

**ΕΠΑΝΑΛΗΠΤΙΚΕΣ ΠΑΝΕΛΛΑΔΙΚΕΣ ΕΞΕΤΑΣΕΙΣ
Γ΄ ΤΑΞΗΣ ΗΜΕΡΗΣΙΟΥ & Δ΄ ΤΑΞΗΣ ΕΣΠΕΡΙΝΟΥ ΓΕΝΙΚΟΥ ΛΥΚΕΙΟΥ**

ΠΕΜΠΤΗ 5 ΣΕΠΤΕΜΒΡΙΟΥ 2019

ΑΠΑΝΤΗΣΕΙΣ ΣΤΑ ΦΥΣΙΚΗ ΠΡΟΣΑΝΑΤΟΛΙΣΜΟΥ

ΘΕΜΑ Α

A1. β

A2. α

A3. δ

A4. β

A5. α. Σωστό, β. Λάθος, γ. Λάθος, δ. Σωστό, ε. Λάθος.

ΘΕΜΑ Β

B1. α. Σωστή απάντηση η (i)

β. $\omega_1 = 399\pi$ r/s και $\omega_2 = 401\pi$ r/s

$$\omega = \frac{\omega_1 + \omega_2}{2} = \frac{399\pi + 401\pi}{2} = \frac{800\pi}{2} = 400\pi \text{ r/s}$$

$$f = \frac{\omega}{2\pi} = \frac{400\pi}{2\pi} = 200 \text{ Hz}$$

$$f_{\delta} = f_2 - f_1 = \frac{\omega_2}{2\pi} - \frac{\omega_1}{2\pi} = \frac{\omega_2 - \omega_1}{2\pi} = \frac{401\pi - 399\pi}{2\pi} = \frac{2\pi}{2\pi} = 1 \text{ Hz}$$

$$T_{\delta} = \frac{1}{f_{\delta}} = 1 \text{ s}$$

$$\Delta t = 2T_{\delta} = 2 \text{ s}$$

$$f = \frac{N_{\text{ταλ}}}{\Delta t} \Rightarrow N_{\text{ταλ}} = f \cdot \Delta t = 200 \cdot 2 = \mathbf{400 \text{ ταλαντώσεις}}$$

B2. α. Σωστή απάντηση είναι η (iii)

$$\beta. \Pi_1 = \Pi_2 \Rightarrow A_1 u_1 = A_2 u_2 \xrightarrow{A_1 = 2A_2} 2A_2 u_1 = A_2 u_2 \Rightarrow u_2 = 2u_1$$

$$p_1 + \frac{1}{2} \rho u_1^2 = p_2 + \frac{1}{2} \rho u_2^2 \Rightarrow p_1 - p_2 = \frac{1}{2} \rho u_2^2 - \frac{1}{2} \rho u_1^2 \Rightarrow$$

$$\rho g h = \frac{1}{2} \rho (u_2^2 - u_1^2) \xrightarrow{u_2 = 2u_1} g h = \frac{1}{2} \rho (4u_1^2 - u_1^2) \Rightarrow$$

$$g h = \frac{1}{2} \rho \cdot 3u_1^2 \Rightarrow h = \frac{3u_1^2}{2g}$$

$$h' = \frac{3u_1'^2}{2g} \xrightarrow{u_1' = 2u_1} h' = \frac{3 \cdot 4u_1^2}{2g} \Rightarrow h' = 4 \cdot \frac{3u_1^2}{2g} \Rightarrow h' = 4h$$

B3. α. Σωστή απάντηση η (ii).

β. Έχουμε ελαστική κρούση, $Q = 0$

$$K_{\text{πριν}} = K_{\text{μετά}} \Rightarrow \frac{1}{2} m u^2 = \frac{1}{2} m u_1^2 + \frac{1}{2} m u_2^2 \Rightarrow u^2 = u_1^2 + u_2^2 \quad (1)$$

$$\text{Α.Δ.Ο} : \vec{p}_{\Pi} = \vec{p}_M \Rightarrow p = \sqrt{p_1^2 + p_2^2 + 2 \cdot p_1 \cdot p_2 \cdot \cos \theta} \Rightarrow$$

$$\cancel{m^2} \cdot u^2 = \cancel{m^2} \cdot u_1^2 + \cancel{m^2} \cdot u_2^2 + 2 \cdot \cancel{m} \cdot u_1 \cdot \cancel{m} \cdot u_2 \cdot \cos \theta \xrightarrow{(1)} \Rightarrow$$

$$\cancel{u_1^2 + u_2^2} = \cancel{u_1^2 + u_2^2} + 2 \cdot u_1 \cdot u_2 \cdot \cos \theta \Rightarrow$$

