ΛΥΣΕΙΣ ΔΙΑΓΩΝΙΣΜΑΤΟΣ ΦΥΣΙΚΗΣ Α'ΛΥΚΕΙΟΥ
10/4/2022

ΘΕΜΑ Α

Α1) α Α2) β Α3) β Α4) γ

Α5) Σ, Λ, Λ, Σ, Λ

ΘΕΜΑ Β

Β1) $\Sigma F_y = 0 \Rightarrow N = W \Rightarrow N = 8N$

$\Sigma F_x = 0 \Rightarrow F = T \Rightarrow T = 6N$

$T = \mu \cdot N \Rightarrow \mu = \frac{T}{N} = \frac{6N}{8N} \Rightarrow \mu = \frac{3}{4} = 0,75$ **ΣΩΣΤΟ ΤΟ (γ)**

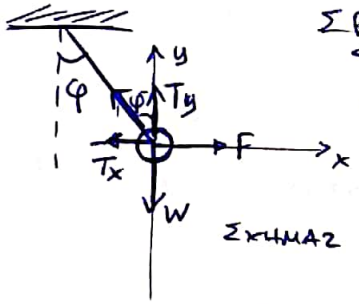
Β2)

ΣΧΗΜΑ 1

α) Σ_2: $\Sigma F = 0 \Rightarrow T_2 = W_2 \Rightarrow$ **$T_2 = 100N$**

Σ_1: $\Sigma F = 0 \Rightarrow T_1 = W_1 + T_2 \Rightarrow T_1 = 100N + 50N \Rightarrow$ **$T_1 = 150N$**

β)

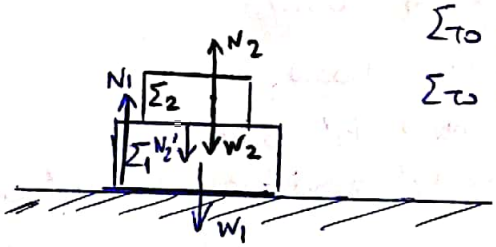


ΣΧΗΜΑ 2

$\Sigma F_y = 0 \Rightarrow T_y = W \Rightarrow T\sigma\upsilon\nu\varphi = W \Rightarrow T \cdot 0,8 = 100 \Rightarrow T = 125N$

$\Sigma F_x = 0 \Rightarrow F = T_x \Rightarrow F = T\eta\mu\varphi \Rightarrow F = 125 \cdot 0,6 \Rightarrow F = 75N$

Β3)



Στο Σ_2 ασκούνται: η $\vec{N}_2$ από το Σ_1 και $\vec{W}_2$ από τη Γη.

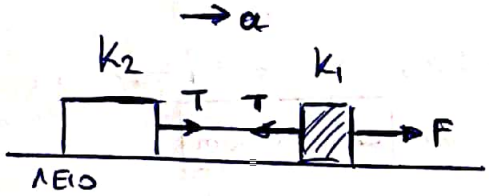
Στο Σ_1 ασκούνται: η $\vec{N}_2'$ από το Σ_2, $\vec{N}_1$ από το οριζόντιο επίπεδο και $\vec{W}_2$ από την Γη.

$\vec{N}_1, \vec{N}_2, \vec{N}_2'$: Δυνάμεις από επαφή.

$\vec{W}_1, \vec{W}_2$: Δυνάμεις από απόσταση.

