ΠΑΝΕΛΛΗΝΙΕΣ ΕΞΕΤΑΣΕΙΣ 2017
ΦΥΣΙΚΗ Ο.Π. - ΕΝΔΕΙΚΤΙΚΕΣ ΛΥΣΕΙΣ

ΘΕΜΑ Α.

Α1-**δ**
Α2-**γ**
Α3-**α**
Α4-**δ**

Α5 **Λάθος**
Σωστό
Σωστό
Σωστό
Λάθος

ΘΕΜΑ Β.

Β1- ii

$$(ΘΙ)\ \Sigma F = 0 \Rightarrow mg = K\Delta l \Rightarrow$$

$$\Rightarrow \Delta l = \frac{mg}{K} \text{ άρα } A = \frac{mg}{K}$$

$$\text{Άρα } U_{ελ,max} = \frac{1}{2}K(2A)^2 = \frac{2m^2g^2}{K}$$

Β2- iii

Bernoulli από την ελεύθερη επιφάνεια εως το σημείο εκροής σε ύψος h

$$P_{atm} + O + pgH = Par + \frac{1}{2}pu^2 + pgh$$

$$pg(H-h) = \frac{1}{2}pu^2 \Rightarrow g\left(H - \frac{H}{5}\right) = \frac{1}{2}u^2$$

$$\Rightarrow \frac{4gH}{5} = \frac{1}{2}u^2 \Rightarrow \sqrt{\frac{8gH}{5}} = u$$

$$\Rightarrow u = 2\sqrt{\frac{2gH}{5}} = 2\sqrt{2gh}$$

$$\Pi_A = \Pi_{εξόδου} \Rightarrow A \cdot u_A = A \cdot u \Rightarrow u_A = u = 2\sqrt{2gh}$$

Β3- ii

$$f_B = \frac{U_{nx} + U_2}{U_{nx} + U_1} f_S \Rightarrow$$

$$f_B = \frac{U_{nx} + \frac{U_{nx}}{10}}{U_{nx} + \frac{U_{nx}}{5}} f_S \Rightarrow f_B = \frac{\frac{11U_{nx}}{10}}{\frac{6U_{nx}}{5}} f_S \Rightarrow f_B = \frac{11}{12} f_S$$

<u>ΘΕΜΑ Γ.</u>

$$E_{TAΛ} = \frac{1}{2} m \cdot U^2 max \Rightarrow 5\pi^2 \cdot 10^{-7} = \frac{1}{2} 10^{-6} \cdot U^2 max \Rightarrow$$

$$U^2 max = \pi^2 \Rightarrow Umax = \pi \ \ m/s$$

Γ1.

$$\Delta t = 0,4s = \frac{T}{2} \Rightarrow T = 0,8s$$

$$\omega = \frac{2\pi}{T} = 2,5\pi \, rad/s$$

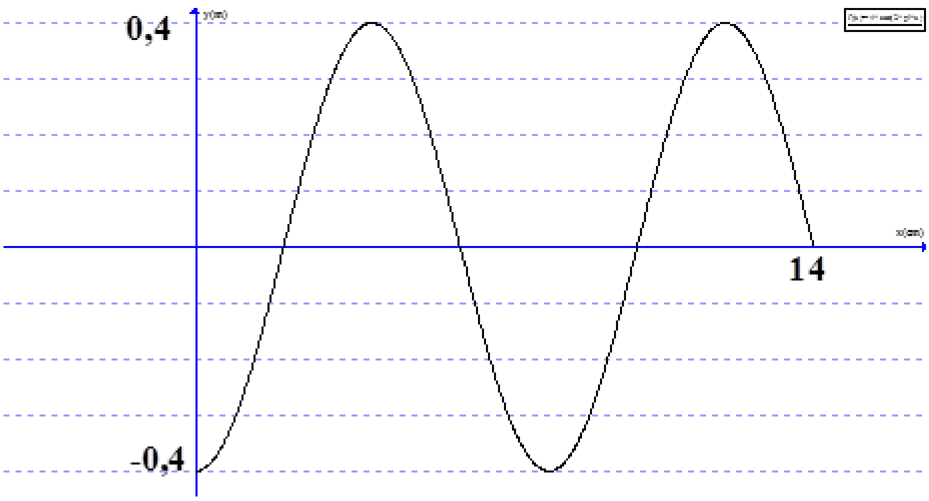
$$\Delta x = \frac{\lambda}{2} \Rightarrow \lambda = 8cm = 0,08m$$

$Umax = \omega A \Rightarrow \pi = \frac{2\pi}{0,8} A \Rightarrow A = 0,4m$ Άρα η εξίσωση κύματος είναι:

$$x = 0,4\eta\mu 2\pi\left(\frac{t}{0,8} - \frac{x}{0,08}\right) (S.I)$$

Γ2. $\Delta t = 1,4s = T + \frac{T}{2} + \frac{T}{4}$

Άρα $x = \lambda + \frac{\lambda}{2} + \frac{\lambda}{4} = 14cm$



$$A\Delta E_{TA\Lambda}\ E = K + U \Rightarrow K = E - U \Rightarrow$$

Γ3. $K = E - \frac{1}{2}Dy^2 = E - \frac{1}{2}m\omega^2 y^2 \Rightarrow$

$$K = 3,75 \cdot \pi^2 10^{-7} J$$

Γ4.

