

ΦΥΣΙΚΗ ΠΡΟΣΑΝΑΤΟΛΙΣΜΟΥ 12/6/2017

ΑΠΑΝΤΗΣΕΙΣ

ΘΕΜΑ Α.

A1-δ

A2-γ

A3-α

A4-δ

A5 Λάθος

Σωστό

Σωστό

Σωστό

Λάθος

ΘΕΜΑ Β.

B1- ii

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

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

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

B2- iii

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

$$P_{\text{atm}} + 0 + \rho g H = P_{\text{at}} + \frac{1}{2} \rho u^2 + \rho g h$$

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

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

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

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

B3- ii

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

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

ΘΕΜΑ Γ.

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

$$U^2 \max = \pi^2 \Rightarrow U \max = \pi \text{ m/s}$$

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

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

Γ1.

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

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

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

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

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



$$\Delta E_{TA\lambda} \quad E = K + U \Rightarrow K = E - U \Rightarrow$$

$$\Gamma 3. \quad K = E - \frac{1}{2} D y^2 = E - \frac{1}{2} m \omega^2 y^2 \Rightarrow$$

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

Γ4.

$$\varphi_p - \varphi_\Sigma = \frac{3\pi}{2} \quad X_p < X_\Sigma$$

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

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

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

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

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

$$U_\Sigma = \omega A \sigma \nu \varphi_\Sigma = \omega A \sigma \nu \pi = -\omega A = -\pi \text{ m/s}$$

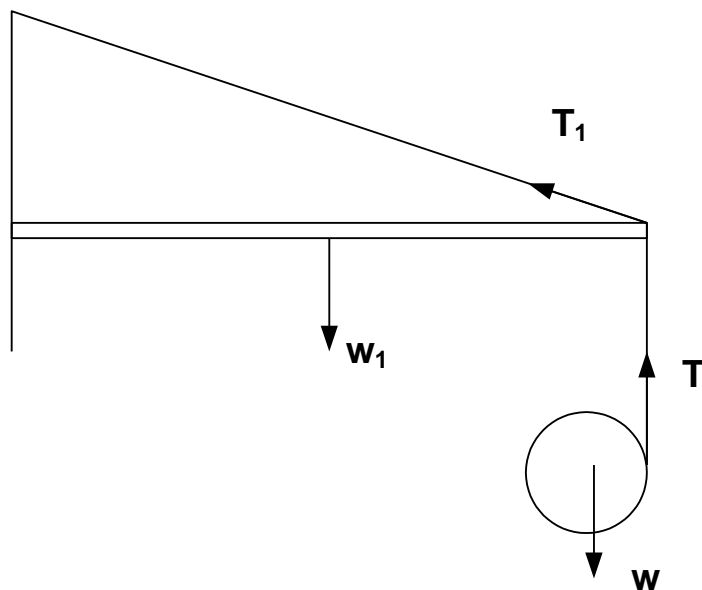
ΘΕΜΑ Δ.

$$\Delta_1. \Sigma F = ma$$

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

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

Από (1), (2) έχουμε $a_{cm} = 20/3 \text{ m/s}^2$



Δ2. Για τη ράβδο

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

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

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

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

Δ3.

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

$$\Rightarrow t = 0,3 \text{ sec}$$

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

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

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

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

Δ4.

Αφού κοπεί το νήμα

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

$$\Rightarrow \frac{d\omega}{dt} = 0 \Rightarrow \omega = \text{σταθερό}$$

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

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