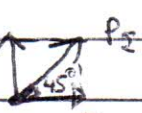
9/10/2016 Λύσεις Διαγωνίσματος Γ Λυκείου

Θέμα Α: 1→β, 2→β, 3→β, 4→δ, 5→γ, 6→α, 7→α,
8: α-Σ, β-Σ, γ-Λ, δ-Σ, ε→Σ

Θέμα Β: Β1→(β)

$\omega_2 = \omega_1 + \frac{20}{100}\omega_1 \Rightarrow \omega_2 = \frac{120}{100}\omega_1 \Rightarrow \frac{\omega_2}{\omega_1} = 1,2 \Rightarrow \frac{\omega_2}{\omega_1} > 1$ (1)



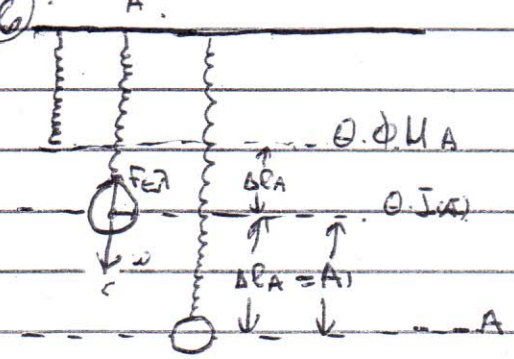
$\epsilon\phi\theta = \frac{P_2}{P_1} \Rightarrow \epsilon\phi 45 = \frac{P_2}{P_1} \Rightarrow P_1 = P_2 \Rightarrow \omega_1 U_1 = \omega_2 U_2$

$\Rightarrow \frac{U_1}{U_2} = \frac{\omega_2}{\omega_1} \xrightarrow{(1)} \boxed{\frac{U_1}{U_2} > 1}$

Β.2.1 → (γ) $k_A = 4k_B \Rightarrow m\omega_A^2 = 4m\omega_B^2 \Rightarrow \omega_A = 2\omega_B$ (1)

$A_1 = \Delta l_A$ & $A_2 = \Delta l_A$ άρα $\frac{U_{A\max}}{U_{B\max}} = \frac{\omega_A \cdot \Delta l_A}{\omega_B \cdot \Delta l_A} \xrightarrow{(1)} \frac{2\omega_B}{\omega_B} = 2$

Β.2.2 → (β)

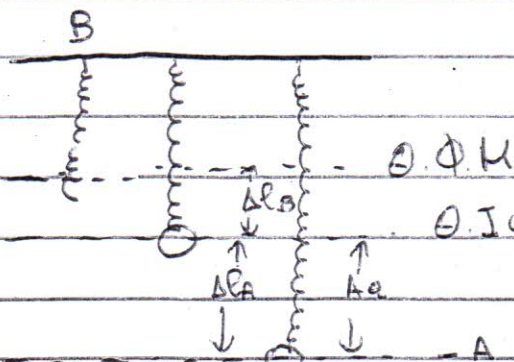


Θ.Ι(Α): $\Sigma F = 0 \Rightarrow \Delta l_A = \frac{mg}{k_A} \Rightarrow$

$\Delta l_A = \frac{mg}{4k_B}$

$\Delta l_{max_A} = \Delta l_A + \Delta l_A \Rightarrow$

$\boxed{\Delta l_{max_A} = \frac{mg}{2k_B}}$ (1)



Θ.Ι(Β): $\Sigma F = 0 \Rightarrow \Delta l_B = \frac{mg}{k_B}$

$\Delta l_{max_B} = \Delta l_B + \Delta l_A \Rightarrow$

$\boxed{\Delta l_{max_B} = \frac{5mg}{4k_B}}$ (2)

