Μοριοδότηση 2018

Ενδεικτικές απαντήσεις και από γραπτά μαθητών

Ožpa A

A1 - 7

A2 - 8

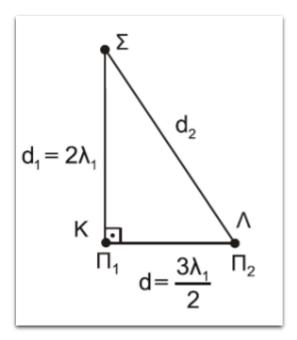
A3-0

A4 - 8

A5:
$$\Lambda - \Sigma - \Lambda - \Sigma - \Lambda$$

Ožpa B

B1-(i)



$$d_2 = \sqrt{d_1^2 + d^2} = \sqrt{4 \cdot \lambda_1^2 + rac{9}{4} \cdot \lambda_1^2} = rac{5 \cdot \lambda_1}{2}$$

Ίδιο υλικό

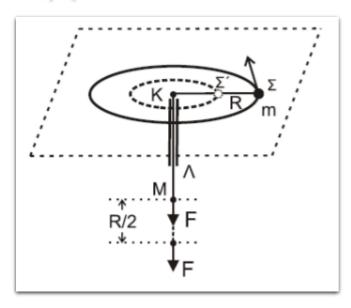
$$v_\delta = \lambda_1 \cdot f_1 = \lambda_2 \cdot f_2 \overset{f_2=2 \cdot f_1}{\Longrightarrow} \lambda_2 = \frac{\lambda_1}{2}$$
α) πρόπος

$$|A_\Sigma|=|2A\cdot\sigma v
urac{2\pi(d_1-d_2)}{2\lambda_2}|=|2A\cdot\sigma v
urac{\pi(rac{3\lambda_1}{2}-rac{5\lambda_1}{2})}{rac{\lambda_1}{2}}|=|2A|$$

β)τρόπος

$$d_1-d_2=rac{3\lambda_1}{2}-rac{5\lambda_1}{2}=-\lambda_1=-2\lambda_2 \$$
 $d_1-d_2=N\cdot\lambda_2 \$ $N=-2$ embaysan

B2 - (ttt)



$$m: \quad \Sigma au_{c
otin (\mathrm{K})} = ec{0} \Rightarrow \Delta ec{L} = ec{0} \Rightarrow ec{L}_1 = ec{L}_2$$

Η τάση του νήματος διέρχεται από τον άξονα περιστροφής

$$\begin{split} \alpha)\underline{\tau\rho\acute{o}\pioc} \\ &\Lambda\rho\alpha \quad m\cdot v_1\cdot R=m\cdot v_2\cdot \frac{R}{2}\Rightarrow v_2=2v_1 \\ \Theta \mathsf{MKE}_m(\Sigma\to\Sigma') \quad \mathsf{K}_{\Sigma'}-\mathsf{K}_{\Sigma}=W_F\Rightarrow \frac{1}{2}\cdot m\cdot v_2^2-\frac{1}{2}\cdot m\cdot v_1^2=W_F \\ &W_F=\frac{3}{2}\cdot m\cdot v_1^2 \\ &v_1=\omega\cdot R \\ \end{split} \\ W_F=\frac{3}{2}\cdot m\cdot v_1^2 \\ v_1=\omega\cdot R \\ \end{split} \\ W_F=\frac{3}{2}\cdot m\cdot \omega^2\cdot R^2 \\ v_1=\omega\cdot R \\ \end{split} \\ \mathcal{B})\underline{\tau\rho\acute{o}\pioc} \\ I_1\cdot\omega=\mathsf{I}_2\cdot\omega'\Rightarrow m\cdot R^2\cdot\omega=m\cdot \frac{R^2}{4}\cdot\omega'\Rightarrow \omega'=4\omega \\ \Theta \mathsf{MKE}_m(\Sigma\to\Sigma') \quad \mathsf{K}_{\Sigma'}-\mathsf{K}_{\Sigma}=W_F\Rightarrow \frac{1}{2}\cdot\mathsf{I}_2\cdot\omega'^2-\frac{1}{2}\cdot\mathsf{I}_1\cdot\omega^2=W_F \\ W_F=\frac{1}{2}m\frac{R^2}{4}16\omega^2-\frac{1}{2}m\cdot R^2\omega^2\Rightarrow W_F=\frac{3}{2}\cdot m\cdot \omega^2\cdot R^2 \end{split}$$

B3 - (1)