$\vec{N}_2 = -\vec{N}_2'$: "ΔΡΑΣΗ – ΑΝΤΙΔΡΑΣΗ"

Β4)



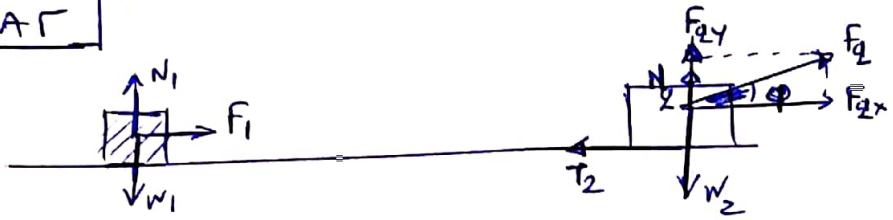
Για το k_1: $\Sigma F_x = m_1 \alpha \Rightarrow F - T = 2m\alpha$ (1)

Για το k_2: $\Sigma F_x = m_2 \alpha \Rightarrow T = m\alpha$ (2)

$\frac{(1)}{(2)} \Rightarrow \frac{F-T}{T} = \frac{2m\alpha}{m\alpha} \Rightarrow \frac{F-T}{T} = 2 \Rightarrow F - T = 2T \Rightarrow F = 3T$

ΣΩΣΤΟ ΤΟ (β)

ΘΕΜΑ Γ



Γ1)

Σ1 $\Sigma F_x = m_1 a_1 \Rightarrow F_1 = m_1 a_1 \Rightarrow a_1 = \frac{F_1}{m_1} \Rightarrow$ **$a_1 = 12\ m/s^2$**

Σ2 $F_{2x} = F_2 \cdot \sigma\upsilon\nu\varphi = 100 \cdot 0{,}8 \Rightarrow F_{2x} = 80N$

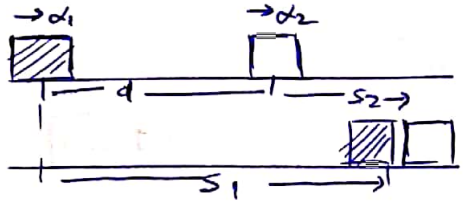
$F_{2y} = F_2 \cdot \eta\mu\varphi = 100 \cdot 0{,}6 \Rightarrow F_{2y} = 60N$

$\Sigma F_y = 0 \Rightarrow N_2 + F_{2y} = W_2 \Rightarrow N_2 = W_2 - F_{2y} = 100N - 60N \Rightarrow N_2 = 40N$

$T_2 = \mu \cdot N_2 = 0{,}5 \cdot 40N \Rightarrow T_2 = 20N$

$\Sigma F_x = m_2 a_2 \Rightarrow F_{2x} - T_2 = m_2 a_2 \Rightarrow 80 - 20 = 10 \cdot a_2 \Rightarrow$ **$a_2 = 6\ m/s^2$**

Γ2)



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

$\Rightarrow \frac{1}{2} \cdot 12\, t_1^2 - \frac{1}{2} \cdot 6 \cdot t_1^2 = 300 \Rightarrow$

$\Rightarrow 3 t_1^2 = 300 \Rightarrow t_1^2 = 100 \Rightarrow$ **$t_1 = 10s$**

Γ3) $U_1 = a_1 t_1 = 12 \cdot 10 \Rightarrow$ **$U_1 = 120\ m/s$**

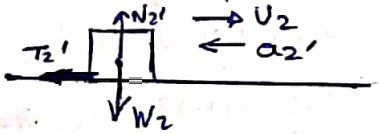
$U_2 = a_2 t_2 = 6 \cdot 10 \Rightarrow$ **$U_2 = 60\ m/s$**

Γ4) Το m1 θα συνεχίσει ε.ο.κ: $U_1' = U_1 = 120\ m/s = \text{σταθ.}$

$S_1' = U_1' \Delta t_2$ (1)

