Ασκ. 5.219 (Μαθ)

$\ell = OA = 1{,}6\,m$.

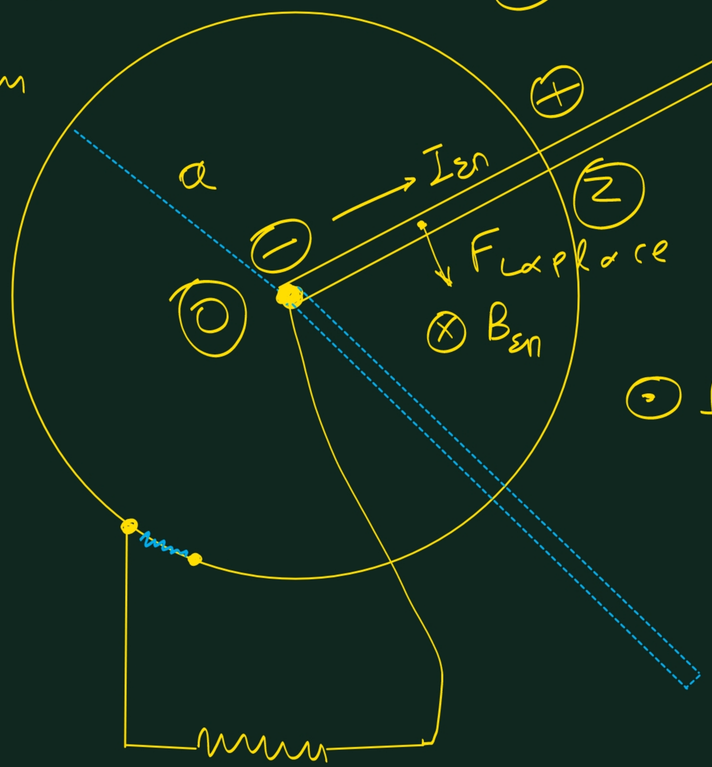
$OZ = a = 1\,m$.

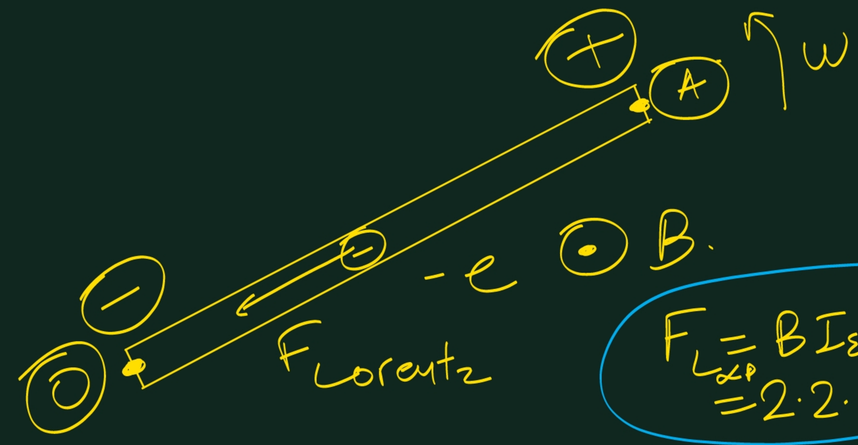
$R^* = 0{,}4\,\Omega/m$ για τον OA.

$V_1 = 0{,}2\,V$.

$R_1 = 0{,}1\,\Omega$

$B = 2\,T$.



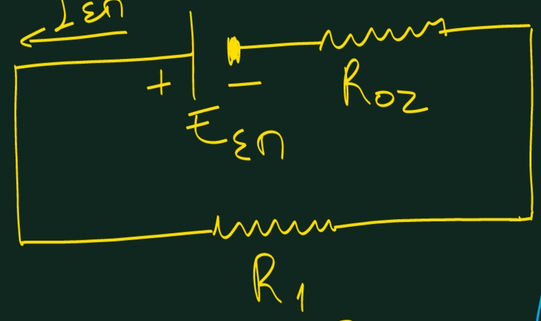


$F_{Laplace} = B I_{επ} a = 2 \cdot 2 \cdot 1 \Rightarrow F_{Laplace} = 4\,N$

$R_{OZ} = R^* \cdot OZ = R^* \cdot a = 0{,}4 \cdot 1 = 0{,}4\,\Omega$

α) Ισοδύναμο κύκλωμα.

β)



$V_1 = I_{επ} \cdot R_1 \Rightarrow$

$0{,}2 = I_{επ} \cdot 0{,}1 \Rightarrow$

$I_{επ} = 2\,A$.

$E_{επ} = I_{επ}(R_1 + R_{OZ}) \Rightarrow$

$E_{επ} = 2 \cdot (0{,}1 + 0{,}4) \Rightarrow$

$E_{επ} = 1\,Volt$.

$E_{επ} = \frac{1}{2} B w a^2 \Rightarrow 1 = \frac{1}{2} \cdot 2 \cdot w \cdot 1^2 \Rightarrow$

