ΛΥΣΕΙΣ Α' ΛΥΚΕΙΟΥ 23-2-2025

ΘΕΜΑ Α

Α1) γ Α2) γ Α3) δ Α4) α Α5) Λ, Λ, Σ, Σ, Λ

ΘΕΜΑ Β

Β1) $\left.\begin{matrix} x = 5t^2 \\ x = \frac{1}{2}at^2 \end{matrix}\right\} \Rightarrow \frac{1}{2}a = 5 \Rightarrow a = 10 m/s^2$

$\Sigma F = ma \Rightarrow F_1 - F_2 = ma \Rightarrow F_1 - 20 = 2 \cdot 10 \Rightarrow F_1 = 40N$

ΣΩΣΤΟ το (γ)

Β2) $y_1 = v_0 t_1 - \frac{1}{2} g t_1^2 = 10 \cdot 3 - \frac{1}{2} \cdot 10 \cdot 3^2 = 30 - 45 \Rightarrow y_1 = -15m < 0$

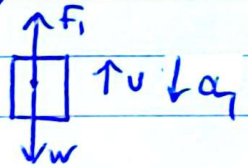
Άρα βρίσκεται 15m κάτω από το σημείο βολής, οπότε από το έδαφος απέχει $h = H - |y_1| = 25m - 15m \Rightarrow h = 10m$

ΣΩΣΤΟ το (α)

Β3) $t_A = 2t_B \Rightarrow \sqrt{\frac{2h_A}{g}} = 2\sqrt{\frac{2h_B}{g}} \Rightarrow \frac{2h_A}{g} = 4 \cdot \frac{2h_B}{g} \Rightarrow h_A = 4h_B$

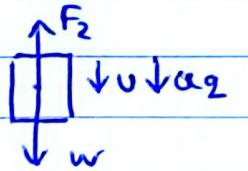
ΣΩΣΤΟ το (β)

Β4)



$\Sigma F = ma_1 \Rightarrow w - F_1 = ma_1 \Rightarrow mg - F_1 = m\frac{g}{2} \Rightarrow$

$\Rightarrow F_1 = mg - \frac{mg}{2} \Rightarrow F_1 = \frac{1}{2}mg \quad (1)$



$\Sigma F = ma_2 \Rightarrow w - F_2 = ma_2 \Rightarrow mg - F_2 = m\frac{g}{4} \Rightarrow$

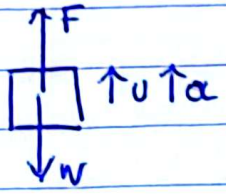
$\Rightarrow mg - \frac{mg}{4} = F_2 \Rightarrow F_2 = \frac{3}{4}mg \quad (2)$

$\frac{(1)}{(2)} \Rightarrow \frac{F_1}{F_2} = \frac{\frac{1}{2}mg}{\frac{3}{4}mg} \Rightarrow \frac{F_1}{F_2} = \frac{2}{3}$ ΣΩΣΤΟ ΤΟ (γ)

ΘΕΜΑ Γ

$W = mg = 4 \cdot 10 \Rightarrow W = 40N$

Γ1)



$\Sigma F = ma \Rightarrow F - W = ma \Rightarrow$

$80 - 40 = 4 \cdot a \Rightarrow 40 = 4a \Rightarrow a = 10 m/s^2$

Γ2) $\Delta y_1 = h = 5m$

$\Delta y_1 = \frac{1}{2} a \Delta t_1^2 \Rightarrow \Delta t_1 = \sqrt{\frac{2\Delta y_1}{a}} = \sqrt{\frac{2 \cdot 5}{10}} \Rightarrow \Delta t_1 = 1 sec$

$\Delta t_1 = t_1 - t_0 \Rightarrow \Delta t_1 = t_1 - 0 \Rightarrow t_1 = 1 sec$

$U_1 = a \Delta t_1 = 10 \cdot 1 \Rightarrow U_1 = 10 m/s$

Γ3)

$\Delta y_2 = S_{stop} = \frac{U_0^2}{2g} = \frac{10^2}{2 \cdot 10} = 5m$

Άρα από το έδαφος $H_{max} = |\Delta y_1| + |\Delta y_2| = 5m + 5m \Rightarrow$

$H_{max} = 10m.$

Γ4) $H_{max} = \frac{1}{2} g t_{\epsilon\pi}^2 \Rightarrow t_{\epsilon\pi} = \sqrt{\frac{2 H_{max}}{g}} = \sqrt{\frac{2 \cdot 10}{10}} \Rightarrow t_{\epsilon\pi} = \sqrt{2} sec$

$U_{\epsilon\pi} = g t_{\epsilon\pi} = 10 \cdot \sqrt{2} \Rightarrow U_{\epsilon\pi} = 10\sqrt{2} m/s$

