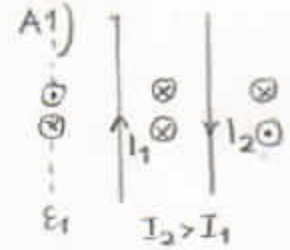
Προσομοίωση 2022 – Πρόδρομος

Θέμα Α | Α1→α | Α2→δ | Α3→β | Α4→β | Α5→ΣΛΑΣΣ

Α1)

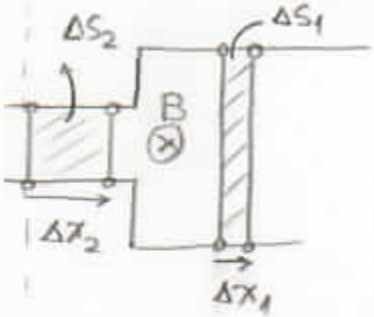


Α2) $V = N\omega BS \Rightarrow V' = 1{,}2V$

Αν $\omega' = 2\omega$ (+100%), $B' = 0{,}6B$ (−40%) $\Rightarrow V' = N \cdot 2\omega \cdot 0{,}6BS = 1{,}2V$

Α5) $\overline{P} = \frac{V_0}{\sqrt{2}} \frac{I_0}{\sqrt{2}} = \frac{P_{max}}{2}$

Θέμα Β | $K\Lambda = 2d$, $MN = d$



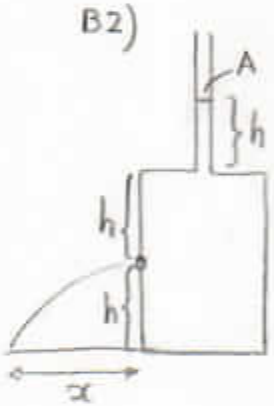
Β1) $\frac{\Delta\Phi}{\Delta t} = 0 \Rightarrow$

$\frac{\Delta\Phi_1}{\Delta t} + \frac{\Delta\Phi_2}{\Delta t} = 0 \Rightarrow$

$\Delta\Phi_1 + \Delta\Phi_2 = 0 \Rightarrow$

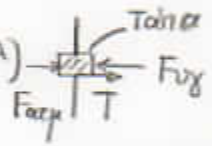
$B \cdot \Delta x_1 \, 2d - B\Delta x_2 \, d = 0 \Rightarrow \Delta x_2 = 2\Delta x_1 \Rightarrow v_2 \cdot \Delta t = 2 v_1 \Delta t \Rightarrow \underline{v_2 = 2v_1}$

Β2)



$A_0 = \frac{A}{4}$

Α)



$\vec{\Sigma F} = 0 \Rightarrow F_{ατμ} + T - F_{υγ} = 0 \Rightarrow$

$p_{ατμ} A_0 + T - (p_{ατμ} + \rho g \cdot 2h) \cdot A_0 = 0$

$\Rightarrow T = (p_{ατμ} + 2\rho g h) A_0 - p_{ατμ} A_0 = 2\rho g h A_0 \rightarrow$ (II)

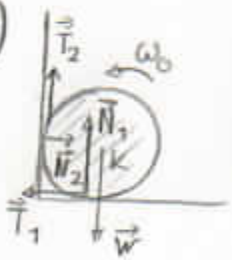
Β) $Av = A_0 v_0 \Rightarrow v = \frac{v_0}{4}$

$p_{ατμ} + \rho g 2h + \frac{1}{2}\rho v^2 = p_{ατμ} + \frac{1}{2}\rho v_0^2 \Big\} v_0 = 8\sqrt{\frac{gh}{15}}$

$x = v_0 \sqrt{\frac{2h}{g}} \Big\} x = \frac{8h}{\sqrt{15}}$

↳ (I)

Β3)