$\frac{U_{\epsilon\lambda B\max}}{U_{\epsilon\lambda B\max}} = \frac{\frac{1}{2}k_A \Delta l^2_{max_A}}{\frac{1}{2}k_B \Delta l^2_{max_B}} \Rightarrow \frac{U_{\epsilon\lambda A\max}}{U_{\epsilon\lambda B\max}} = \frac{\frac{1}{2}4k_B \cdot \frac{m^2g^2}{4k_B^2}}{\frac{1}{2}k_B \frac{25m^2g^2}{16k_B^2}} \Rightarrow \boxed{\frac{U_{\epsilon\lambda A\max}}{U_{\epsilon\lambda B\max}} = \frac{16}{25}}$

6.3.1. → (β) $\omega = \frac{\Delta\phi}{\Delta t} \Rightarrow \omega = \frac{\frac{4\pi}{3} - \pi}{\frac{\pi}{15} - \frac{\pi}{30}} \Rightarrow \boxed{\omega = 10\ r/s}$

Και $\Delta\phi = \omega \cdot \Delta t \Rightarrow \phi_{T+2} - \phi_0 = \omega (t_{T+2} - t_0) \Rightarrow$

$\pi - \phi_0 = 10 \cdot \frac{\pi}{30} \Rightarrow \boxed{\phi_0 = \frac{2\pi}{3}\ rad}$

Β 3.9 → (α) $T = \frac{2\pi}{\omega} \Rightarrow \boxed{T = \frac{\pi}{5}\ sec}$

Β4.1 → (δ) $\omega_1 = \omega$, $\omega_2 = 2\omega$, $\frac{4T_1}{4} = \frac{8T_2}{4} \Rightarrow T_1 = 2T_2 \Rightarrow \boxed{\omega_2 = 2\cdot\omega_1}$ (1)

$U_{max1} = 2U_{max2} \Rightarrow \omega_1 \cdot A_1 = 2 \cdot \omega_2 \cdot A_2 \overset{(1)}{\Rightarrow} \omega_1 A_1 = 2 \cdot 2\omega_1 \cdot A_2 \Rightarrow \boxed{A_1 = 4A_2}$ (2)

$\frac{F_{max1}}{F_{max2}} = \frac{-D \cdot A_1}{-D_2 \cdot A_2} = \frac{m_1 \omega_1^2 \cdot A_1}{m_2 \omega_2^2 \cdot A_2} \overset{(1),(2)}{=} \frac{\cancel{m_1} \cdot \omega_1^{\cancel{2}} \cdot \cancel{4} \cdot A_2}{2\cancel{m_1} \cdot \cancel{4}\omega_1^{\cancel{2}} \cdot A_2} = \frac{1}{2}$

Θέμα Γ: [1] $S = \frac{3A}{2} \Rightarrow \frac{6}{10} = \frac{3A}{2} \Rightarrow \boxed{A = 0{,}4\ m}$

$\Delta t = \frac{T}{2} \Rightarrow \boxed{T = 0{,}2\ s} \Rightarrow \boxed{\omega = 10\pi\ r/s}$

$x = A \cdot \eta\mu(\omega t + \phi_0) \overset{\substack{t=0 \\ x=\frac{A}{2}}}{\Rightarrow} \frac{A}{2} = A \cdot \eta\mu\phi_0 \Rightarrow \eta\mu\phi_0 = \eta\mu\frac{\pi}{6}$

$\phi_0 = 2k\pi + \frac{\pi}{6}$, $k=0$, $\phi_0 = \frac{\pi}{6}\ rad$

$\phi_0 = 2k\pi + \pi - \frac{\pi}{6}$, $k=0$, $\phi_0 = \frac{5\pi}{6}\ rad$.

Δεκτή $\boxed{\phi_0 = \frac{\pi}{6}\ rad}$ για $U > 0$

$x = A \cdot \eta\mu(\omega t + \phi_0)$

$\boxed{x = 0{,}4\,\eta\mu\left(10\pi t + \frac{\pi}{6}\right)}$ S.I.