ΘΕΜΑ Δ

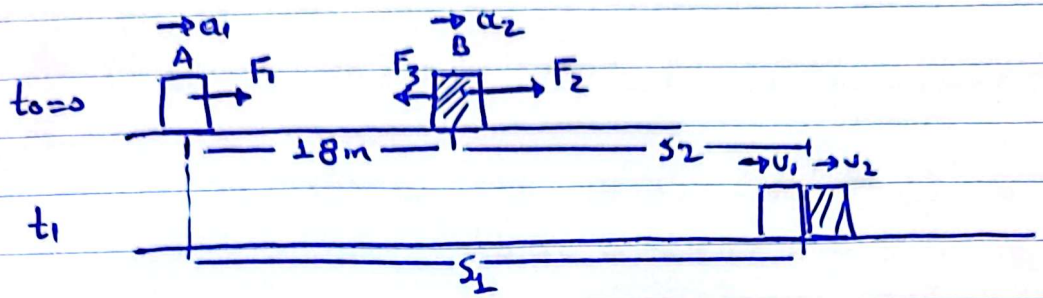
Δ1) ΣΩΜΑ Α: $\Sigma F_1 = m_1 a_1 \Rightarrow F_1 = m_1 a_1 \Rightarrow 3 = 1 \cdot a_1 \Rightarrow$

$\Rightarrow \boxed{a_1 = 3 m/s^2}$

ΣΩΜΑ Β: $\Sigma F_2 = m_2 a_2 \Rightarrow F_2 - F_3 = m_2 a_2 \Rightarrow 10 - 6 = 2 a_2 \Rightarrow$

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

Δ2)



$S_1 = 18 + S_2 \Rightarrow \frac{1}{2} a_1 t_1^2 = 18 + \frac{1}{2} a_2 t_1^2 \Rightarrow$

$\frac{1}{2} \cdot 3 \cdot t_1^2 = 18 + \frac{1}{2} \cdot 2 t_1^2 \Rightarrow 3 t_1^2 = 36 + 2 t_1^2 \Rightarrow t_1^2 = 36 \Rightarrow$

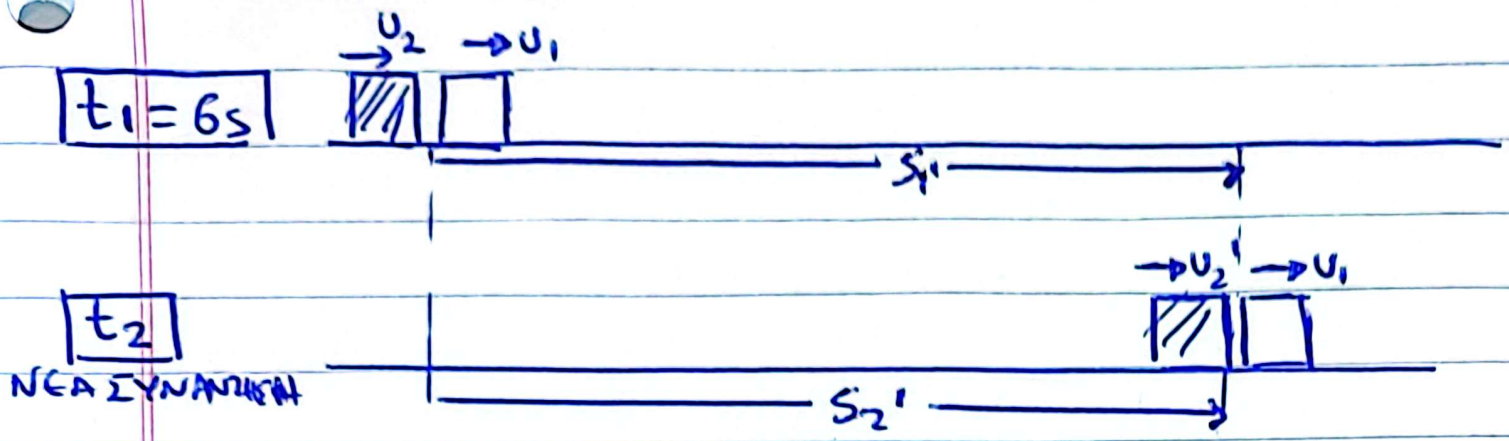
$\Rightarrow t_1 = \sqrt{36} \Rightarrow \boxed{t_1 = 6 s}$

Δ3) $U_1 = a_1 t_1 = 3 \cdot 6 \Rightarrow U_1 = 18 m/s$

$U_2 = a_2 t_1 = 2 \cdot 6 \Rightarrow U_2 = 12 m/s$

Δ4) Το Α μετά την κατάργηση της $\vec{F_1}$ εκτελεί Ε.Ο.Κ. με σταθερή ταχύτητα $U_1 = 18 m/s$

ΣΥΝΕΧΕΙΑ Δ4



Αν περάσει χρονικό διάστημα Δt μεταξύ των χρονικών στιγμών t_1 και t_2 τότε :

$$S_1' = S_2' \Rightarrow U_1 \Delta t = U_2 \Delta t + \frac{1}{2} a_2 \Delta t^2 \Rightarrow$$

$$18 \Delta t = 12 \Delta t + \frac{1}{2} \cdot 2 \cdot \Delta t^2 \Rightarrow$$

$$6 \Delta t = \Delta t^2 \Rightarrow \Delta t^2 - 6 \Delta t = 0$$

$$\Rightarrow \Delta t (\Delta t - 6) = 0 \Rightarrow \Delta t = 0 \text{ ή } \boxed{\Delta t = 6 sec}$$

και $\Delta t = t_2 - t_1 \Rightarrow t_2 = \Delta t + t_1 = 6_s + 6_s \Rightarrow \boxed{t_2 = 12\ s}$