$\mu = 0{,}5$, $I = \frac{1}{2}mR^2$

$T_2 + N_1 - W = 0$, $T_1 - N_2 = 0$ | $T_1 = \mu N_1$, $T_2 = \mu N_2$ |

$\mu N_2 + N_1 = W$

$\mu N_1 - N_2 = 0$

$\mu N_2 + N_1 = W$

$\mu^2 N_1 - \mu N_2 = 0$ +

$(1+\mu^2) N_1 = W \Rightarrow N_1 = \frac{W}{1{,}25}$, $N_2 = \frac{0{,}5W}{1{,}25}$

Άρα $T_1 = \frac{0{,}5W}{1{,}25}$, $T_2 = \frac{0{,}25W}{1{,}25}$ ή $T_1 = 0{,}4W$, $T_2 = 0{,}2W$

$\Sigma\tau_K = I \cdot a_{γων} \Rightarrow -T_1 R - T_2 R = \frac{1}{2} mR^2 a_{γων} \Rightarrow a_{γων} = \cdots -1{,}2g/R \rightarrow$ (I)

Θέμα Γ

$d=0{,}1\,m$, $N=400$, $f=\frac{150}{\pi}$, $B=0{,}2\,T$, $R^*=0{,}05\,\Omega/m$, $R_2=32\,\Omega$

Γ1) $E_{max}=$; $E_{max}=N\omega BS=400\cdot 2\pi\cdot\frac{150}{\pi}\cdot 0{,}2\cdot 0{,}1^2=24000\cdot 0{,}01=240\,V$

$I_{max}=\frac{E_{max}}{R_{ολ}}=\frac{240}{2+32}=6\,A$, αφού η αντίσταση του πλαισίου:

$R=R^*\cdot 4d=0{,}05\cdot 4\cdot 0{,}1=0{,}05\cdot 0{,}4=0{,}02\,\Omega$, $R_n=N\cdot R=400\cdot 0{,}02=8\,\Omega$

↗ 1 σπείρα

Γ2) $V_{KA,max}=E_{max}-I_{max}\cdot R_η=240-6\cdot 8=240-48=192\,V$

$\omega=2\pi f=2\pi\frac{150}{\pi}=300\,rad/s$

Άρα $V_{KA}=192\,ημ(300t)$ S.I

Γ3) $V_{KA,ενεργ}=\frac{V_{KA,max}}{\sqrt{2}}=\frac{192}{\sqrt{2}}\,V$

$\bar{P}_Σ=V^2_{KA,ενεργ}/R_2=\frac{192^2}{2\cdot 32}=576\,W$

Σε 1h: $\bar{W}_{ολ}=\bar{P}_Σ\cdot t=576\,Wh$

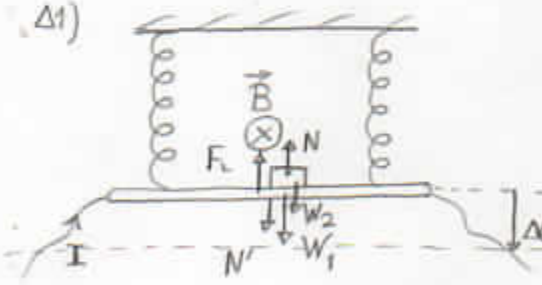
Γ4) Η μέγιστη ισχύς που απαιτείται για την περιστροφή μετατρέπεται σε αντίσταση $P_{max}=E_{max}\cdot I_{max}=240\cdot 6=1440\,W$

$P_{τ,max}=P_{max}\Rightarrow τ\cdot\omega=P_{max}\Rightarrow 300τ=1440\Rightarrow τ=4{,}8\,N\cdot m$

Θέμα Δ

$\ell=1\,m$, $M=0{,}8\,kg$, $k=50\,N/m$, $m=0{,}2\,kg$, $B=1\,T$, $φ.μ.$

Δ1)



σώμα: $ΣF=0\Rightarrow N=mg=2N=N'$

ράβδος: $ΣF=0\Rightarrow F_L-N'-W_1=0\Rightarrow$

$BI\ell=Mg+N'\Rightarrow I=8+2\Rightarrow I=10\,A$

Δ2) Θ.Ι.: $2F_{ελ}=(M+m)g\Rightarrow 2k\Delta\ell_0=(M+m)g\Rightarrow\Delta\ell_0=\frac{M+m}{2k}\cdot g$