$$2 \cdot u_1 \cdot u_2 \cdot \cos \theta = 0 \xrightarrow[u_2 \neq 0]{u_1 \neq 0} \Rightarrow$$

$$\cos \theta = 0 \Rightarrow \theta = 90^\circ$$

ΘΕΜΑ Γ

$$\Gamma 1. \omega = \frac{\Delta\varphi}{\Delta t} \Rightarrow \omega = \frac{20\pi}{2} \Rightarrow \omega = 10\pi \text{ r/s.}$$

$$E = \frac{1}{2} \cdot \Delta_m \cdot u_{\max}^2 \Rightarrow E = \frac{1}{2} \cdot \Delta_m \cdot \omega^2 \cdot A^2 \Rightarrow A^2 = \frac{2E}{\Delta_m \cdot \omega^2} \Rightarrow$$

$$A^2 = \frac{2 \cdot 16 \pi^2 \cdot 10^{-8}}{2 \cdot 10^{-6} \cdot 10^2 \pi^2} \Rightarrow A^2 = 16 \cdot 10^{-4} \Rightarrow A = 4 \cdot 10^{-2} = \mathbf{0,04 \text{ m}}$$

$$\Gamma 2. T = \frac{2\pi}{\omega} \Rightarrow T = 0,2 \text{ s}$$

$$\varphi = 2\pi \left(\frac{t}{T} - \frac{x}{\lambda} \right) \Rightarrow 20\pi = 2\pi \left(\frac{4}{0,2} - \frac{1}{\lambda} \right) \Rightarrow 10 = 20 - \frac{1}{\lambda} \Rightarrow$$

$$\frac{1}{\lambda} = 10 \Rightarrow \lambda = 0,1 \text{ m}$$

$$y = 0,04 \eta \mu 2\pi(5t - 10x) \text{ (S.I.)}$$

$$\Gamma 3. u = \frac{\lambda}{T} \Rightarrow u = 0,5 \text{ m/s}$$

$$x_p = u \cdot t \Rightarrow x_p = 0,5 \cdot 2 \Rightarrow x_p = 1 \text{ m}$$

$$\Delta\varphi = \varphi_p - \varphi_1 = 2\pi(5t - 10) - 2\pi(5t - 11,5) = 3\pi \text{ rad}$$

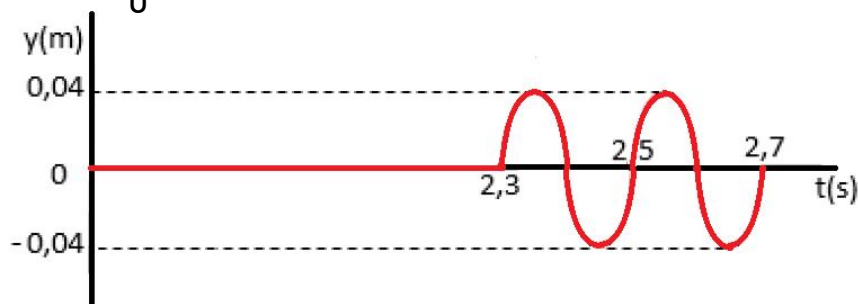
Το Σ ταλαντώνεται σε αντίθεση φάσης με το Ρ, άρα

$$u_\Sigma = -u_P \Rightarrow u_\Sigma = -u_{\max} \Rightarrow u_\Sigma = -0,4\pi \text{ m/s}$$

