

ΦΡΟΝΤΙΣΤΗΡΙΟ ΟΡΟΣΗΜΟ

Φυσική Προσανατολισμού

23-5-2016

ΘΕΜΑ Α

- A1. β
A2. γ
A3. β
A4. δ
A5. α. Σ
β. Λ
γ. Σ
δ. Λ
ε. Λ

ΘΕΜΑ Β

B1. Σωστή απάντηση: iii

$$f_1 = \frac{v_{\eta\chi} + 0}{v_{\eta\chi} + \frac{v_{\eta\chi}}{10}} \cdot f_s = \frac{v_{\eta\chi}}{\frac{11}{10} v_{\eta\chi}} \cdot f_s = \frac{10}{11} f_s$$

$$f_2 = \frac{v_{\eta\chi}}{v_{\eta\chi}} \cdot f_B, \text{ όπου } f_B = \frac{v_{\eta\chi} + 0}{v_{\eta\chi} - \frac{v_{\eta\chi}}{10}} \cdot f_s = \frac{v_{\eta\chi} \cdot f_s}{\frac{9}{10} \cdot v_{\eta\chi}} = \frac{10}{9} f_s.$$

$$\text{Άρα } \frac{f_1}{f_2} = \frac{\frac{10}{11}}{\frac{10}{9}} = \frac{9}{11}.$$

B2. Σωστή απάντηση: i

$$|u_{\max(M)}| = \omega |A'_M|, \text{ όπου } A'_M = 2A \text{ συν } 2\pi \frac{x_M}{\lambda}.$$

$$|u_{\max(M)}| = \left| \omega 2A \text{ συν } \frac{2\pi \cdot \frac{9\lambda}{8}}{\lambda} \right| = \omega 2A \text{ συν } \frac{18\pi}{8} = \frac{2\pi}{T} 2A \frac{\sqrt{2}}{2} = \frac{2\pi A \sqrt{2}}{T}, \text{ όπου}$$

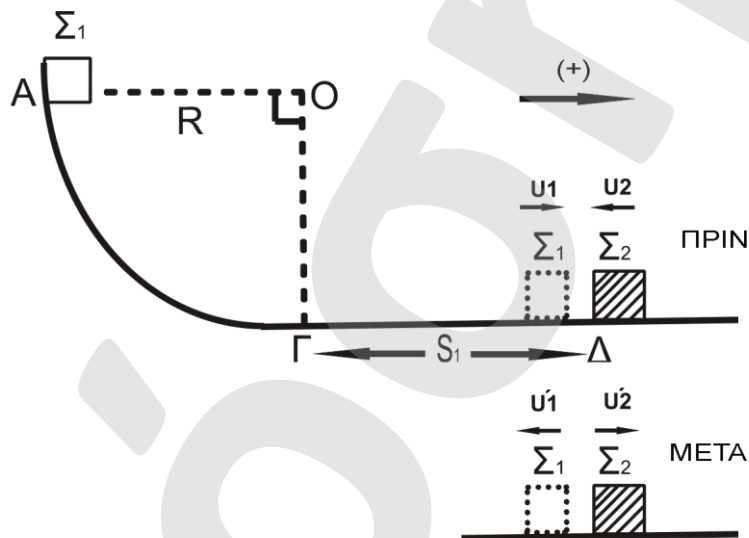
$$\text{συν } \frac{18\pi}{8} = \text{συν} \left(\frac{4 \cdot 2\pi + \pi}{4} \right) = \text{συν} \left(2\pi + \frac{\pi}{4} \right) = \text{συν} \frac{\pi}{4} = \frac{\sqrt{2}}{2}.$$

B3. Σωστή απάντηση: ii

$$A_A u_A = A_B u_B \Rightarrow 2A_B u_A = A_B u_B \Rightarrow 2u_A = u_B \text{ (Εξίσωση συνέχειας)}$$

Από εξίσωση Bernoulli μεταξύ των A και B

$$\begin{aligned} \frac{1}{2} \rho u_A^2 + \rho g y + P_A &= \frac{1}{2} \rho u_B^2 + \rho g y + P_B \Rightarrow P_A - P_B = \frac{1}{2} \rho (u_B^2 - u_A^2) \Rightarrow \\ &\Rightarrow P_A - P_B = \frac{1}{2} \rho (4u_A^2 - u_A^2) \Rightarrow \\ &\Rightarrow P_A - P_B = \frac{1}{2} \rho 3u_A^2 \Rightarrow \\ &\Rightarrow P_A - P_B = 3 \frac{1}{2} \frac{m}{V} u_A^2 \Rightarrow \\ &\Rightarrow P_A - P_B = 3 \frac{K_A}{V} = 3\Lambda \end{aligned}$$