Εξίσωση Bernoulli για μια ρευματική γραμμή $(\Gamma o \Delta)$

$$P_{\Gamma} + rac{1}{2}
ho\cdot v_{\Gamma}^2 = P_{\Delta} + rac{1}{2}
ho\cdot v_{\Delta}^2 +
ho\cdot g\cdot h$$

Εξίσωση συνέχειας $(\Gamma o \Delta)$

$$\Pi_{\Gamma} = \Pi_{\Delta} \Rightarrow A_{\Gamma} \cdot v_{\Gamma} = A_{\Delta} \cdot v_{\Delta} \stackrel{A_{\Gamma} = 2A_{\Delta}}{\Longrightarrow} v_{\Delta} = 2v_{\Gamma}$$

Οριζόντια βολή $(\Delta o K)$

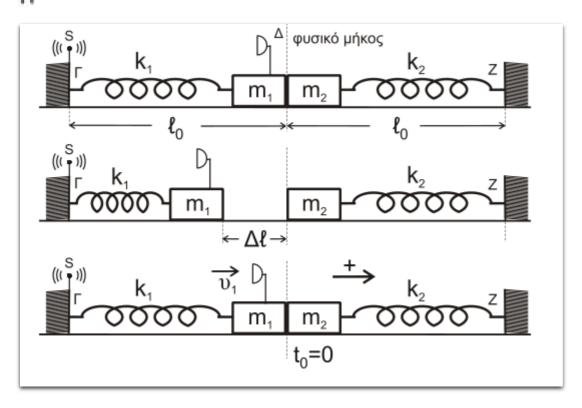
$$\left. \begin{array}{l} h = \frac{1}{2}g \cdot t^2 \\ 4h = v_\Delta \cdot \sqrt{\frac{2h}{g}} \Rightarrow v_\Delta^2 = 8g \cdot h \stackrel{v_\Delta = 2v_\Gamma}{\Longrightarrow} 4v_\Gamma^2 = 8g \cdot h \Rightarrow v_\Gamma^2 = 2g \cdot h \\ g \cdot h = \frac{v_\Gamma^2}{2} \end{array} \right.$$

Άρα η εξίσωση Bernoulli γράφεται

$$P_{\Gamma}-P_{\Delta}=rac{1}{2}
ho\cdot v_{\Delta}^2+
ho\cdot g\cdot h-rac{1}{2}
ho\cdot v_{\Gamma}^2=rac{1}{2}
ho\cdot 4v_{\Gamma}^2+
ho\cdot rac{v_{\Gamma}^2}{2}-rac{1}{2}
ho\cdot v_{\Gamma}^2=2
ho\cdot v_{\Gamma}^2$$

Ožpa F

П



$$k_1 = k_2 = k$$

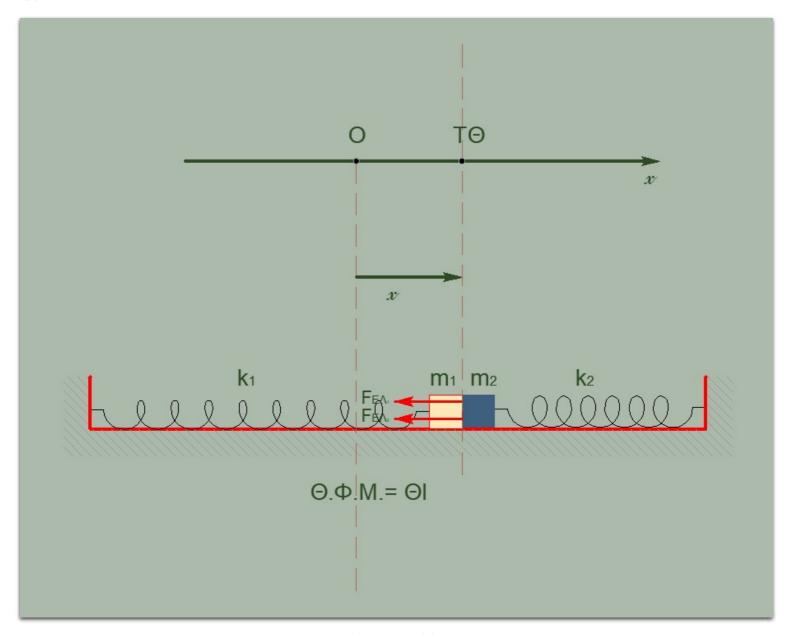
$$m_1=m_2=m$$

$$\Delta l=0.4m=A_1$$
 $K_1-m, \quad \mathrm{AAT}: D_1=k_1=m_1\cdot\omega_1^2\Rightarrow\omega_1=\sqrt{\frac{k}{m}}=5rac{rad}{sec}$
 $v_{max1}=\omega_1\cdot A_1=\sqrt{\frac{k}{m}}\cdot\Delta l=2rac{m}{sec}$