$w = 1\,rad/sec$

γ) $\omega = 1\ rad/sec \Rightarrow$

$\frac{2\pi}{T} = 1 \Rightarrow T = 2\pi\ sec.$

$Q = I_{\varepsilon\pi}^2 (R_1 + R_{o2}) \cdot t \Rightarrow$

$Q = I_{\varepsilon\pi}^2 (R_1 + R_{o2}) \cdot 10T \Rightarrow$

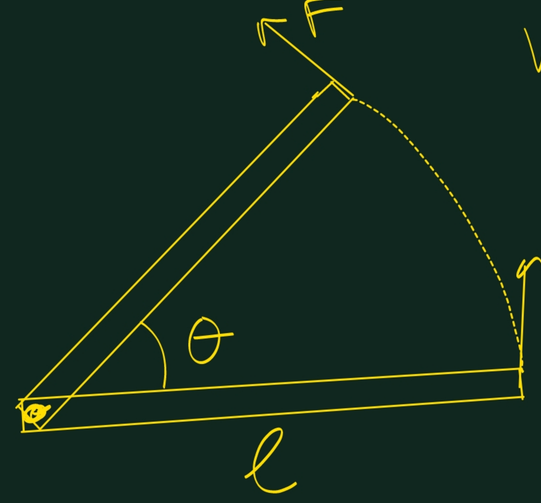
$Q = 2^2 \cdot (0,1 + 0,4) \cdot 10 \cdot 2\pi \Rightarrow$

$Q = 4 \cdot 0,5 \cdot 10 \cdot 2\pi \Rightarrow$

$Q = 40\pi$ Joule

δ) Το έργο της σταθερής δύναμης F που ασκείται κάθετα στο άκρο A του δοκού γίνεται θερμότητα στις αντιστάσεις.

Δηλαδή: $P_F = P_{R_{o2}}$ (εξίσωση ισχύων)



$W_F = F \cdot \ell \cdot \theta \Rightarrow$

$\frac{\Delta W_F}{\Delta t} = F \cdot \ell \cdot \frac{\Delta \theta}{\Delta t} = F \cdot \ell \cdot \omega$

$P_{R_{o2}} = I_{\varepsilon\pi}^2 (R_1 + R_{o2})$

Άρα: $I_{\varepsilon\pi}^2 (R_1 + R_{o2}) = F \cdot \ell \cdot \omega \Rightarrow 2^2 \cdot (0,1 + 0,4) = F \cdot 1,6 \cdot 1 \Rightarrow$

$2 = 1,6F \Rightarrow F = \frac{2}{1,6} \Rightarrow F = 1,25N$

Ασκ. 5.220 (Εξετάσεις 1993)

$L_1 = 1\,m$

$L_2 = 2\,m$

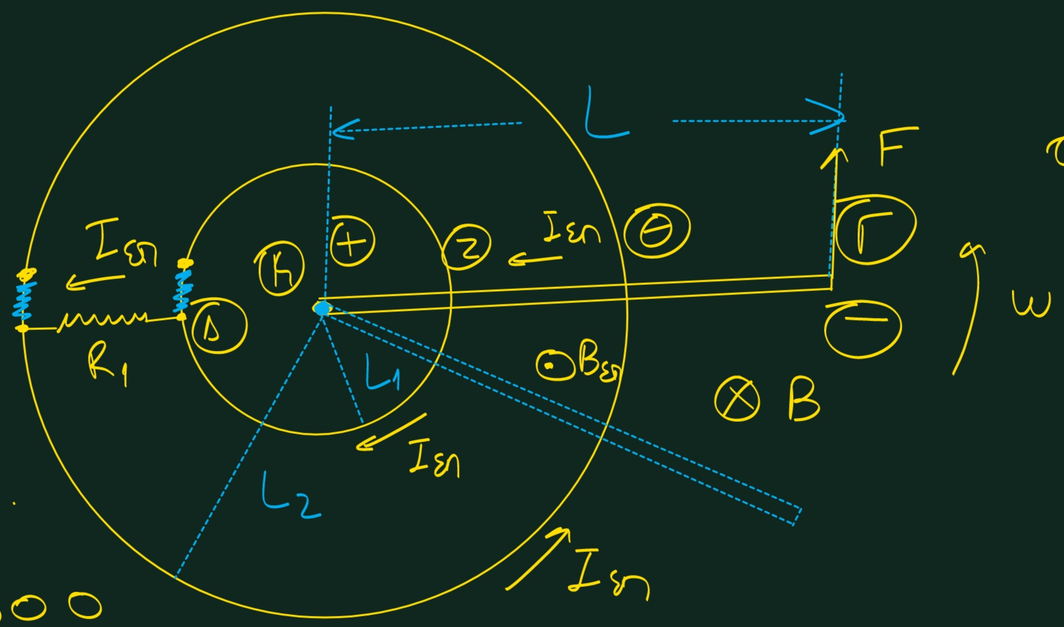
$B = 5\,T$

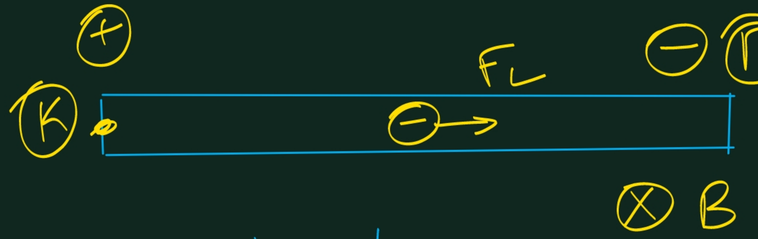
$R_1 = 600\,\Omega$

$L = 2{,}5\,m$

$\omega = 10\,rad/s$

$R_{K\Gamma} = 1000\,\Omega$





α) $E_{επ} = \dfrac{|\Delta\Phi|}{\Delta t} = \dfrac{B\pi(L_2^2 - L_1^2)}{T} =$

$= \dfrac{B\pi(L_2^2 - L_1^2)}{\frac{2\pi}{\omega}} = \dfrac{1}{2}B\omega(L_2^2 - L_1^2)$

με $V_2 > V_\Theta$

Αρα: $E_{επ} = \frac{1}{2}\cdot 5\cdot 10\cdot(4-1) = 25\cdot 3 \Rightarrow$ **$E_{επ} = 75\,Volt$**

b)