



Κελάφας

ΦΡΟΝΤΙΣΤΗΡΙΑ

ΕΠΑΝΑΛΗΠΤΙΚΕΣ ΠΑΝΕΛΛΑΔΙΚΕΣ ΕΞΕΤΑΣΕΙΣ
Γ' ΤΑΞΗΣ ΗΜΕΡΗΣΙΟΥ & Δ' ΤΑΞΗΣ ΕΣΠΕΡΙΝΟΥ ΓΕΝΙΚΟΥ ΛΥΚΕΙΟΥ

ΤΕΤΑΡΤΗ 6 ΣΕΠΤΕΜΒΡΙΟΥ 2017

ΑΠΑΝΤΗΣΕΙΣ ΣΤΑ ΦΥΣΙΚΗ ΠΡΟΣΑΝΑΤΟΛΙΣΜΟΥ

ΘΕΜΑ Α.

A1. α A2. δ A3. γ A4. β
A5. Σ Λ Σ Σ Λ

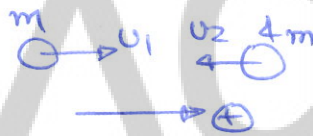
ΘΕΜΑ Β.

B1. ΣΩΣΤΗ ΑΠΑΝΤΗΣΗ: (iii)

ΑΙΤΙΟΛΟΓΗΣΗ: $K_1 = K_2 \Rightarrow \frac{1}{2} m_1 v_1^2 = \frac{1}{2} m_2 v_2^2 \Rightarrow m v_1^2 = 4 m v_2^2$

$$\Rightarrow |v_1| = 2v_2$$

ΑΠΟ Α.Δ.Ο.



$$m v_1 - 4m v_2 = (m_1 + m_2) v$$

$$\Rightarrow m v_1 - 4m v_2 = 5m v \Rightarrow 2v_2 - 4v_2 = 5v$$

$$\Rightarrow v = -\frac{2}{5} v_2$$

$$\frac{K_\Sigma}{K_1 + K_2} = \frac{\frac{1}{2} \cdot 5m \cdot \left(\frac{4}{25} v_2^2\right)}{\frac{1}{2} m 4v_2^2 + \frac{1}{2} \cdot 4m v_2^2}$$

$$= \frac{\frac{4}{5}}{\frac{4}{5} + \frac{4}{5}} = \frac{4}{5 \cdot 2} = \frac{1}{10}$$

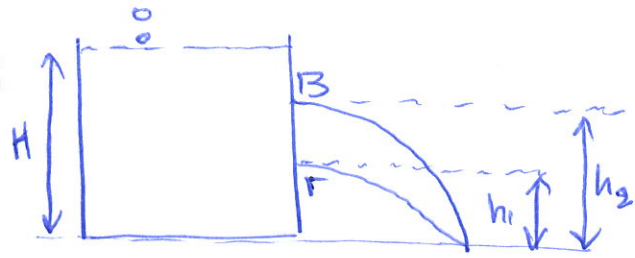
$$\Rightarrow \frac{K_\Sigma}{K_1 + K_2} = \frac{1}{10}$$



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ΦΡΟΝΤΙΣΤΗΡΙΑ

ΑΙΣΧΥΛΟΥ 16 - ΠΕΡΙΣΤΕΡΙ - ΤΗΛ. 210 5710710



B2. ΣΩΣΤΗ ΑΠΑΝΤΗΣΗ: (i)

ΑΙΤΙΟΛΟΓΗΣΗ:

TORRICELLI $0 \rightarrow B: P_0 + \rho g H + \frac{1}{2} \rho v_0^2 = P_B + \frac{1}{2} \rho v_B^2 + \rho g h_2$

$$\Rightarrow v_B^2 = 2g(H - h_2)$$

ΟΜΟΙΩΣ $0 \rightarrow \Gamma: P_0 + \rho g H + \frac{1}{2} \rho v_0^2 = P_\Gamma + \frac{1}{2} \rho v_\Gamma^2 + \rho g h_1$

$$\Rightarrow v_\Gamma^2 = 2g(H - h_1)$$

ΟΙ ΧΡΟΝΟΙ ΠΤΩΣΗΣ: $t_B = \sqrt{\frac{2h_2}{g}}$ και $t_\Gamma = \sqrt{\frac{2h_1}{g}}$ ΑΠΟ ΤΗ ΣΧΕΣΗ $h = \frac{1}{2} g t^2$