[2] $a = -\omega^2 \cdot x \Rightarrow \boxed{x = \frac{\sqrt{3}}{10}\ m}$ Από Α.Δ.Ε.Τ: $E = K + U \Rightarrow$

$\frac{1}{2} D A^2 = K + \frac{1}{2} D x^2 \Rightarrow \boxed{K = 13\ J}$

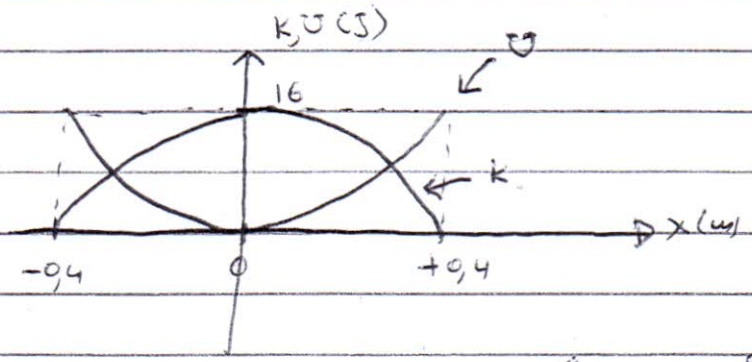
[3] $\frac{\Delta K}{\Delta t} - \frac{|F| \cdot \Delta x}{\Delta t} = |F| \cdot U = -D \cdot x \cdot U \Rightarrow \frac{\Delta K}{\Delta t} = -m \cdot \omega^2 \cdot x \cdot U$ (1)

$t=0 \Rightarrow U = \omega \cdot A \cos(\phi_0) \Rightarrow U = 10\pi \cdot \frac{4}{10} \cdot \frac{\sqrt{3}}{2} \Rightarrow \boxed{U = 2\pi\sqrt{3}\ m/s}$

Αρα $\frac{\Delta K^{(1)}}{\Delta t} = -\frac{2}{10} \cdot 10 \cdot 8 \cdot \frac{2}{10} \cdot 2\pi\sqrt{3} = -80\pi\sqrt{3}\ J/s$

$$\boxed{\frac{\Delta K}{\Delta t} = -80\pi\sqrt{3}\ J/s}$$

[4]

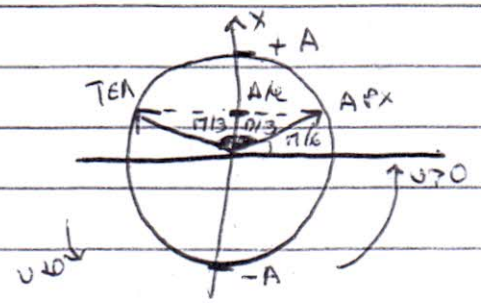


[5] $W_{F\epsilon\pi} = K_{\tau\epsilon\lambda} - K_{\alpha\rho\chi} \Rightarrow W_{F\epsilon\pi} = \frac{1}{2} m \cdot U_{max}^2 - \frac{1}{2} m \cdot U^2 \Rightarrow$

$W_{F\epsilon\pi} = \frac{1}{2} \cdot \frac{2}{10} \left(10\pi \frac{4}{10}\right)^2 - \frac{1}{2} \cdot \frac{2}{10} (2\pi\sqrt{3})^2 \Rightarrow$

$W_{F\epsilon\pi} = 16 - \frac{4 \cdot \pi^2 \cdot 3}{10} \Rightarrow \boxed{W_{F\epsilon\pi} = +4J}$

[6]



$\Delta\phi = \omega \cdot \Delta t \Rightarrow$

$\frac{2\pi}{3} = 10\pi \cdot \Delta t \Rightarrow$

$\boxed{\Delta t = \frac{1}{15}\ s}$

Θεμα Δ

Δ1) $h = \frac{1}{2} g t^2 \Rightarrow h = \frac{1}{2} \cdot 10 \cdot \frac{\pi^2}{100} \Rightarrow \boxed{h = \frac{1}{8}\ m}$