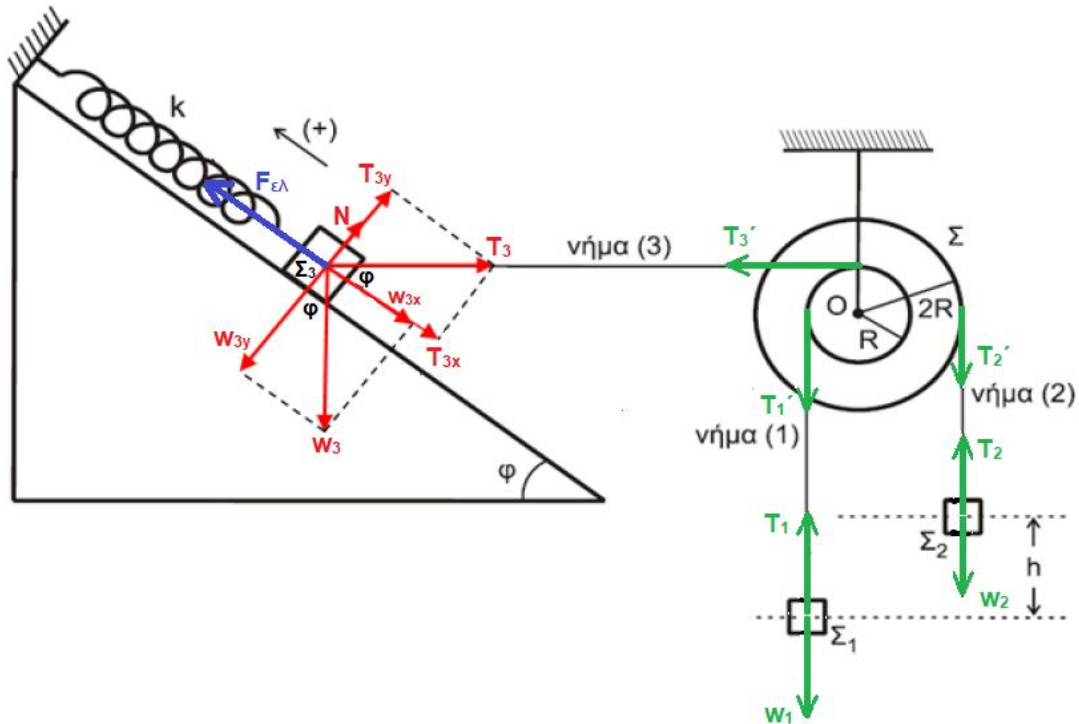
$$|u_\Sigma| = 0,4\pi \text{ m/s, αρνητική κατεύθυνση}$$

$$\Gamma 4. y = 0,04 \eta \mu 2\pi(5t - 11,5) \text{ (SI) } t \geq 2,3 \text{ s}$$

$$t_\Sigma = \frac{x_\Sigma}{u} \Rightarrow t_\Sigma = 2,3 \text{ s}$$



ΘΕΜΑ Δ



Δ1. $T_1 = T'_1 = m_1 g = 10 \text{ N}$ και
 $T_2 = T'_2 = m_2 g = 15 \text{ N}$

$$\sum \tau = 0 \Rightarrow T'_2 \cdot 2R - T'_1 \cdot R - T'_3 \cdot R = 0 \Rightarrow T'_3 = 2T'_2 - T'_1 \Rightarrow$$

$$T'_3 = 2 \cdot 15 - 10 \Rightarrow T'_3 = T_3 = 20 \text{ N}$$

$$\sum F_x = 0 \Rightarrow F_{ελ} = w_{3x} + T_{3x} \Rightarrow F_{ελ} = m_3 \cdot g \cdot \eta \mu \phi + T_3 \cdot \sigma \upsilon \nu \phi \Rightarrow$$

$$F_{ελ} = 3 \cdot 10 \cdot 0,8 + 20 \cdot 0,6 \Rightarrow F_{ελ} = 24 + 12 \Rightarrow F_{ελ} = 36 \text{ N}$$

$$\Delta \ell_1 = \frac{F_{ελ}}{k} = \frac{36}{300} = 0,12 \text{ m}$$

$$\Delta 2. \sum F_x = 0 \Rightarrow F_{ελ} = w_{3x} \Rightarrow$$

$$K \cdot \Delta \ell = m_3 \cdot g \cdot \eta \mu \varphi \Rightarrow$$

$$\Delta \ell = \frac{m_3 \cdot g \cdot \eta \mu \varphi}{K} \Rightarrow$$

$$\Delta \ell = \frac{3 \cdot 10 \cdot 0,8}{300} \Rightarrow \Delta \ell = 0,08 \text{ m}$$

$$A = \Delta \ell_1 - \Delta \ell = 0,12 - 0,08 = 0,04 \text{ m}$$

$$\omega = \sqrt{\frac{k}{m_3}} = \sqrt{\frac{300}{3}} = 10 \text{ rad/s}$$

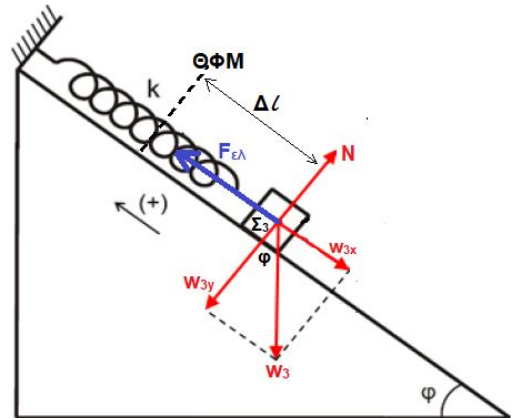
Συνθήκη : Για $t = 0$, $x = -0,04 \text{ m}$ και $u = 0$