$$f_1=rac{v_{\eta\chi}-v_{max1}}{v_{\eta\chi}}\cdot f_s$$
 $\mathrm{A\Delta O}\quad m_1,m_2\quad (\Theta.1.)\quad m_1\cdot v_{max1}=(m_1+m_2)\cdot V\Rightarrow V=1rac{m}{sec}$
 $f_2=rac{v_{\eta\chi}-V}{v_{\eta\chi}}\cdot f_s$

 $rac{f_1}{f_2} = rac{v_{\eta\chi} - v_{max1}}{v_{\eta\chi} - V} = rac{338}{339}$

Γ2



$$(m_1 + m_2)$$
:

Στη θέση Θ.Φ.Μ. $\Sigma F=0$ άρα αυτή είναι και Θ.Ι.

T.
$$\Theta_{\cdot}$$
: $\Sigma F = -F_{\text{EA1}} - F_{\text{EA2}} = -k_1 \cdot x - k_2 \cdot x = -(2k)x$

Για να εκτελεί ένα σώμα ΑΑΤ πρέπει να ισχύει

$$\Sigma F = -D \cdot x, D = 2k = (m_1 + m_2)\omega^2 \Rightarrow \omega = \sqrt{\frac{2k}{2m}} = \sqrt{\frac{k}{m}} = 5 \frac{rad}{sec}$$
 $T = \frac{2\pi}{\omega} = \frac{2\pi}{5}sec$
 $\Theta. I.: V = v_{max} \stackrel{v_{max} = \omega \cdot A}{\Longrightarrow} 1 = 5 \cdot A \Rightarrow A = 0.2m$

L3

$$egin{aligned} f_{\Delta ext{EKTH}} &= f_s \ f_{\Delta ext{EKTH}} &= rac{v_{v_{ ext{NL}}} \pm v_{\Sigma ext{Y}\Sigma}}{v_{v_{ ext{NL}}}} \cdot f_s \end{aligned}
ight\} v_{\Sigma ext{Y}\Sigma} = 0$$

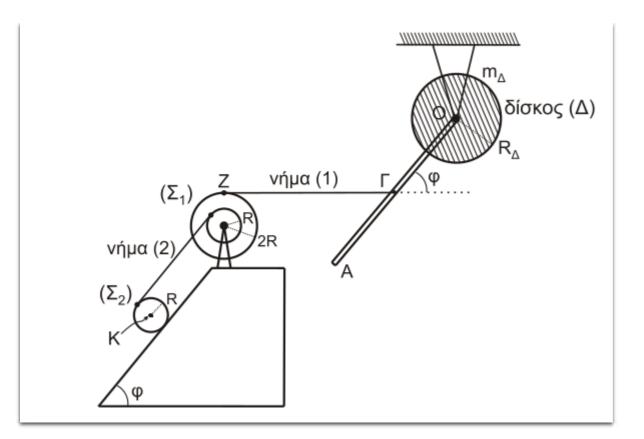
Για πρώτη φορά, δηλαδή ακραία θέση, οπότε

$$\Delta t = rac{T}{4} = rac{\pi}{10} sec$$

Г4

$$|\frac{dp}{dt}|_{m_1+m_2(max)} = \Sigma F_{max} = D \cdot A \stackrel{D=100}{\Longrightarrow} \Sigma F_{max} = 20N, \quad \dot{\eta} \quad \frac{kg \cdot m}{sec^2}$$

DEHO A



Ράβδος (ρ)

$$M = 8kg$$

$$l=3m$$

Δίσκος (Δ)

$$m_{\Delta} = 4kg$$

$$R_{\Delta} = \frac{\sqrt{2}}{2}m$$

Τροχαλία (τροχ)

