

ΦΥΣΙΚΗ ΠΑΝΕΛΛΑΔΙΚΩΝ ΕΞΕΤΑΣΕΩΝ ΘΕΤΙΚΗΣ  
ΚΑΙ ΤΕΧΝΟΛΟΓΙΚΗΣ ΚΑΤΕΥΘΥΝΣΗΣ 2010  
ΓΕΝΙΚΟΥ ΛΥΚΕΙΟΥ  
ΑΠΑΝΤΗΣΕΙΣ

**ΘΕΜΑ Α**

**A1:** β

**A2:** γ

**A3:** β

**A4:** γ

**A5:** α - Λ    β - Λ    γ - Σ    δ - Λ    ε - Σ

**ΘΕΜΑ Β**

**B1:** α

$$|r_1 - r_2| = N \cdot \lambda$$

$$\left. \begin{aligned} v &= \lambda \cdot f \\ v &= \lambda' \cdot 2f \end{aligned} \right\} \Rightarrow \lambda' = \frac{\lambda}{2}$$

$$|r_1 - r_2| = N \cdot \lambda = N \cdot 2\lambda' \text{ ΕΝΙΣΧΥΣΗ}$$

**B2:** α

$$\text{Αρχική ισορροπία: } \Sigma F = 0 \Rightarrow M \cdot g = k \cdot \Delta l_1 \Rightarrow \Delta l_1 = \frac{M \cdot g}{k}$$

$$\text{Στη θέση ισορροπίας: } \Sigma F = 0 \Rightarrow k \cdot \Delta l_2 = (M + m) \cdot g \Rightarrow \Delta l_2 = \frac{(M + m) \cdot g}{k}$$

$$v = 0 \text{ (ακραία θέση)} \Rightarrow E = \frac{1}{2} \cdot k \cdot A^2 = \frac{1}{2} \cdot \frac{m^2 g^2}{k} \text{ αφού } A = \Delta l_2 - \Delta l_1 = \frac{M \cdot g}{k}$$

**B3:** β

$$\left. \begin{aligned} \vec{p}_1 &\perp \vec{p}_2 \\ \vec{p}_{ολ} &= \vec{p}_1 + \vec{p}_2 \end{aligned} \right\}$$

$$\text{Αρχή διατήρησης της ορμής: } (m_1 + m_2)^2 V^2 = m_1^2 v_1^2 + m_2^2 v_2^2$$

$$V^2 = \frac{m_1^2 v_1^2 + m_2^2 v_2^2}{(m_1 + m_2)^2}$$

$$K = \frac{1}{2} (m_1 + m_2) V^2 = \frac{1}{2} \cdot \frac{m_1^2 v_1^2 + m_2^2 v_2^2}{m_1 + m_2} = \frac{64 + 36}{2 \cdot 5} = 10 \text{ J}$$

**ΘΕΜΑ Γ**

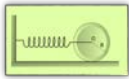
$$\mathbf{\Gamma 1: } C = \frac{Q}{E} \Rightarrow Q = C \cdot E = 40 \cdot 10^{-6} C = 4 \cdot 10^{-5} C$$

$$\mathbf{\Gamma 2: } T = 2\pi \sqrt{LC} = 2\pi \sqrt{16 \cdot 10^{-8}} = 2\pi \cdot 4 \cdot 10^{-4} = 8\pi \cdot 10^{-4} \text{ s}$$

$$\mathbf{\Gamma 3: } i = -I \cdot \eta \mu \omega t$$

$$\omega = \frac{2\pi}{T} = \frac{2\pi}{8\pi \cdot 10^{-4}} = \frac{10^4}{4} = 2500 \text{ rad/s}$$





$$I = \cdot Q = 2,5 \cdot 10^3 \cdot 4 \cdot 10^{-5} = 10 \cdot 10^{-2} = 0,1 A$$

$$i = -0,1 \cdot \eta \mu 2500 t \quad (SI)$$

$$\Gamma 4: \left. \begin{array}{l} U_B = 3U_E \\ U_B + U_E = E \end{array} \right\} \Leftrightarrow 4U_E = E \Leftrightarrow 4 \cdot \frac{1}{2} \cdot \frac{q^2}{\epsilon} = \frac{1}{2} \cdot \frac{Q_2}{\epsilon} \Leftrightarrow q = \pm \frac{Q}{2} = \pm 2 \cdot 10^{-5} C$$

