Μοριοδότηση 2019

Ενδεικτικές απαντήσεις και από γραπτά μαθητών

Θέμα Α

A1 - β

⑤

A2 - γ

⑤

A3 - α

⑤

A4 - γ

⑤

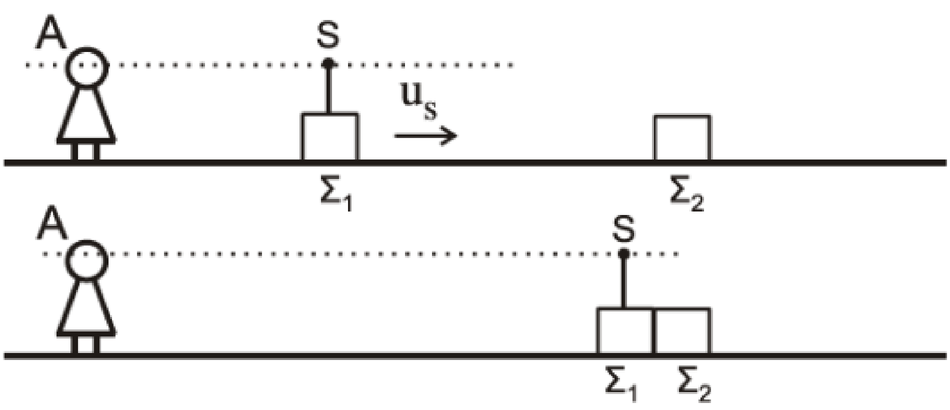
A5: $\Lambda - \Sigma - \Lambda - \Sigma - \Sigma$

⑤

Θέμα Β

B1-(ii)

②



Σχήμα 2

$$\Sigma\overrightarrow{F_{\varepsilon\xi}} = 0 \Rightarrow \mathrm{A.\Delta.O.} \quad \vec{p}_{\pi\rho\iota\nu} = \vec{p}_{\mu\varepsilon\tau\alpha}$$

$$m \cdot u_s = (m+m) \cdot V_k \Rightarrow V_k = \frac{m \cdot u_s}{2 \cdot m} \Rightarrow V_k = \frac{u_{\mathrm{H}}}{40}$$

②

$$f_1 = \frac{u_H}{u_H + u_s} \cdot f_s$$

①

$$f_2 = \frac{u_H}{u_H + V_k} \cdot f_s$$

①

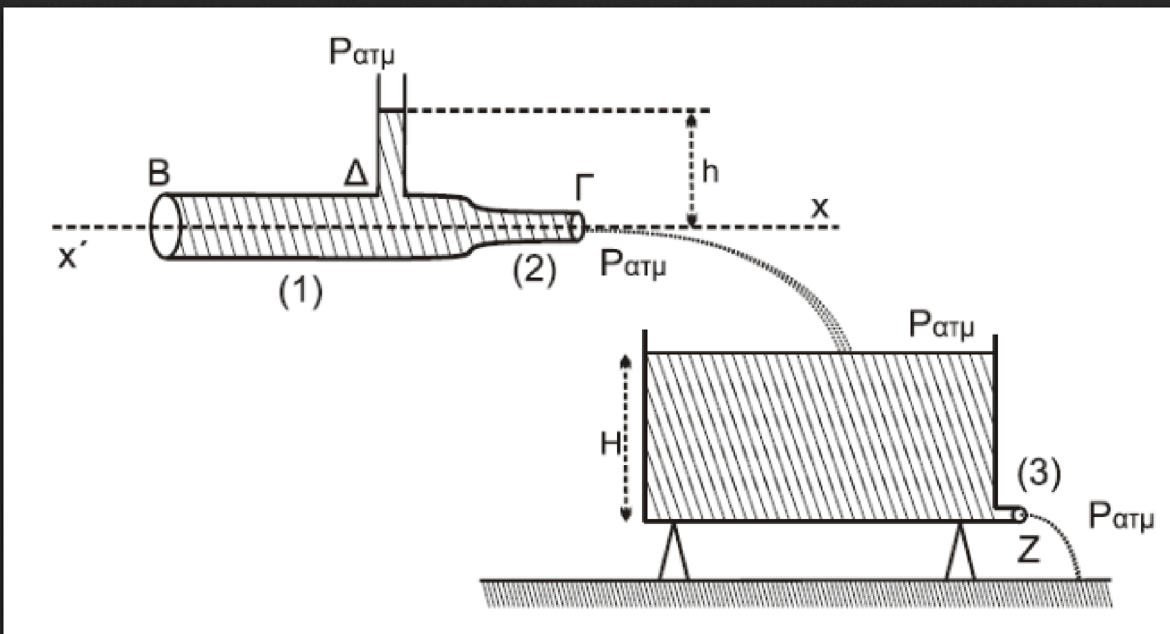
$$\frac{f_1}{f_2} = \frac{u_H + V_k}{u_H + u_s} = \frac{u_H + \frac{u_H}{40}}{u_H + \frac{u_H}{20}} = \frac{\frac{41u_H}{40}}{\frac{21u_H}{20}} = \frac{41}{42}$$

