(1) 37 → Indução

1) $N = 50$

$5\,cm \times 10\,cm$

$|\vec{B}_0| = 0$

$B = 0{,}5\,T$

$\mathcal{E} = ?$

$\Delta t = 0{,}25\,s$

$$\mathcal{E} = \frac{\Delta(NBA)}{\Delta t}$$

$$\mathcal{E} = \frac{50 \times 0{,}5 \times 0{,}05 \times 0{,}10}{0{,}25} = 05\ V$$

2) $A = 8{,}0\,cm^2$

$0{,}5\,T \rightarrow 2{,}5\,T$

$\Delta t = 1\,s$

$R = 2\,\Omega$

(mesma espira)

$$I = \frac{\mathcal{E}}{R}$$

$$\mathcal{E} = \frac{1 \times (2{,}5 - 0{,}5) \times 8 \times 10^{-4}}{1} = 0{,}0016\ V$$

$$I = \frac{0{,}0016}{2} = 8 \times 10^{-4}\ A$$

(X) 3) $N = 25$

$d = 1{,}0\,m$

$B = 50\,\mu T$

$\Delta t = 0{,}2\,s$

$\theta = 180°$

$\frac{NBA\cos\theta}{\Delta t}$

a) $$\mathcal{E} = \frac{-25 \times 50 \times 10^{-6} \times (\cos(180°) - \cos(0°)) \times \pi \times 0{,}5^2}{0{,}2}$$

$$\mathcal{E} = 9{,}8 \times 10^{-3}\ V$$

b) Faz $180°$ em $0{,}2\,s$

logo $2\pi \rightarrow 0{,}4$ $\quad \omega = \frac{2\pi}{0{,}4} = 5\pi\ rad/s$

(X) $\mathcal{E} = NAB\omega \operatorname{sen} \omega t$

$= 25 \times 50 \times 10^{-6} \times \pi \times 0{,}5^2 \times 5\pi \times \operatorname{sen}(5\pi t)$

$= 0{,}0154 \operatorname{sen}(5\pi t)$

4) $N = 500$

$d = 10\,cm$

$B = 0{,}2\,T$

$\downarrow$

$B = 0$

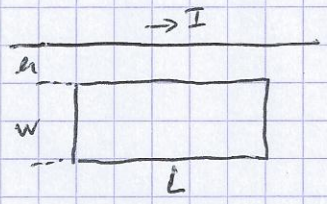
$\varepsilon = 10\,kV$

$$\varepsilon = -\frac{N \times A \times (B - B_0)}{\Delta t}$$

$$10 \times 10^3 = +\frac{500 \times \pi \times (0{,}05)^2 \times 0{,}2}{\Delta t}$$

$$\Delta t = 7{,}85 \times 10^{-5}\ s$$

5)



a) $$\Phi_B = \frac{\mu_0 I L}{2\pi} \ln\left(\frac{h+w}{h}\right)$$

b) $I(t) = a + bt$ $\quad \varepsilon = ?$ $\quad I'(t) = b$

$b = 10\ A/s$ $\quad h = 1\,cm$ $\quad w = 10\,cm$ $\quad L = 100\,cm$

$$\varepsilon = -\frac{d\Phi_B}{dt} = -\frac{d}{dt}\left[\frac{\mu_0 I L}{2\pi} \ln\left(\frac{h+w}{h}\right)\right]$$

$$= -\frac{\mu_0 I b}{2\pi} \ln\left(\frac{h+w}{h}\right)$$

$$= -4{,}80 \times 10^{-6}\ V$$

6) $N = 15$

$r = 10\,cm$

$r_3 = 2\,cm$

$n = 1000\ espiras/m$

$I = 5\,\mathrm{sen}(120t)$

$$\Phi_B = \mu_0 n I A_{solenoid}$$

$$\Phi_B = \mu_0 \times 1000 \times 5\,\mathrm{sen}(120t) \times \pi \times (0{,}02)^2$$

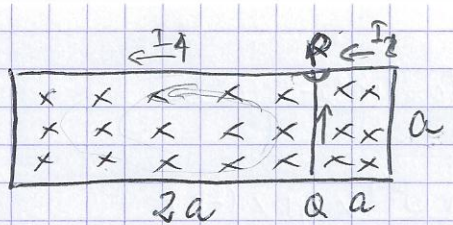
$$= 7{,}90 \times 10^{-6}\,\mathrm{sen}(120t)$$

$$\varepsilon = -N\frac{d\Phi_B}{dt} = -15 \times 7{,}90 \times 10^{-6} \times 120\cos(120t)$$

$$= -0{,}01422\cos(120t)$$

(2)

7)



$a = 65\ cm$

$B = 1{,}0 \times 10^{-3}\, t \quad (T)$

$\rho = 0{,}1\ \Omega/m$

$I = ?$ $\qquad R = 0{,}100 \times 0{,}650 = 0{,}065\ \Omega$

$B = 1{,}0 \times 10^{-3}\, t$

- $\frac{d}{dt}\left[B \times 2a^2 \cos 0^\circ\right] - I_1 \times 0{,}325 - I_{PQ} \times 0{,}065 = 0$

$$1{,}0\times10^{-3} \times 2 \times 0{,}65^2 - I_1 \times 0{,}325 - I_{PQ} \times 0{,}065 = 0$$

$$8{,}45\times10^{-4} - 0{,}325 I_1 - I_{PQ} \times 0{,}065 = 0$$

$$I_{PQ} = 0{,}013 - 5 I_1$$

- $\frac{d}{dt}\left[B \times a^2\right] - I_2 \times 0{,}195 - 0{,}065\, I_{PQ} = 0$