$$x = 0,04 \cdot \eta \mu \left(10t + \frac{3\pi}{2} \right) \text{ (SI)} \quad / \quad T = \frac{2\pi}{\omega} = \frac{\pi}{5} \text{ s}$$

$$\left| \frac{dp}{dt} \right| = |\sum F| = k \cdot x = 300 \cdot 0,04 \cdot \eta \mu \left(10 \frac{\pi}{15} + \frac{3\pi}{2} \right)$$

$$= 12 \cdot \eta \mu \left(\frac{2\pi}{3} + \frac{3\pi}{2} \right) = 12 \cdot \eta \mu \left(\frac{4\pi}{6} + \frac{9\pi}{6} \right)$$

$$= 12 \cdot \eta \mu \frac{13\pi}{6} = 12 \cdot \eta \mu \frac{\pi}{6} = 12 \cdot \frac{1}{2} = \mathbf{6 \text{ N}}$$



$$\Delta 3. \alpha_y = \frac{\alpha_1}{R_1} = \frac{\alpha_2}{R_2} \Rightarrow \begin{cases} \alpha_1 = 0,1 \cdot \alpha_y \\ \alpha_2 = 0,2 \cdot \alpha_y \end{cases}$$

$$\sum F_{(1)} = m_1 \cdot \alpha_1 \Rightarrow T_1 - m_1 g = \alpha_1 \Rightarrow T_1 = 10 + 0,1 \cdot \alpha_y$$

$$\sum F_{(2)} = m_2 \cdot \alpha_2 \Rightarrow m_2 g - T_2 = 1,5 \alpha_2 \Rightarrow T_2 = 15 - 0,3 \cdot \alpha_y$$

$$\sum \tau = I \cdot \alpha_y \Rightarrow T_2 \cdot 2R - T_1 \cdot R = 2MR^2 \cdot \alpha_y \Rightarrow$$

$$(15 - 0,3 \cdot \alpha_y) \cdot 2 - (10 + 0,1 \cdot \alpha_y) = 2 \cdot 1,5 \cdot 0,1 \cdot \alpha_y \Rightarrow$$

$$30 - 0,6 \cdot \alpha_y - 10 - 0,1 \cdot \alpha_y = 0,3 \cdot \alpha_y \Rightarrow \alpha_y = 20 \text{ rad/s}$$

Δ4. $\alpha_1 = 0,1 \cdot \alpha_Y = 2 \text{ m/s}^2$ και

$\alpha_2 = 0,2 \cdot \alpha_Y = 4 \text{ m/s}^2$

$$S_1 + S_2 = h \Rightarrow \frac{1}{2} \cdot \alpha_1 \cdot \Delta t^2 + \frac{1}{2} \cdot \alpha_2 \cdot \Delta t^2 = 0,48 \Rightarrow$$

$$\frac{1}{2} \cdot 2 \cdot \Delta t^2 + \frac{1}{2} \cdot 4 \cdot \Delta t^2 = 0,48 \Rightarrow 3 \cdot \Delta t^2 = 0,48 \Rightarrow$$

$$\Delta t^2 = 0,16 \Rightarrow \Delta t = 0,4 \text{ s}$$

$$L = I \cdot \omega = 2 \cdot M \cdot R^2 \cdot \alpha_Y \cdot \Delta t = 2 \cdot 1,5 \cdot 0,1^2 \cdot 20 \cdot 0,4$$

$$= 0,24 \text{ Kg} \cdot \text{m}^2/\text{s}$$

Δ5. $\left. \begin{array}{l} N = \frac{20}{\pi} \\ \Delta\theta = N \cdot 2\pi \end{array} \right\} \Rightarrow \Delta\theta = \frac{20}{\pi} \cdot 2\pi \Rightarrow \Delta\theta = 40 \text{ rad}$

$$\Delta\theta = \frac{1}{2} \cdot \alpha_Y \cdot t_2^2 \Rightarrow 40 = 10 \cdot t_2^2 \Rightarrow t_2^2 = 4 \Rightarrow t_2 = 2 \text{ s}$$

$$\left| \frac{dK}{dt} \right| = \left| \sum \tau \cdot \omega \right| = I \cdot \alpha_Y \cdot \alpha_Y \cdot t_2 = 2 \cdot M \cdot R^2 \cdot \alpha_Y^2 \cdot t_2$$

$$= 2 \cdot 1,5 \cdot 0,1^2 \cdot 20^2 \cdot 2 = 24 \text{ J/s}$$