②

άρα σωστό το ii

B2 - (iii)

②



Σχήμα 3

Όταν σταθεροποιείται το ύψος στο δοχείο

$$\Pi_2 = \Pi_3 \Rightarrow A_2 \cdot \upsilon_2 = A_3 \cdot \upsilon_3 \overset{A_3 = \frac{A_2}{2}}{\Longrightarrow} \upsilon_2 = \frac{\upsilon_3}{2}$$

①

Εξίσωση Bernoulli για μια ρευματική γραμμή $(H \to Z)$

$$P_H + \frac{1}{2}\rho \cdot \upsilon_H^2 + \rho \cdot g \cdot h = P_Z + \frac{1}{2}\rho \cdot \upsilon_3^2 \Rightarrow P_{\alpha\tau\mu} + \rho \cdot g \cdot h = P_{\alpha\tau\mu} + \frac{1}{2}\rho \cdot \upsilon_3^2$$

$$\upsilon_3 = \sqrt{2 \cdot g \cdot H}$$

①

Εξίσωση συνέχειας $(\Delta \rightarrow \Gamma)$

$$\Pi_1 = \Pi_2 \Rightarrow \mathrm{A}_1 \cdot \upsilon_1 = \mathrm{A}_2 \cdot \upsilon_2 \overset{\mathrm{A}_1=2\mathrm{A}_2}{\Longrightarrow} \upsilon_2 = 2\upsilon_1$$

①

Εξίσωση Bernoulli για μια οριζόντια ρευματική γραμμή $(\Delta \rightarrow \Gamma)$

$$P_\Delta + \frac{1}{2}\rho \cdot \upsilon_1^2 = P_2 + \frac{1}{2}\rho \cdot \upsilon_2^2$$

$$P_\Delta = P_{\alpha\tau\mu} + \rho \cdot g \cdot h$$

②

$$P_{\alpha\tau\mu} + \rho \cdot g \cdot h + \frac{1}{2}\rho \cdot \upsilon_1^2 = P_{\alpha\tau\mu} + \frac{1}{2}\rho \cdot \upsilon_2^2 \Rightarrow \rho \cdot g \cdot h = \frac{1}{2} \cdot (\upsilon_2^2 - \upsilon_1^2)$$

$$g \cdot h = \frac{3}{8} \cdot \upsilon_2^2 \overset{\upsilon_2=\frac{\upsilon_3}{2}}{\Longrightarrow} g \cdot h = \frac{3}{8} \cdot \frac{\upsilon_3^2}{4}$$

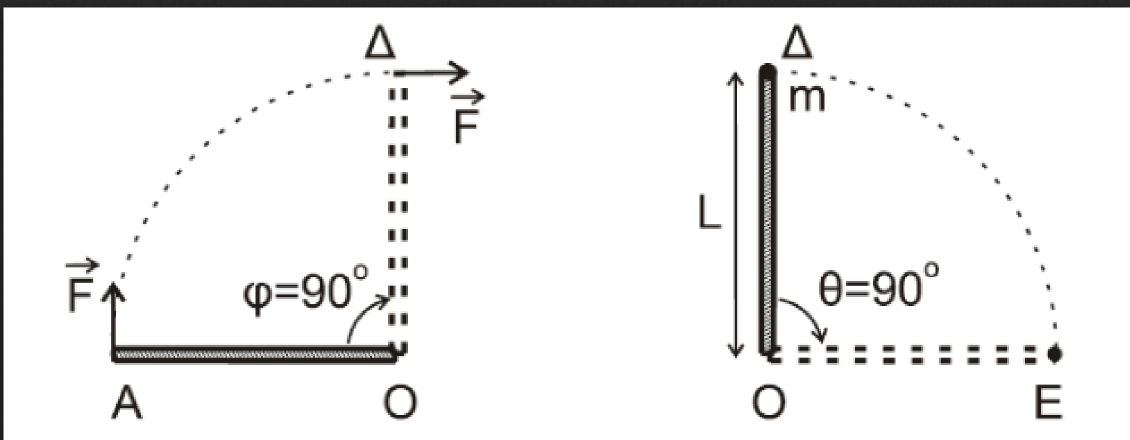
$$\upsilon_3^2 = \frac{32}{3} \cdot g \cdot h \overset{\upsilon_3=\sqrt{2\cdot g\cdot H}}{\Longrightarrow} 2 \cdot g \cdot H = \frac{32}{3} \cdot g \cdot h \Rightarrow \frac{h}{H} = \frac{3}{16}$$