$$R=0.2m$$

$$I_{\tau\rho\rho\chi} = 1.95kg \cdot m^2$$

Κύλινδρος

$$m = 30kg$$

$$R=0.2m$$

$$\eta\mu\varphi=0.8$$

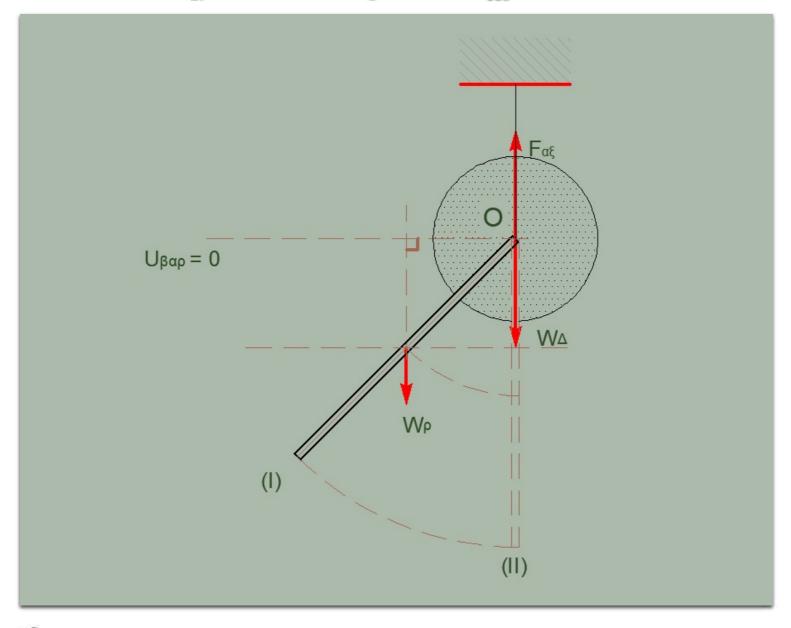
$$\sigma v \nu \varphi = 0.6$$

$$g = 10 \frac{m}{sec^2}$$

$$I_{
ho-\Delta} = (rac{1}{12} \cdot M \cdot l^2 + M rac{l^2}{4}) + rac{1}{12} \cdot m_\Delta \cdot R_\Delta^2 = 25 kg \cdot m^2$$

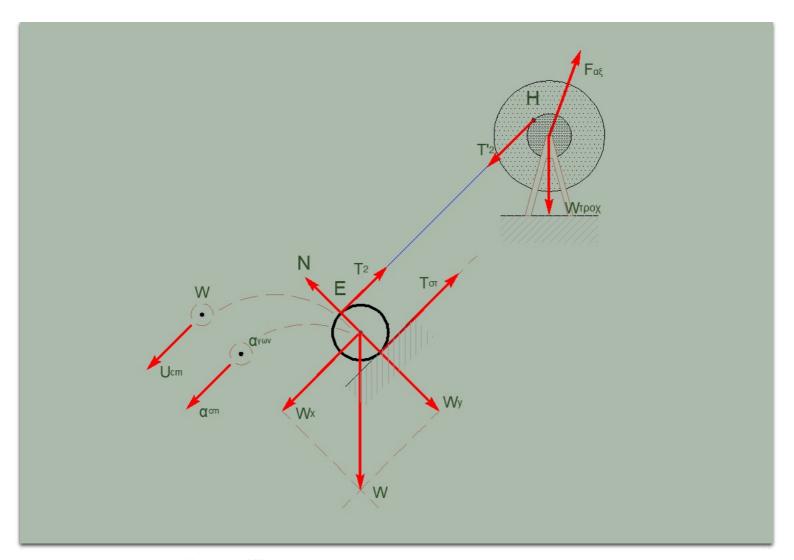
Δ2

$$|rac{dL}{dt}|_{
ho-\Delta} = \Sigma au_{(0)} = W_
ho \cdot rac{l}{2} \cdot au
u arphi = 72 rac{kg \cdot m^2}{sec^2} \quad \dot{\eta} \quad N \cdot m$$



Δ3

$$\begin{split} \Delta\Delta \text{ME}_{\rho-\Delta}(\text{I} \to II) : K_I + U_1 &= K_{II} + U_{II} \\ 0 + (-M \cdot g \cdot \frac{l}{2} \cdot \eta \mu \varphi + U_{\beta\alpha\rho(\Delta)(1))}) &= \text{K}_{\text{II}} + (-M \cdot g \cdot \frac{l}{2} + U_{\beta\alpha\rho(\Delta)(1I))}) \\ K_{II} &= M \cdot g \cdot \frac{l}{2} \cdot (1 - \eta \mu \varphi) \Rightarrow K_{II} = 24J \end{split}$$