#### ΘΕΜΑ Δ

**Δ1:**  $a_{cm}$  = σταθερό

$$x_{cm} = \frac{1}{2} a_{cm} \cdot t^2 \Rightarrow a_{cm} = \frac{2x_{cm}}{t^2} = \frac{4}{1} = 4 m/s^2$$

$$\Sigma F_x = m \cdot a_{cm} \Rightarrow w_x - T_s = m \cdot a_{cm} \Rightarrow$$

$$\Rightarrow T_s = m \cdot g \cdot \eta \mu \phi - m \cdot a_{cm} = 2 \cdot 10 \cdot \frac{1}{2} - 2 \cdot 4 = 2 N$$

$$\left. \begin{array}{l} \Sigma \tau = I \cdot a_{\gamma \omega \nu} \\ a_{\gamma \omega \nu} = \frac{a_{cm}}{r} = \frac{4}{1} = 4 rad/s^2 \end{array} \right\} I = \frac{\Sigma \tau}{a_{\gamma \omega \nu}} = \frac{T_s \cdot r}{a_{\gamma \omega \nu}} = \frac{2 \cdot 1}{4} \Rightarrow I = 0,5 kg \cdot m^2$$

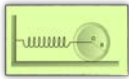
$$\Delta 2: \left. \begin{array}{l} \Sigma F_x = M \cdot a_{cm} \Rightarrow M \cdot g \cdot \eta \mu \phi - T_s = M \cdot a_{cm} \\ \Sigma \tau = I \cdot a_{\gamma \omega \nu} \Rightarrow T_s \cdot R = \lambda \cdot M \cdot R \cdot a_{\gamma \omega \nu} \end{array} \right\} \Rightarrow$$

$$\Rightarrow M \cdot g \cdot \eta \mu \phi = (\lambda + 1) \cdot M \cdot a_{cm} \Rightarrow a_{cm} = \frac{g \eta \mu \phi}{\lambda + 1}$$

$$\left. \begin{array}{l} \lambda_1 = \frac{1}{2} \\ \lambda_2 = 1 \end{array} \right\} \left. \begin{array}{l} a_{cm(1)} = \frac{2g \cdot \eta \mu \phi}{3} \\ a_{cm(2)} = \frac{g \cdot \eta \mu \phi}{2} \end{array} \right\} \Rightarrow a_{cm(1)} > a_{cm(2)}$$

$$\Delta 3: \left. \begin{array}{l} K_1 = \frac{1}{2} M v^2 + \frac{1}{2} \cdot \frac{1}{2} M R^2 \omega^2 = \frac{3}{4} M v^2 \\ K_2 = \frac{1}{2} M v^2 + \frac{1}{2} M R^2 \omega^2 = 1 \cdot M v^2 \end{array} \right\} \Rightarrow \frac{K_1}{K_2} = \frac{3}{4}$$





Δ4:

Δίσκος

$$F + w_x - T_s = M \cdot a_{cm}$$

$$T_s \cdot R = \frac{1}{2} MR^2 \cdot a_{γων}$$

⊕

$$F + w_x = \frac{3}{2} M \cdot a_{cm} \Rightarrow \boxed{\frac{2}{3}(F + w_x) = M \cdot a_{cm}} \quad (1)$$

Δακτύλιος

$$w_x - F - T_s = M \cdot a_{cm}$$

$$\oplus \quad T_s \cdot R = \frac{1}{2} MR^2 \cdot a_{γων}$$

$$\boxed{w_x - F = 2 \cdot M \cdot a_{cm}} \quad (2)$$

Από (1) και (2) προκύπτει:  $\frac{2}{3}(F + w_x) = \frac{1}{2}(w_x - F)$

$$\frac{2}{3}F + \frac{1}{2}F = \frac{1}{2}w_x - \frac{2}{3}w_x \Leftrightarrow \frac{7}{6}F = -\frac{1}{6}w_x$$

$$F = \frac{-w_x}{7} = \frac{-M \cdot g \cdot \eta \mu \phi}{7} = -1N$$

Η φορά των δυνάμεων  $\vec{F}$  είναι αντίθετη από αυτή που φαίνεται στο σχήμα