①

άρα σωστό το iii

B3 - (ii)

②



Σχήμα 4 **Σχήμα 5**

$\underline{\alpha)\tau\rho\acute{o}\pi o\varsigma}$

$$\Sigma\tau = \mathrm{I} \cdot \alpha_{\gamma\omega\nu} \Rightarrow F \cdot L = \frac{1}{3} \cdot M \cdot L^2 \cdot \alpha_{\gamma\omega\nu} \Rightarrow \alpha_{\gamma\omega\nu} = \frac{3F}{ML}$$

$$\varphi = \frac{1}{2} \cdot \alpha_{\gamma\omega\nu} \cdot t^2 \Rightarrow \frac{\pi}{2} = \frac{1}{2} \cdot \alpha_{\gamma\omega\nu} \cdot t_{A\Delta} \Rightarrow t_{A\Delta} = \sqrt{\frac{\pi \cdot M \cdot L}{3F}}$$

$$\omega = \alpha_{\gamma\omega\nu} \cdot t_{A\Delta} = \frac{3F}{ML} \cdot \sqrt{\frac{\pi \cdot M \cdot L}{3F}} \Rightarrow \omega = \sqrt{\frac{3 \cdot Fcdot\pi}{M \cdot L}} \Rightarrow \omega = 3\pi\frac{rad}{s}$$

3

β)<u>τρόπος</u>

$$\Theta\text{MKE}(\mathrm{A} \rightarrow \Delta) \quad \mathrm{K}_{\Delta} - \mathrm{K}_{\mathrm{A}} = \Sigma W_{\tau} \Rightarrow \frac{1}{2} \cdot \mathrm{I}_{\rho} \cdot \omega^2 - 0 = \tau_F \cdot \theta$$

$$\frac{1}{2} \cdot \mathrm{I}_{\rho} \cdot \omega^2 = F \cdot L \cdot \frac{\pi}{2} \Rightarrow \frac{M}{3} \cdot L^2 \cdot \omega^2 = F \cdot L \cdot \pi$$

$$\omega = \sqrt{\frac{3 \cdot F \cdot \pi}{\mathrm{M} \cdot L}} = \sqrt{9 \cdot \pi^2}$$

$$\omega = 3\pi \frac{rad}{s}$$

3

$$\Sigma\tau_{\varepsilon\xi} = 0 \Rightarrow A.\Delta.\Sigma\tau\rho_0 \Rightarrow \vec{L}_{\pi\rho\iota\nu} = \vec{L}_{\mu\varepsilon\tau\acute{\alpha}} \Rightarrow I_{\rho} \cdot \omega = (\mathrm{I}_{\rho} + m \cdot L^2) \cdot \omega_k$$

$$\frac{1}{3} \cdot M \cdot L^2 \cdot \omega = (\frac{1}{3} \cdot M \cdot L^2 + m \cdot L^2) \cdot \omega_k \Rightarrow \omega = 2 \cdot \omega_k \Rightarrow \omega_k = \frac{\omega}{2}$$

2

Ομαλή στροφική κίνηση

$$\Delta\theta = \omega_k \cdot \Delta t \Rightarrow \Delta t = \frac{\Delta\theta}{\omega_k} = \frac{\Delta\theta}{\frac{\omega}{2}} = \frac{2\Delta\theta}{\omega} = \frac{2 \cdot \frac{\pi}{2}}{\omega} = \frac{\pi}{\omega}$$