νήμα(2) αβαρές, μη εκτατό $(\mathbf{T}_2 = \mathbf{T}_2')$

KX(Q)

$$egin{aligned} v_{
m B} = 2 \cdot v_{
m cm} = 2 \cdot \omega \cdot R \Rightarrow lpha_{
m B} = 2 \cdot lpha_{
m cm} = 2 \cdot lpha_{\gamma\omega\nu} \cdot R \ \\ v_{
m B} = v_{
m H} = \omega_{\gamma\rho\rho\chi} \cdot R \Rightarrow lpha_{
m B} = lpha_{
m H} = lpha_{\gamma\omega\nu_{\gamma\rho\chi}} \cdot R \end{aligned}$$

m: MET.

$$\Sigma F_x = m \cdot \alpha_x \Rightarrow W_x - T_{\alpha\tau} - T_2 = m \cdot \alpha_{em} \quad (1)$$

m: ΣΤΡΟΦ.

$$\Sigma \tau = \mathbf{I} \cdot \alpha_{\gamma \omega \nu} \Rightarrow T_{\sigma \tau} \cdot R - T_2 \cdot R = \frac{1}{2} \cdot m \cdot R^2 \cdot \alpha_{\gamma \omega \nu} \stackrel{\alpha_{cm} = \alpha_{\gamma \omega \nu} \cdot R}{\Longrightarrow} T_{\sigma \tau} - T_2 = \frac{1}{2} \cdot m \cdot \alpha_{cm} \quad (2)$$

$$(1)\Lambda(2) \Rightarrow W_x - 2T_2 = \frac{3}{2} \cdot m \cdot \alpha_{cm} \quad (3)$$

$$\tau \rho o \chi : \quad \Sigma \tau = \mathbf{I} \cdot \alpha_{\gamma \omega \nu} \Rightarrow T_2' \cdot R = 1.95 \cdot \alpha_{\gamma \omega \nu} (\tau \rho o \chi) \stackrel{\alpha_{\gamma \omega \nu} (\tau \rho o \chi)}{\Longrightarrow} \stackrel{2\alpha_{cm}}{\Longrightarrow} \quad (3)$$

$$W_x - 2 \cdot rac{1.95 \cdot rac{2lpha_{cm}}{R}}{R} = rac{3}{2} \cdot m \cdot lpha_{cm}$$
 $300 \cdot 0.8 - rac{4 \cdot 1.95 \cdot lpha_{cm}}{4 \cdot 10^{-2}} = 45 \cdot lpha_{cm} \Rightarrow lpha_{cm} = 1 rac{m}{sec^2}$
 $lpha_{cm} = lpha_{\gamma\omega\nu} \cdot R \Rightarrow lpha_{\gamma\omega\nu} = 5 rac{rad}{sec^2}$

α) τρόπος

κύλινδρος:

$$\begin{split} s &= \frac{1}{2} \cdot \alpha_{cm} \cdot t^2 \Rightarrow t = 2sec \\ v_{cm} &= \alpha_{cm} \cdot t \Rightarrow v_{cm} = 2\frac{m}{sec} \\ \frac{\beta)\tau\rho\dot{\alpha}\sigma\varsigma}{sec} \\ \Theta \text{MKE}_{\text{O}\rightarrow S}: K_{\pi\!\lambda} - \text{K}_{\alpha\rho\chi} = \Sigma W \Rightarrow (\frac{1}{2} \cdot m \cdot v_{cm}^2 + \frac{1}{2} \cdot m \cdot R^2 \cdot \omega^2) - 0 = (\Sigma F_x) \cdot S + (\Sigma \tau) \cdot \Delta \theta \\ \Sigma F_x &= m \cdot \alpha_{cm} \\ \Sigma \tau &= \text{I} \cdot \alpha_{\gamma\omega\nu} \\ \frac{3}{4} \cdot m \cdot v_{cm}^2 &= m \cdot \alpha_{cm} \cdot s + \frac{1}{2} \cdot m \cdot R^2 \cdot \alpha_{\gamma\omega\nu} \cdot \Delta \theta \overset{\alpha_{\gamma\omega\nu} \cdot R = \alpha_{cm}}{\Longrightarrow} \\ \frac{3}{4} \cdot m \cdot v_{cm}^2 &= m \cdot \alpha_{cm} \cdot s + \frac{1}{2} \cdot m \cdot \alpha_{cm} \cdot s \Rightarrow \frac{3}{4} \cdot m \cdot v_{cm}^2 &= \frac{3}{2} \cdot \alpha_{cm} \cdot S \Rightarrow v_{cm} = 2\frac{m}{sec} \end{split}$$

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