$$1{,}0\times10^{-3} \times 0{,}65^2 - 0{,}195\, I_2 - 0{,}065\, I_{PQ} = 0$$

$$I_{PQ} = 0{,}0065 - 3 I_2$$

- $I_{PQ} + I_2 = I_1 \iff I_{PQ} = I_1 - I_2$

$$\begin{cases} I_1 - I_2 = 0{,}013 - 5 I_1 \\ I_1 - I_2 = 0{,}0065 - 3 I_2 \end{cases} \quad \begin{cases} 6 I_1 = 0{,}013 + I_2 \\ \text{---------} \end{cases}$$

$$\begin{cases} I_1 = \frac{0{,}013 + I_2}{6} \\ 2 I_2 = 0{,}0065 - \frac{0{,}013 + I_2}{6} \end{cases} \quad \begin{cases} \text{---------} \\ 12 I_2 = 0{,}039 - 0{,}013 - I_2 \end{cases}$$

$$\begin{cases} \\ 13 I_2 = 0{,}026 \end{cases} \quad \Big\} \; I_2 = 0{,}002$$

Logo $I_{PQ} = 5 \times 10^{-4}\ A$ (calculos!)

8) $A = 100\,cm^2$

$N = 200$

$B_0 = 1,1\,T$

$R = 5\,\Omega$

$I = \frac{\mathcal{E}}{R}$

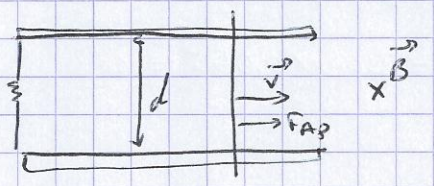
$$\mathcal{E} = -\frac{N \times A \times B\,(\cos(180°) - \cos 0°)}{\Delta t}$$

$$IR = \frac{-200 \times 100 \times 10^{-4} \times 1,1 \times (-2)}{\Delta t}$$

$$\frac{\Delta Q}{\Delta t} \times 5 = \frac{4,4}{\Delta t}$$

$$\Delta Q = 0,88\,C$$

9)



$R = 6\,\Omega$ $\quad B = 2,5\,T$

$d = 1,2\,m$

(A) a) $I = 0,5\,A$ $\quad I = \frac{\mathcal{E}}{R} = \frac{Blv}{R} \Leftrightarrow v = \frac{IR}{Bl} = 1\ m/s$

b) $v = 2,00\ m/s$ $\quad F_B = IlB$

$I = \frac{\mathcal{E}}{R}$ e $\mathcal{E} = Blv$ logo, $F_B = \frac{B^2 l^2 v}{R} = 3\,N$

c) $\mathcal{P} = I^2 R = \left(\frac{Blv}{R}\right)^2 \times R = \frac{(Blv)^2}{R} = 6\,W$

ou $P = Fv = 3 \times 2 = 6\,W$

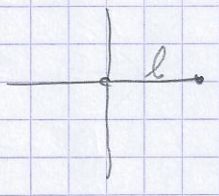
10) $d = 3\,m$

$w = 5\,m/s$

$B = 40\,\mu T$

$\mathcal{E} = ?$

$w = 5 \times 2\pi = 10\pi\ rad/s$



$$\mathcal{E} = \frac{1}{2} Blv$$
$$= \frac{1}{2} B l \times w \times l$$
$$= 1,41 \times 10^{-3}\,V$$

11) a) O sentido da aresta é oposto ao de variação do campo magnético

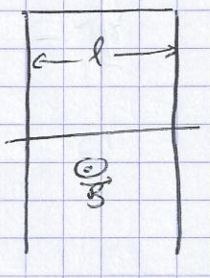
Diminui →

?

(3)

12) ℓ

$F_G + F_m$



a) $mg = I\ell B$ pq R é constante

$I = \frac{\varepsilon}{R}$

$mg = \frac{\varepsilon}{R}\ell B$

$mg = \frac{B\ell^2 v}{R}$

$v = \frac{Rmg}{B^2\ell^2}$

b) $m = 0,1$

$R = 1\,\Omega$

$\ell = 0,1\ m$

$B = 10\ T$

$v = \frac{1 \times 0,1 \times 9,8}{10^2 \times 0,1^2} = 0,98\ m/s$

$I = \frac{B\ell v}{R} = 0,98\ A$

c) ...

13) $A = 0,1\ m^2$

$N = 1000$

$w = 60 \times 2\pi/s$

$B = 0,2\ T$

a) $w = 120\pi/s$

$\varepsilon = NAB\,w\,\mathrm{sen}(wt)$

$= 1000 \times 0,1 \times 0,2 \times 120\pi \times 1$

$= 7,54 \times 10^3\ V$

b)

14) ω $t=0$

$$\Phi_B = -\Phi_{max} \operatorname{sen} \omega t$$

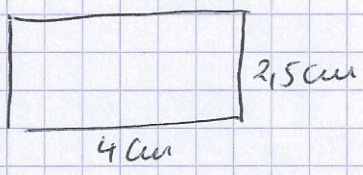
$$\varepsilon = -\frac{d\Phi_B}{dt} = \omega \Phi_{max} \cos \omega t$$

$$I = \frac{\varepsilon}{R} = \frac{\omega \Phi_{max}}{2} \cos \omega t = I_{max} \cos \omega t$$

15) $N = 80$

$I = 10A$

$B = 0,8T$



a) $\tau = NBAI \operatorname{sen}\theta$

$= 80 \times 0,8 \times (0,04 \times 0,025) \times 10 \times 1 = 0,64 \text{ N.m}$

b) $w = 3600 \text{ rev/min}$

$w = \frac{3600 \times 2\pi}{60} = 377 \text{ rad/s}$

(A) $\boxed{P_{max} = \tau_{max} w} = 241 \text{ W}$