$\Rightarrow\Delta\ell_0=\frac{10}{100}=0{,}1\,m$

Τυχ. θέση: $ΣF=-2k(\Delta\ell_0+x)+(M+m)g=\underbrace{-2k\Delta\ell_0+(M+m)g}_{0}-2kx$

$\Rightarrow ΣF=-2kx$, $D=2k=100\,N/m$

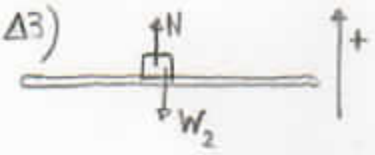
Η Θ.Φ.Μ ≡ άνω ακ. θέση

$A = \Delta\ell_0 = 0{,}1\,m$, $t_0 = 0$, $x = +A \Rightarrow \varphi_0 = \frac{\pi}{2}$

$\omega = \sqrt{\frac{2k}{M_{o\lambda}}} = \sqrt{\frac{100}{1}} = 10\,rad/s$

$x = 0{,}1 \cdot \eta\mu\left(10t + \frac{\pi}{2}\right)$ (SI)

Δ3)

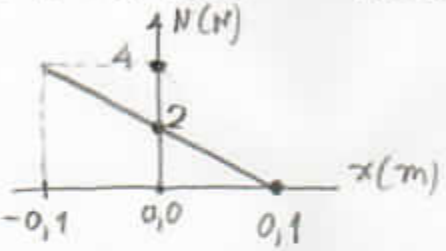


$\vec{\Sigma F} = -m\omega^2 \cdot \vec{x} \Rightarrow$

$\vec{N} + \vec{W}_2 = -m\omega^2 \cdot \vec{x} \Rightarrow N - mg = -m\omega^2 \cdot x$

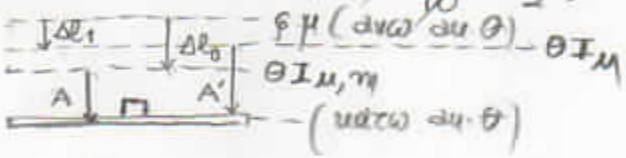
$N = mg - m\omega^2 x \Rightarrow N = 2 - 0{,}2 \cdot 100 \cdot x$

$\Rightarrow N = 2 - 20 \cdot x \quad -0{,}1 \le x \le 0{,}1\,m$



Δ4) Η μάζα m αφήνεται στη θέση

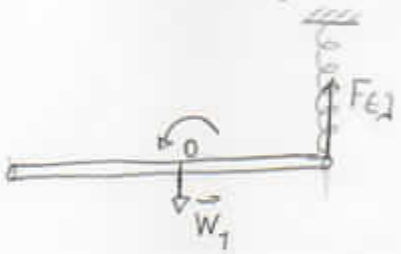
$x_1 = 0{,}1 \cdot \eta\mu\left(10 \cdot \frac{3\pi}{10} + \frac{\pi}{2}\right) = 0{,}1\,\eta\mu\,\frac{3\pi}{2} = -0{,}1\,m$



$\Theta I_\mu \Rightarrow: \Delta\ell_1 = \frac{Mg}{2k} = \frac{8}{100} = 0{,}08\,m$

$A' = A + (\Delta\ell_0 - \Delta\ell_1) = 0{,}1 + (0{,}1 - 0{,}08) = 0{,}1 + 0{,}02 = 0{,}12\,m$

Δ5)



$F_{\epsilon\lambda} = k(\Delta\ell_0 + A) = 50 \cdot (0{,}1 + 0{,}1) = 10\,N$

$\frac{dL_{(o)}}{dt} = \Sigma\tau_{(o)} = F_{\epsilon\lambda}\frac{\ell}{2} = 10 \cdot 0{,}5 = 5\,N \cdot m$