ΕΠΕΙΔΗ $x_B = x_\Gamma \Rightarrow v_B \cdot t_B = v_\Gamma \cdot t_\Gamma \Rightarrow \sqrt{2g(H - h_2)} \sqrt{\frac{2h_2}{g}} = \sqrt{2g(H - h_1)} \sqrt{\frac{2h_1}{g}}$

$$\Rightarrow (H - h_2)h_2 = (H - h_1)h_1 \Rightarrow H = 4h_1$$

B3. ΣΩΣΤΗ ΑΠΑΝΤΗΣΗ: (iii)

ΑΙΤΙΟΛΟΓΗΣΗ:

ΑΠΟ Α.Δ.ΣΤΡ $L_{\text{αρχ}} = L_{\text{τελ}} \Rightarrow I_0 \omega_0 = I \cdot \omega \Rightarrow \frac{2}{5} m r_0^2 \cdot \omega_0 = \frac{2}{5} m r^2 \omega$

$$r = r_0/2 \Rightarrow r_0^2 \cdot \omega_0 = \frac{r_0^2}{4} \omega \Rightarrow \omega = 4\omega_0$$

$$\frac{K}{K_0} = \frac{\frac{1}{2} I \cdot \omega^2}{\frac{1}{2} I \omega_0^2} = \frac{\frac{2}{5} m r^2 \omega^2}{\frac{2}{5} m r_0^2 \omega_0^2} = \frac{\frac{r_0^2}{4} \cdot 16 \omega_0^2}{r_0^2 \cdot \omega_0^2} = 4 \Rightarrow \frac{K}{K_0} = 4$$



ΘΕΜΑ Γ.

Γ₁. $r_1 = 1,4 \text{ m}$, $A = 5 \cdot 10^{-2} \text{ m}$

Τη χρονική στιγμή $t_1 = 0,35 \text{ sec}$ φτάνει στο Σ το κύμα από την π_1 . $u = \frac{r_1}{t_1} \rightarrow u = \frac{1,4}{0,35} \rightarrow \boxed{u = 4 \text{ m/s}}$

Κι έπειτα: $u = \frac{r_2}{t_2} \rightarrow r_2 = u \cdot t_2 \rightarrow r_2 = 4 \cdot 0,55 \rightarrow \boxed{r_2 = 2,2 \text{ m}}$

Γ₂. Από το διαγράμμα: $t_1 = 0,35 \text{ s}$ και $t_2 = 0,55 \text{ s}$
 $\Delta t = t_2 - t_1 \rightarrow \Delta t = 0,2 \text{ sec}$.

Στο Δt αυτό έχουν πραγματοποιηθεί 2 ταλαντώσεις.

$\Delta t = 2T \rightarrow T = 0,1 \text{ s} \rightarrow \frac{1}{f} = 0,1 \rightarrow \boxed{f = 10 \text{ Hz}}$

$u = \lambda \cdot f \Rightarrow \lambda = u/f \rightarrow \boxed{\lambda = 0,4 \text{ m}}$

Γ₃. Τη χρονική στιγμή $t = \frac{5}{8} \text{ sec}$ έχει ξεκινήσει η σύμβολη
 ΑΡΑ ΙΣΧΥΕΙ: $y_\Sigma = 2A \sin 2\pi \frac{|r_1 - r_2|}{2\lambda} \sin 2\pi \left(\frac{t}{T} - \frac{r_1 + r_2}{2\lambda} \right) \rightarrow$
 $\Rightarrow y_\Sigma = 1 \cdot 10^{-1} \sin \frac{2\pi \cdot 0,8}{2 \cdot 0,4} \sin 2\pi \left(\frac{50}{8} - 4,5 \right) \Rightarrow y_\Sigma = 1 \cdot 10^{-1} \cdot 1 \cdot \sin \frac{7\pi}{2} \rightarrow$

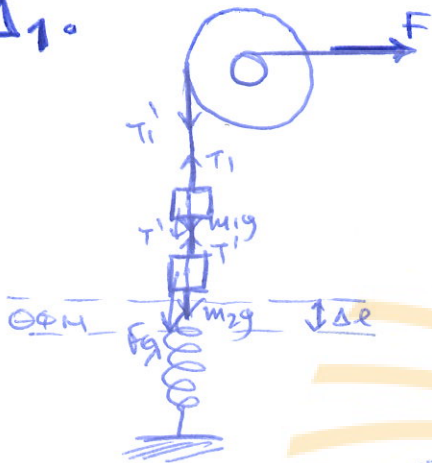
$\Rightarrow \boxed{y_\Sigma = -0,1 \text{ m}}$

Γ₄. Ακρόαση σύμβολη: $A' = 0 \rightarrow |r_1 - r_2| = (2k+1) \frac{\lambda'}{2} \rightarrow$

$\Rightarrow |r_1 - r_2| = \frac{(2k+1)u}{2f'} \rightarrow f' = \frac{(2k+1)u}{2|r_1 - r_2|} \rightarrow f'_{\min} \rightarrow \boxed{f'_{\min} = 2,5 \text{ Hz}}$
 $k=0$

ΘΕΜΑ Δ.