ΘΕΜΑ Γ**Γ1. ΘΜΚΕ A → Γ**

$$K_{\Gamma} - K_A = W_{\text{βάρους}} \Rightarrow \frac{1}{2} m u_{\Gamma}^2 = mgR \Rightarrow u_{\Gamma} = \sqrt{2gR} = \sqrt{2 \cdot 10 \cdot s} = 10 \text{ m/s}$$

Γ2. ΘΜΚΕ Γ → Δ

$$\begin{aligned}
 K_{\Delta} - K_r &= W_r \Rightarrow K_{\Delta} - K_r = -\mu m g s_1 \Rightarrow \\
 &\Rightarrow \frac{1}{2} m u_{\Delta}^2 - \frac{1}{2} m u_r^2 = -\mu m g s_1 \Rightarrow \\
 &\Rightarrow \frac{1}{2} m u_{\Delta}^2 - \frac{1}{2} u_r^2 = -0,5 m 10 \cdot 3,6 \Rightarrow \\
 &\Rightarrow \frac{1}{2} u_{\Delta}^2 - 50 = -18 \Rightarrow \frac{1}{2} u_{\Delta}^2 = 32 \Rightarrow \\
 &\Rightarrow u_{\Delta}^2 = 64 \Rightarrow u_{\Delta} = 8 \text{ m/s}
 \end{aligned}$$

$$\begin{aligned}
 u_1' &= \frac{m_1 - m_2}{m_1 + m_2} \cdot u_1 + \frac{2m_2 u_2}{m_1 + m_2} = \frac{m_1 - 3m_1}{4m_1} \cdot 8 + \frac{2 \cdot 3m_1 (-4)}{4m_1} = \\
 &= \frac{-2m_1}{4m_1} \cdot 8 + (-6) = -2 \cdot 2 - 6 = \\
 &= -10 \text{ m/s}
 \end{aligned}$$

$$\begin{aligned}
 u_2' &= \frac{m_2 - m_1}{m_1 + m_2} \cdot u_2 + \frac{2m_1 u_1}{m_1 + m_2} = \frac{3m_1 - m_1}{4m_1} \cdot (-4) + \frac{2m_1 8}{4m_1} = \\
 &= -\frac{2m_1}{4m_1} \cdot (-4) + 4 = -2 + 4 = \\
 &= 2 \text{ m/s}
 \end{aligned}$$

Γ3. Θεωρώντας θετική φορά προς τα δεξιά έχουμε:

$$\Delta \vec{P}_2 = \vec{P}_{2\text{μετά}} - \vec{P}_{2\text{πριν}} = m_2 (\vec{u}'_2 - \vec{u}_2) \text{ Οπότε}$$

$$\Delta P = m_2 \cdot (2 - (-4)) = 6 \cdot 3 = 18 \text{ kgm/s}$$

Με φορά προς τα δεξιά.

Γ4.

$$\frac{K_1' - K_1}{K_1} = \frac{K_1'}{K_1} - 1 = \frac{\frac{1}{2} m u_1'^2}{\frac{1}{2} m u_1^2} - 1 = \frac{10^2}{8^2} - 1 = \frac{100}{64} - 1 = \frac{100 - 64}{64} = \frac{36}{64} = 0,5625 = 56,25\%$$

ΘΕΜΑ Δ

$$\Delta\theta = \frac{1}{2} \alpha_{\gamma\omega\nu} t^2 \Rightarrow t = \sqrt{\frac{2\Delta\theta}{\alpha_{\gamma\omega\nu}}} = \sqrt{\frac{2 \cdot 24 \cdot 3}{100}} = \sqrt{\frac{144}{100}} = \frac{12}{10} = 1,2 \text{ s}$$

$$\omega = \alpha_{\gamma\omega\nu} t = \frac{100}{3} \frac{12}{10} = 40 \text{ rad/s}$$

$$L = I\omega = \frac{1}{2} MR^2 \omega = \frac{1}{2} \cdot 2 \cdot \frac{1}{100} \cdot 40 = 0,4 \text{ kg} \cdot \text{m}^2 / \text{s}$$

Δ4.

$$\frac{dK}{dt} = \sum F \cdot u_{cm} + \sum \tau \cdot \omega = M\alpha_{cm} u_{cm} + I\alpha_{\gamma\omega\nu} \omega$$

$$u_{cm} = \alpha_{cm} t = \frac{10}{3} \cdot 3 = 10 \text{ m/s}$$

$$\omega = \alpha_{\gamma\omega\nu} t = \frac{100}{3} \cdot 3 = 100 \text{ rad/s}$$

$$\Rightarrow \frac{dK}{dt} = 2 \frac{10}{3} \cdot 10 + \frac{1}{2} \cdot 2 \cdot \frac{1}{100} \cdot \frac{100}{3} = \frac{200}{3} + \frac{100}{3} = \frac{300}{3} = 100 \text{ J/s}$$