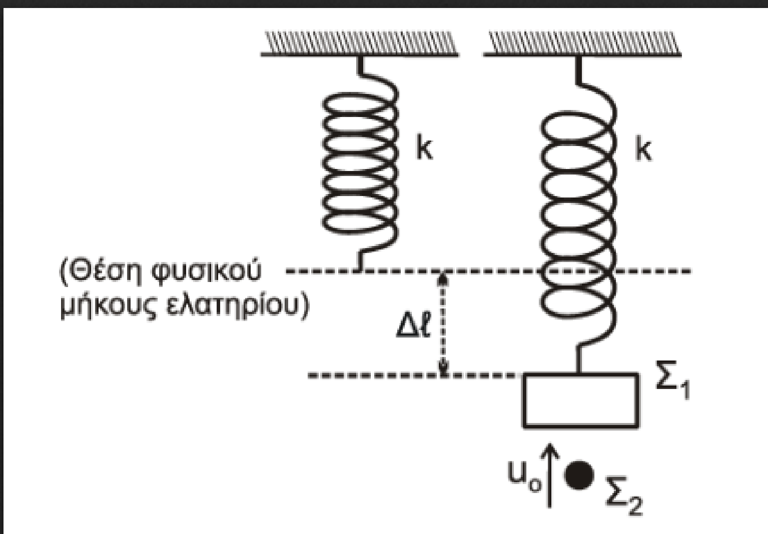
$$\Delta t = \frac{1}{3} s$$

2

άρα σωστό το ii

Θέμα Γ

Γ1



Σχήμα 6

①

$$(\Theta\mathrm{I}_{m_1}) \quad \Sigma F = 0 \Rightarrow$$
$$F_{\varepsilon\lambda} = m_1 \cdot g \Rightarrow$$
$$k \cdot \Delta l = m_1 \cdot g \Rightarrow$$
$$k = \frac{m_1 \cdot g}{\Delta l} = 200\frac{N}{m}$$

②

$$(\Theta\mathrm{I}_{m_1,m_2}) \quad \Sigma F = 0 \Rightarrow$$
$$F'_{\varepsilon\lambda} = (m_1 + m_2) \cdot g \Rightarrow$$
$$k \cdot \Delta l_1 = (m_1 + m_2) \cdot g \Rightarrow$$
$$\Delta l_1 = \frac{(m_1 + m_2) \cdot g}{k} \Rightarrow$$
$$\Delta l_1 = 0.1m$$

②

Στην ακραία θέση $\upsilon_{\tau\alpha\lambda} = 0 \Rightarrow A = 0.1m$

①

Γ2

$$\Sigma\overrightarrow{F_{\varepsilon\xi}} = 0 \Rightarrow \mathrm{A.\Delta.O.} \quad \vec{p}_{\pi\rho\iota\nu} = \vec{p}_{\mu\varepsilon\tau\alpha}$$

$$m_2 \cdot u_o = (m_1 + m_2) \cdot V_k \Rightarrow V_k = \frac{m \cdot u_s}{2 \cdot m} \Rightarrow V_k = \frac{u_{\mathrm{H}}}{40}$$

②

$$\mathrm{A\Delta E}_{\tau\alpha\lambda}(\Gamma \rightarrow \Delta)$$

$$K_\Gamma + U_{\tau\alpha\lambda\Gamma} = K_\Delta + U_{\tau\alpha\lambda\Delta} \Rightarrow \frac{1}{2} \cdot (m_1 + m_2) \cdot V_k^2 + \frac{1}{2} \cdot D \cdot (\Delta l_1 - \Delta l)^2 = 0 + \frac{1}{2} \cdot D \cdot A^2$$

$$2V_k^2 + 200 \cdot 0.05^2 = 200 \cdot 0.01 \Rightarrow V_k^2 + 0.25 = 1 \Rightarrow V_k = \sqrt{0.75} \Rightarrow |V_k| = 0.5\sqrt{3}\frac{m}{s}, V_k > 0$$