Δ1.



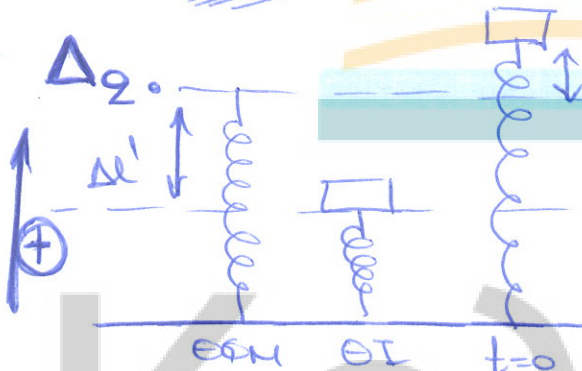
$$\Sigma \tau_{\text{pulley}} = 0 \Rightarrow F \cdot R = T_1' \cdot 2R \Rightarrow$$

$$\Rightarrow T_1' = F/2 \Rightarrow T_1' = 50 \text{ N}$$

$$\Sigma F_1 = 0 \Rightarrow T_1 = T_1' + m_1 g \Rightarrow T_1' = 30 \text{ N}$$

$$\Sigma F_2 = 0 \Rightarrow T_1' = m_2 g + k \Delta \ell \Rightarrow \boxed{k = 100 \text{ N/m}}$$

Δ2.



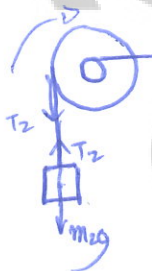
$$\Sigma F_{\text{block}} = 0 \Rightarrow m_2 g = k \Delta \ell' \Rightarrow \Delta \ell' = 0,1 \text{ m}$$

$$\text{ΑΡΑ ΤΗΝ } t=0 \rightarrow x = \Delta \ell + \Delta \ell' \Rightarrow x = 0,3 \text{ m}$$

$$\omega = \sqrt{\frac{k}{m_2}} \Rightarrow \omega = \sqrt{\frac{100}{1}} \Rightarrow \omega = 10 \text{ rad/s}$$

$$\text{ΑΡΑ } \boxed{x = 0,3 \sin(10t + \frac{\pi}{2}) \text{ m}}$$

Δ3.



$$\Sigma \tau = I \alpha_{\text{pulley}} \Rightarrow F \cdot R = T_2 \cdot 2R = \frac{3}{2} M R^2 \alpha_{\text{pulley}} \Rightarrow$$

$$\Rightarrow F - 2T_2 = \frac{3}{2} M \alpha_{\text{pulley}} \Rightarrow T_2 = \frac{100}{2} - 0,6 \alpha_{\text{pulley}} \quad (1)$$

$$\Sigma F = m_2 a_2 \Rightarrow T_2 - m_2 g = m_2 \cdot \alpha_{\text{pulley}} 2R \Rightarrow T_2 = 20 - 0,4 \alpha_{\text{pulley}} \quad (2)$$

$$(1) = (2) \Rightarrow 50 - 0,6 \alpha_{\text{pulley}} = 20 + 0,4 \alpha_{\text{pulley}} \Rightarrow \alpha_{\text{pulley}} = 30 \text{ rad/s}^2$$

$$a_2 = \alpha_{\text{pulley}} 2R$$

$$\boxed{a_2 = 6 \text{ m/s}^2}$$

$$\Delta_4. \frac{dL}{dt} = I\alpha = I \cdot \alpha_{\text{cm}} = \frac{3}{2}MR^2 \cdot \alpha_{\text{cm}}$$

$$= \frac{3}{2} \cdot 8 \cdot 0,01 \cdot 30 \rightarrow \boxed{\frac{dL}{dt} = 3,6 \frac{\text{kgm}^2}{\text{s}^2}}$$

$$\Delta_5. N = \frac{\Delta\theta}{2\pi} \Rightarrow \Delta\theta = 2\pi \cdot N \rightarrow \boxed{\Delta\theta = 40 \text{ rad}}$$

$$W_F = \tau_F \cdot \Delta\theta \Rightarrow W_F = F \cdot R \cdot \Delta\theta \Rightarrow W_F = 100 \cdot 0,1 \cdot 40$$
$$\Rightarrow \boxed{W_F = 400 \text{ J}}$$

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