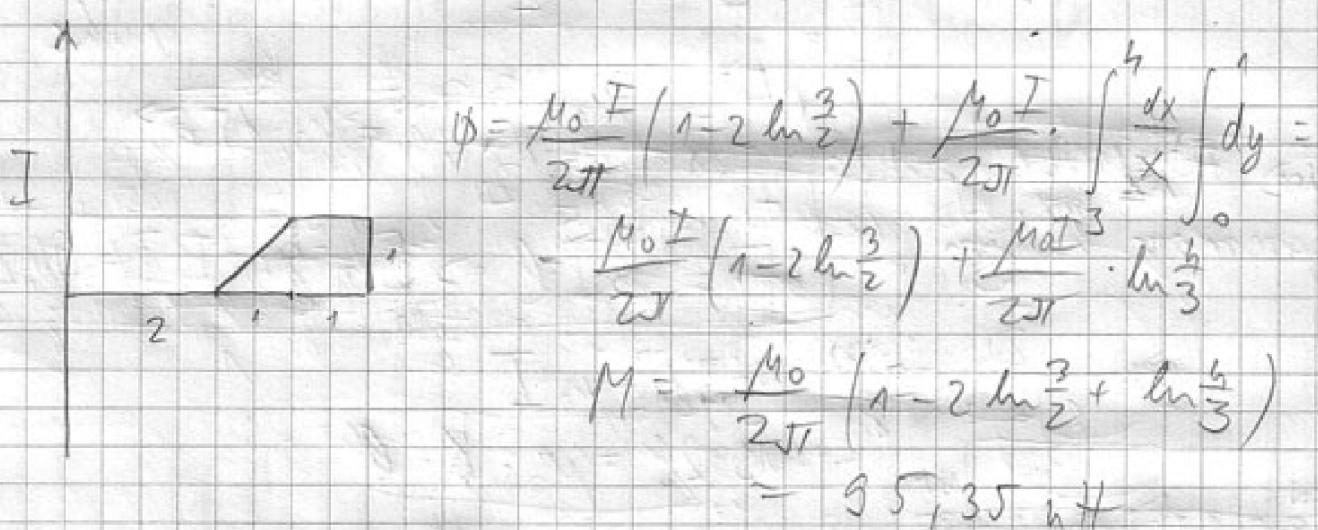
$$M = \frac{J}{I}$$

$$M = \frac{\mu_0}{2\pi} \left(1 - 2 \ln \frac{3}{2}\right) = 37,8 \mu H$$

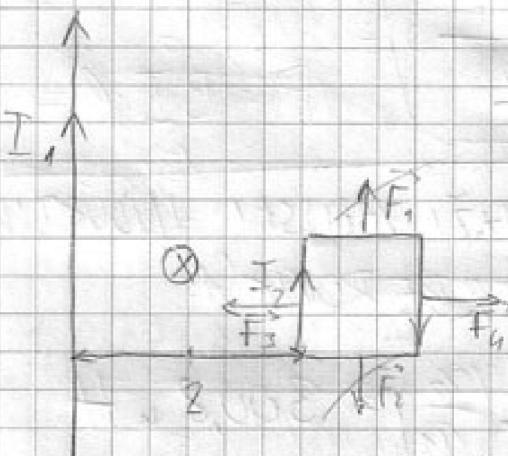
6. I



7.



8.



$$\vec{F}_1 + \vec{F}_2 = \emptyset$$

sila između par. vodiča: $\vec{F}_{12} = \mu_0 \text{mn} \cdot \frac{\vec{I}_1 \cdot \vec{I}_2 \cdot l}{2\pi r}$

duljina vodiča

$$\vec{F}_3 = \mu_0 \cdot \frac{\vec{I}_1 \cdot \vec{I}_2 \cdot l}{2\pi \cdot 2} \vec{a}_y$$

$$\vec{F}_4 = \mu_0 \cdot \frac{\vec{I}_1 \cdot \vec{I}_2 \cdot l}{2\pi \cdot 3} \vec{a}_y$$

$$\vec{F}_{OK} = -33,33 \text{ nN} \vec{a}_x$$

utjecajemost
između vodiča

9. $B_f = 1 \text{ T}$, $I = 10 \text{ A}$

$$H_f = \frac{1}{\mu_0}$$

$$B_{25} = B_f \Rightarrow H_f = 200 \text{ A/m}$$

$$B_{25} \cdot S_{25} = B_{10} \cdot S_{10} \Rightarrow B_{10} = B_{25} \cdot \frac{S_{25}}{S_{10}} = 1 \cdot \frac{60}{100} = \\ \Rightarrow H_{10} = 60 \text{ A/m}$$

$$NI = H_{10} \cdot l_{10} + 2 \cdot H_{25} \cdot l_{25} + H_f \cdot 8$$

$$= 60 \cdot \frac{10}{100} + 2 \cdot 200 \cdot \frac{25}{100} + \frac{1}{\mu_0} \cdot \frac{20}{1000} = 16024,24$$

$$N = 1602$$

10. $W_f = \frac{1}{2} \cdot B_f \cdot H_f \cdot S_{25} \cdot 5 = 47,75 \text{ J}$

11. $B = 1$

$$H = 200$$

$$B = \mu_0 \mu_r \cdot H \Rightarrow \mu_r = \frac{B}{\mu_0 \cdot H} = 3978,27$$

12. $W_{25} = \frac{1}{2} \cdot B_{25} \cdot H_{25} \cdot S_{25} \cdot \frac{25}{100} = 0,15 \text{ J}$

13. $N_1 I_1 - N_2 I_2 = H_{34} \cdot l_{34} + H_{16} \cdot l_{16}$

$$B_{34} \cdot S_{34} = B_{16} \cdot S_{16} = 120 \cdot 10^{-6}$$

$$B_{34} = 0,2 \Rightarrow H_{34} = 165 \text{ A/m}$$

$$B_{16} = 0,3 \Rightarrow H_{16} = 185 \text{ A/m}$$

$$N_1 I_1 - N_2 I_2 = 78,9$$

$$200 \cdot I_1 - 100 \cdot I_2 = 78,9$$

$$I_1 = \frac{78,9}{100} = 0,789 \text{ A}$$

14. $W_{34} = \frac{1}{2} \cdot B_{34} \cdot H_{34} \cdot S_{34} \cdot l_{34} = 2,958 \text{ mJ} \approx 3 \text{ mJ}$

15. $W_{16} = \frac{1}{2} \cdot B_{16} \cdot H_{16} \cdot S_{16} \cdot l_{16} = 1,776 \text{ mJ} \approx 1,8 \text{ mJ}$