③

$$K_2 = \frac{1}{2} \cdot m_2 \cdot u_o^2 \Rightarrow K_2 = 1.5J$$

①

Γ3

$$\Delta\overrightarrow{p_2} = \vec{p}_{\tau\varepsilon\lambda} - \vec{p}_{\alpha\rho\chi} \Rightarrow \Delta p_2 = m_2 \cdot V_k - m_2 \cdot u_o \Rightarrow \Delta p_2 = 0.5\sqrt{3} - \sqrt{3} \Rightarrow \Delta p_2 = -0.5\sqrt{3}$$

②

$$|\Delta\overrightarrow{p_2}| = 0.5\sqrt{3}kg \cdot \frac{m}{s}$$

2

$$\Delta p_2 = -0.5\sqrt{3}$$

Το πρόσημο δηλώνει την κατεύθυνση του διανύσματος. (Βλέπε σχήμα)

2

Γ4

$$D = k = (m_1 + m_2) \cdot \omega^2 \Rightarrow \omega = \sqrt{\frac{k}{m_1 + m_2}} \Rightarrow \omega = 10\frac{rad}{s}$$

2

$$t_o = 0, \quad y = +\frac{A}{2}, \quad \upsilon > 0$$

$$y = A \cdot \eta\mu(\omega t + \varphi_o) \Rightarrow \frac{A}{2} = A \cdot \eta\mu\varphi_o$$

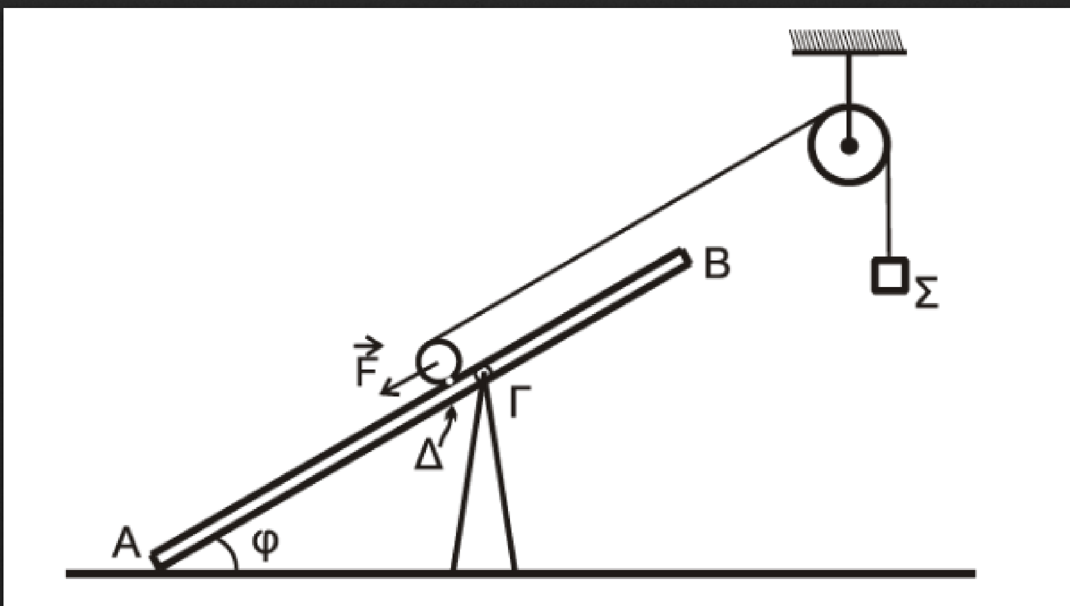
$$\eta\mu\varphi_o = \frac{1}{2} \Rightarrow \eta\mu\varphi_o = \eta\mu\frac{\pi}{6} \Rightarrow \varphi_o = \begin{cases} 2k\pi + \frac{\pi}{6}, & k = 0 \Rightarrow \varphi_o = \frac{\pi}{6} \quad \sigma\upsilon\nu\varphi_o > 0 \\ 2k\pi + \frac{5\pi}{6}, & k = 0 \Rightarrow \varphi_o = \frac{5\pi}{6} \quad \sigma\upsilon\nu\varphi_o < 0, \text{απορρίπτεται} \end{cases}$$

3

$$y = 0.1 \cdot \eta\mu(10t + \frac{\pi}{6}), \quad S.I.$$

1

Θέμα Δ



Σχήμα 7

Δ1

$$M_\Sigma, \quad \text{ισορροπία}, \Rightarrow \Sigma F = 0 \Rightarrow T_1 = M_\Sigma \cdot g \Rightarrow T_1 = 20N$$