Το m2 θα εκτελέσει ε.ο. επιβραδ. κ με $U_{0x} = U_2 = 60\ m/s$

ΝΕΑ ΜΕΛΕΤΗ



$\Sigma F_y = 0 \Rightarrow N_2' = W_2 \Rightarrow N_2' = 100N$

$T_2' = \mu \cdot N_2' = 0{,}5 \cdot 100N \Rightarrow T_2' = 50N$

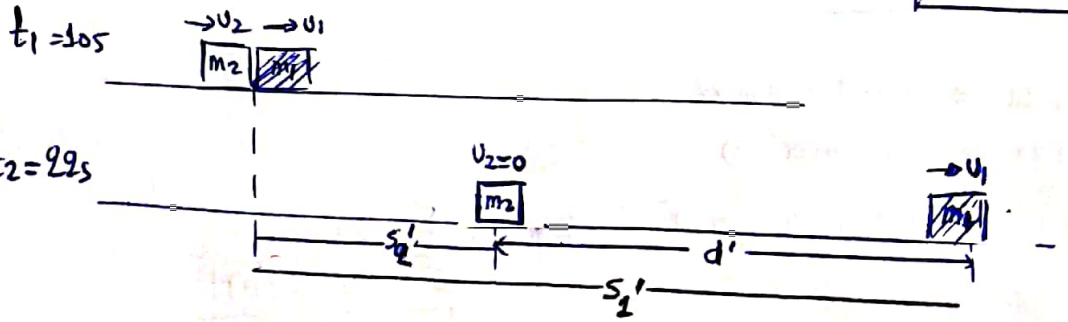
$\Sigma F_x = m_2 a_2' \Rightarrow T_2 = m_2 a_2' \Rightarrow 50 = 10 \cdot a_2' \Rightarrow a_2' = 5\ m/s^2$

$S_2' = S_{stop} = \frac{U_{0x}^2}{2|a'|} = \frac{60^2}{2 \cdot 5} \Rightarrow S_2' = 360m$

$\Delta t_2 = \Delta t_{stop} = \frac{U_{0x}}{|a'|} = \frac{60}{5} \Rightarrow \Delta t_2 = 12sec.$

Από το m1 θα έχει διανύσει: $S_1' = U_1' \Delta t_2 = 120 \cdot 12m \Rightarrow S_1' = 1440m$

Οπότε $d' = S_1' - S_2' = 1440m - 360m \Rightarrow$ **$d' = 1080m$**



ΘΕΜΑ Δ

ΓΙΑ ΤΗΝ ΚΙΝΗΣΗ ΤΟΥ ΣΩΜΑΤΟΣ: Α → Γ

$W_x = mg\eta\mu\varphi = 50 \cdot 0{,}6 \Rightarrow W_x = 30N$

$W_y = mg\sigma\upsilon\nu\varphi = 50 \cdot 0{,}8 \Rightarrow W_y = 40N$

$\Sigma f_y = 0 \Rightarrow N = W_y \Rightarrow N = 40N$ και $T = \mu N = 0{,}25 \cdot 40N \Rightarrow \boxed{T = 10N}$

Δ1) $T = 10N$

Δ2) $\Sigma f_x = ma_1 \Rightarrow W_x + T = ma_1 \Rightarrow 30 + 10 = 5 \cdot a_1 \Rightarrow \boxed{a_1 = 8 m/s^2}$ (Μέτρο επιβράδυνσης)

Δ3) $S_{stop} = (A\Gamma) = \frac{U_0^2}{2|a_1|} = \frac{20^2}{2 \cdot 8} \Rightarrow S_{stop} = 25m$

$\eta\mu\varphi = \frac{h}{S_{stop}} \Rightarrow h = S_{stop} \cdot \eta\mu\varphi = 25 \cdot 0{,}6 \Rightarrow \boxed{h = 15m}$

Β' ΤΡΟΠΟΣ

ΘΜΚΕ Α→Γ $\quad 0 - \frac{1}{2}mU_0^2 = W_{Wx}^{A\to\Gamma} + \cancel{W_{Wy}^{A\to\Gamma}}^{0} + W_T^{A\to\Gamma} \Rightarrow -\frac{1}{2}mU_0^2 = -W_x \cdot S_{stop} - T \cdot S_{stop} \Rightarrow$

$\Rightarrow -\frac{1}{2} \cdot 5 \cdot 20^2 = -30 \cdot S_{stop} - 10 S_{stop} \Rightarrow -1000 = -40 S_{stop} \Rightarrow S_{stop} = 25m$

Δ4) **α)** $W_x = 30N$, $T_{s\max} = T_{\alpha\rho} = \mu_s \cdot N = 0{,}5 \cdot 40 = 20N$

Επειδή $W_x > T_{\alpha\rho}$ θα επιστρέψει στη βάση.