$\varphi_P - \varphi_\Sigma = \frac{3\pi}{2} \qquad X_\rho < X_\Sigma$

$\varphi_P = \varphi_\Sigma + \frac{3\pi}{2}$

$Y_\rho = A\eta\mu\varphi_P \Rightarrow 0{,}4 = 0{,}4\eta\mu\left(\varphi_\Sigma + \frac{3\pi}{2}\right)$

$\eta\mu\left(\varphi_\Sigma + \frac{3\pi}{2}\right) = +1 \Rightarrow \varphi_\Sigma + \frac{3\pi}{2} = 2K\pi + \frac{\pi}{2} \Rightarrow$

$\varphi_\Sigma = 2K\pi - \pi \overset{\kappa=1}{\Rightarrow} \varphi_\Sigma = \pi$

$Y_\Sigma = A\eta\mu\varphi_\Sigma = A\eta\mu\pi = 0$

$U_\Sigma = \omega A\sigma\upsilon\nu\varphi_\Sigma = \omega A\sigma\upsilon\nu\pi = -\omega A = -\pi\ m/s$

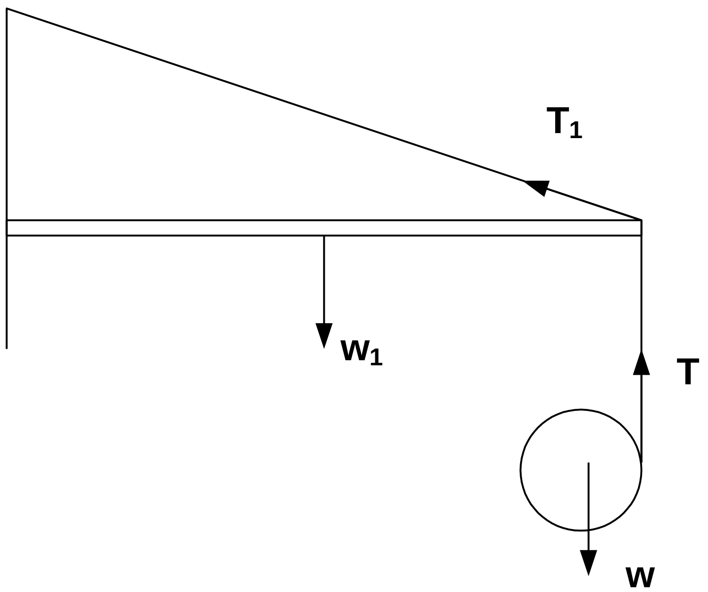
ΘΕΜΑ Δ.

Δ$_1$. $\Sigma F = ma$

$\Sigma F = ma_{cm} \rightarrow w - T = ma_{cm} (1)$

$\Sigma\tau = I\alpha_\gamma \rightarrow TR = \frac{1}{2}MR^2\frac{\alpha_{cm}}{R} (2)$

Από (1), (2) έχουμε α_{cm}=20/3m/s^2



Δ2. Για τη ράβδο

$$\Sigma\tau_{(A)} = 0 \Rightarrow -Mg\frac{l}{2} + T'\psi l - Tl = 0$$

$$\Rightarrow T'\psi l = Mg\frac{l}{2} + Tl$$

$$\Rightarrow T' \cdot \eta\mu\varphi = \frac{Mg}{2} + T$$

$$\Rightarrow T'0,8 = 20 + \frac{20}{3} \Rightarrow T' = \frac{100}{3}N$$

Δ3.

$$h = \frac{1}{2}at^2 \Rightarrow t = \sqrt{\frac{2h}{a}}$$

$$\Rightarrow t = 0,3 sec$$

$$\omega = a\gamma \cdot t \Rightarrow \omega = \frac{a}{R}t \Rightarrow$$

$$\omega = \frac{20}{3} \cdot 0,3 \Rightarrow \omega = 20\ r/s$$

$$L = I\omega \Rightarrow L = \frac{1}{2}mR^2 \cdot \omega$$

$$\Rightarrow L = 0,2\ kg\ m^2 / s$$

Δ4.

Αφού κοπεί το νήμα

$$\Sigma\tau = 0 \Rightarrow I a\gamma = 0 \Rightarrow a\gamma = 0$$

$$\Rightarrow \frac{d\omega}{dt} = 0 \Rightarrow \omega = \sigma\tau\alpha\theta\varepsilon\rho\acute{o}$$

$$u' = u + g \cdot \Delta t' = \omega R + g\Delta t' \Rightarrow u' = 3m/s$$

$$\text{Άρα } \frac{K\pi}{K_M} = \frac{\frac{1}{2}I \cdot \omega^2}{\frac{1}{2}mu'^2} = \frac{\frac{1}{2}mR^2 \cdot \omega^2}{mu'^2} \Rightarrow \frac{K\pi}{K_M} = \frac{R^2 \cdot \omega^2}{2 \cdot u'2} = \frac{0,1^2 \cdot 20^2}{2 \cdot 9} = \frac{0,01 \cdot 400}{9} = \frac{2}{9}$$