①

$$M_T, \quad \text{ισορροπία}, \Rightarrow \Sigma\tau = 0 \Rightarrow T_1 \cdot R_T = T_1 \cdot R_T \Rightarrow T_2 = 20N$$

①

$$\underline{\alpha)\text{τρόπος}}$$

$$M_K, \quad \text{ισορροπία}, \Rightarrow \Sigma\tau_{(K)} = 0 \Rightarrow T_2 \cdot R_K = T_{\sigma\tau} \cdot R_K \Rightarrow T_2 = T_{\sigma\tau}$$

$$\Sigma F = 0 \Rightarrow T_2 + T_{\sigma\tau} = F + M_K \cdot g \cdot \eta\mu\varphi \Rightarrow 2T_2 = F + 10 \Rightarrow F = 30N$$

②

$$\underline{\beta)\text{τρόπος}}$$

$$M_K, \quad \text{ισορροπία}, \Rightarrow \Sigma\tau_{(\Delta)} = 0 \Rightarrow T_2 \cdot 2 \cdot R_K = (F + M_K \cdot g \cdot \eta\mu\varphi) \cdot R_K \Rightarrow 40 = F + 10 \Rightarrow F = 30N$$

②

Δ2

$$M_\Sigma : \quad META\Phi OPIKH$$

$$\Sigma F = M_\Sigma \cdot g - T_3 = M_\Sigma \cdot \alpha_\Sigma \quad (1)$$

①

$$M_T : \quad \Sigma TPO\Phi IKH$$

$$\Sigma\tau = I_T \cdot \alpha_{\gamma\omega\nu_T} \Rightarrow T_3 \cdot R_T - T_4 \cdot R_T = \frac{1}{2} \cdot M_T \cdot R_T^2 \cdot \alpha_{\gamma\omega\nu_T} \Rightarrow T_3 - T_4 = \frac{1}{2} \cdot M_T \cdot R_T \cdot \alpha_{\gamma\omega\nu_T} \quad (2)$$

①

νήμα αβαρές, μη εκτατό

$$\alpha_\Sigma = \alpha'_\Sigma = \alpha_{\gamma\rho} = \alpha_{\gamma\omega\nu_T} \cdot R_T \quad (3)$$

①

$$(2)\Lambda(3) \Rightarrow T_3 - T_4 = \alpha_\Sigma \quad (4)$$

$$M_K : \quad META\Phi OPIKH$$

$$\Sigma F = M_K \cdot \alpha_{cm}$$

$$T_4 + T_{\sigma\tau} - M_K \cdot g \cdot \eta\mu\varphi = M_K \cdot \alpha_{cm} \Rightarrow T_4 + T_{\sigma\tau} - 10 = 2 \cdot \alpha_{cm} \quad (5)$$

①

$$M_K : \quad \Sigma TPO\Phi IKH$$

$$\Sigma\tau = I_K \cdot \alpha_{\gamma\omega\nu_K} \Rightarrow T_4 \cdot R_K - T_{\sigma\tau} \cdot R_K = \frac{1}{2} \cdot M_K \cdot R_K^2 \cdot \alpha_{\gamma\omega\nu_K} \Rightarrow T_4 - T_{\sigma\tau} = \frac{1}{2} \cdot M_K \cdot R_K \cdot \alpha_{\gamma\omega\nu_K}$$

$$K.X.O.\ \upsilon_A = 0 \Rightarrow \upsilon_{cm} = \omega \cdot R_K \Rightarrow \alpha_{cm} = \alpha_{\gamma\omega\nu_K} \cdot R_K$$

$$T_4 - T_{\sigma\tau} = \frac{1}{2} \cdot M_K \cdot R_K \cdot \alpha_{\gamma\omega\nu_K} \Rightarrow T_4 - T_6 = \alpha_{cm} \quad (6)$$

①

νήμα αβαρές, μη εκτατό

$$\alpha_{\Lambda} = \alpha'_{\Lambda} = \alpha_{\gamma\rho} = \alpha_{\gamma\omega\nu_T} \cdot R_T$$