β) **Κατά την κίνηση από τη θέση Γ στη θέση Α:**

$\Sigma f_x = m a_2 \Rightarrow W_x - T = m a_2 \Rightarrow 30 - 10 = 5 \cdot a_2 \Rightarrow a_2 = 4 m/s^2$ (Μέτρο επιτάχυνσης)

$S_2 = \frac{1}{2} a_2 t_2^2 \Rightarrow t_2 = \sqrt{\frac{2S_2}{a_2}} = \sqrt{\frac{2 \cdot 25}{4}} = \sqrt{\frac{25}{2}} = \frac{5}{\sqrt{2}} \Rightarrow t_2 = \frac{5\sqrt{2}}{2} s$

$S_2 = (A\Gamma) = S_{stop} = 25m$.

Άρα $U_2 = a_2 t_2 = 4 \cdot \frac{5\sqrt{2}}{2} \Rightarrow \boxed{U_2 = 10\sqrt{2}\, m/s}$

Β' ΤΡΟΠΟΣ

ΘΜΚΕ Γ→Α $\quad \frac{1}{2}mU_2^2 - 0 = W_{Wx}^{\Gamma\to A} + \cancel{W_{Wy}^{\Gamma\to A}}^{0} + W_T^{\Gamma\to A} \Rightarrow \frac{1}{2}mU_2^2 = +W_x \cdot S_2 - T \cdot S_2 \Rightarrow$

$\frac{1}{2} 5 U_2^2 = 30 \cdot 25 - 10 \cdot 25 \Rightarrow \frac{1}{2} \cdot 5 U_2^2 = 500 \Rightarrow U_2^2 = 200 \Rightarrow U_2 = \sqrt{200} \Rightarrow$

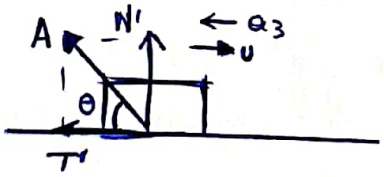
$\Rightarrow U_2 = 10\sqrt{2}\, m/s$

Δ5) **ΝΕΑ ΜΕΛΕΤΗ ΓΙΑ ΤΟ ΟΡΙΖΟΝΤΙΟ ΕΠΙΠΕΔΟ**

- $\Sigma f_y = 0 \Rightarrow N' = W \Rightarrow \boxed{N' = 50N}$
- $T' = \mu' N'$
- $S_3 = S_{stop} = \frac{U_0^2}{2|a_3|} \Rightarrow 25 = \frac{(10\sqrt{2})^2}{2 \cdot |a_3|} \Rightarrow 50|a_3| = 200 \Rightarrow |a_3| = 4 m/s^2$
- $\Sigma f_x = M a_3 \Rightarrow T' = m a_3 \Rightarrow T' = 5 \cdot 4\, N \Rightarrow \boxed{T' = 20N}$

$A = F_{\delta\iota\alpha\sigma\varepsilon\sigma\eta} = \sqrt{N'^2 + T'^2} = \sqrt{50^2 + 20^2} = \sqrt{2900N} \Rightarrow$

$A = F_{\delta\iota\alpha\sigma\varepsilon\sigma\eta} = \sqrt{2900}\, N = 10\sqrt{29}\, N$ (ΜΕΤΡΟ)



$\varepsilon\varphi\theta = \frac{N'}{T'} = \frac{50N}{20N} = \frac{5}{2}$ (ΚΑΤΕΥΘΥΝΣΗ)