①

$$\upsilon_{\Lambda} = \upsilon_{cm} + \omega \cdot R_K \Rightarrow \upsilon_{\Lambda} = 2 \cdot \upsilon_{cm} \Rightarrow \alpha_{\Lambda} = 2 \cdot \alpha_{cm}$$
$$2 \cdot \alpha_{cm} = \alpha_{\gamma\omega\nu_T} \cdot R_T \Rightarrow 2 \cdot \alpha_{cm} = \alpha_{\Sigma} \quad (7)$$

①

Λύση του συστήματος $\alpha_{\Sigma} = 4\frac{m}{s^2}$

①

Δ3

$$M_K : \text{ΜΕΤΑΦΟΡΙΚΗ}, \quad 0 - t_1$$
$$\upsilon_{cm1} = \alpha_{cm} \cdot t_1 \Rightarrow \upsilon_{cm1} = 1\frac{m}{s}$$

①

$$\mathrm{M_K} : \quad \text{ΜΕΤΑΦΟΡΙΚΗ}$$
$$\Sigma F = \mathrm{M_K} \cdot \alpha_{cm}$$
$$\mathrm{M_K} \cdot g \cdot \eta\mu\varphi - T_{\sigma\tau} = \mathrm{M_K} \cdot \alpha_{cm} \Rightarrow 10 - \mathrm{T}_{\sigma\tau} = 2\alpha_{cm}, \text{επιβραδυνόμενη}$$

①

$$M_K : \quad \text{ΣΤΡΟΦΙΚΗ}$$
$$\Sigma\tau = \mathrm{I}_K \cdot \alpha_{\gamma\omega\nu_K} \Rightarrow T_{\sigma\tau} \cdot R_{\mathrm{K}} = \frac{1}{2} \cdot M_{\mathrm{K}} \cdot R_{\mathrm{K}}^2 \cdot \alpha_{\gamma\omega\nu_{\mathrm{K}}} \Rightarrow T_{\sigma\tau} = R_{\mathrm{K}} \cdot \alpha_{\gamma\omega\nu_{\mathrm{K}}} \Rightarrow T_{\sigma\tau} = \alpha_{cm}, \text{επιβραδυνόμενη}$$

①

$$10 - \alpha_{cm} = 2 \cdot \alpha_{cm} \Rightarrow \alpha_{cm} = \frac{10}{3}\frac{m}{s^2}$$

①

$$\upsilon_{cm} = \upsilon_{cm1} - \alpha_{cm} \cdot \Delta t \Rightarrow 0 = 1 - \frac{10}{3} \cdot \Delta t \Rightarrow \Delta t = 0.3s$$
$$t_2 = t_1 + \Delta t \Rightarrow t_2 = 0.8s$$

②

Δ4

$$M_K : \text{ΜΕΤΑΦΟΡΙΚΗ}, \quad 0 - t_1$$

$$x_{cm1} = \frac{1}{2} \cdot \alpha_{cm} \cdot t_1^2 \Rightarrow x_{cm1} = 0.25m$$

①

$$M_K : \text{ΜΕΤΑΦΟΡΙΚΗ}, \quad t_1 - t_2$$

$$\Delta x_{cm} = \upsilon_{cm1} \cdot \Delta t - \frac{1}{2} \cdot \alpha_{cm} \cdot \Delta t^2 \Rightarrow \Delta x_{cm} = 0.15m$$

①

$$x_{ολ} = x_{cm1} + \Delta x_{cm} \Rightarrow x_{ολ} = 0.4m$$

①

Δ5

$$(\Gamma\Delta) = 0.2m, \quad (\text{Κ}\Gamma) = 0.5m, \quad (\Gamma\Omega) = x_{ολ} - (\Gamma\Delta) \Rightarrow (\Gamma\Omega) = 0.2m$$

①

$$|\tau_{W_\rho}| = \text{M}_\rho \cdot g \cdot συνφ \cdot (\text{Κ}\Gamma) \Rightarrow |\tau_{W_\rho}| = 5\sqrt{3}N \cdot m$$

①

$$|\tau'_N| = \text{M}_\rho \cdot g \cdot συνφ \cdot (\text{Κ}\Gamma) \Rightarrow |\tau'_N| = 2\sqrt{3}N \cdot m$$

①

$$|\tau_{W_\rho}| > |\tau'_N|$$

άρα η σανίδα δεν ανατρέπεται

①

Μπορείτε να εκτυπώσετε τις λύσεις σε μορφή pdf από εδώ και τα θέματα από εδώ

← Previous | Archive | Next →