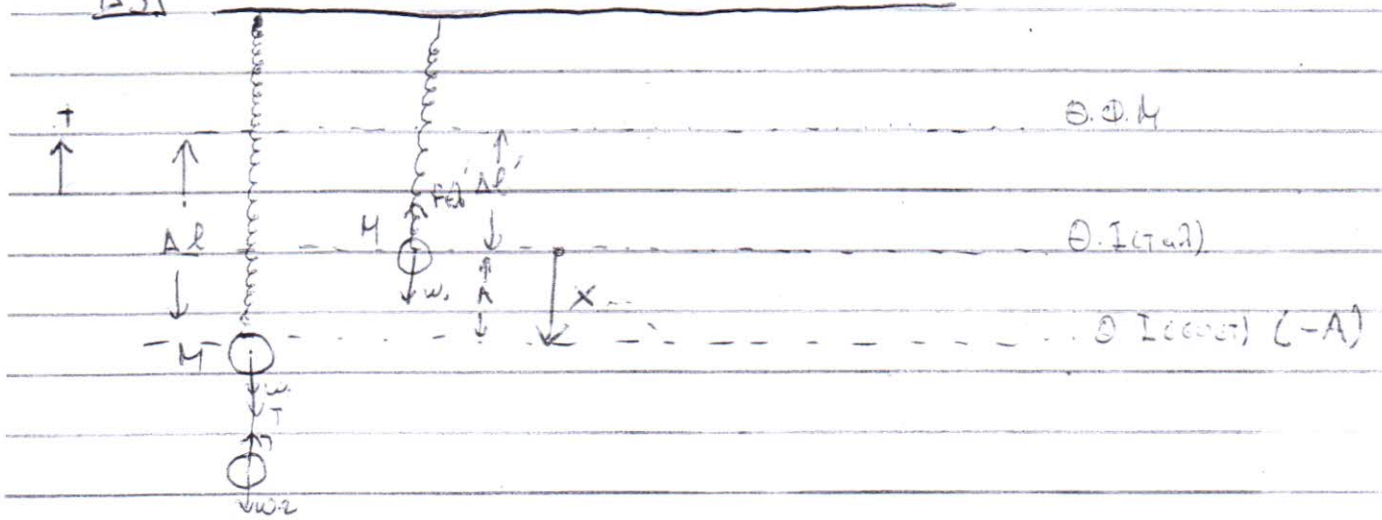
$U = g \cdot t \Rightarrow U = 10 \cdot \frac{\pi}{10} \Rightarrow \boxed{U = \pi\ m/s}$

Δ2) $t = \frac{T}{4} \Rightarrow \frac{\pi}{10} = \frac{T}{4} \Rightarrow \boxed{T = \frac{4\pi}{10}\ s} \Rightarrow \boxed{\omega = 5\ rad/s}$

$K = D \Rightarrow$ Π.

$D = M \cdot \omega^2 \Rightarrow D = 5 \cdot 95 \Rightarrow \boxed{D = 195\ N/m}$

Δ3|



Θ.Ι ΣΩΜΑΤΟΣ: $\Delta l' = \frac{(M+m)g}{K} \Rightarrow \Delta l = 0,5\,m$ ⎫ $A = \Delta l - \Delta l'$ ⎬ $\boxed{A = 0,1\,m}$

Θ.Ι (ΤΑΛΑΝΤΩΣΗΣ): $\Delta l' = \frac{M \cdot g}{K} \Rightarrow \Delta l' = 0,4\,m$ ⎭

Αρχική φο: $t=0$: $x = A\,ημ(\omega t + \phi_0) \xrightarrow{x=-A} ημφ_0 = ημ\frac{3\pi}{2} \Rightarrow \boxed{\phi_0 = \frac{3\pi}{2}\ rad}$

$x = A \cdot ημ(\omega t + \phi_0) \Rightarrow \boxed{x = 0,1\,ημ(5t + \frac{3\pi}{2})}\ SI$

Δ4| $\frac{\Sigma F}{F_{ελ}} = \frac{-D \cdot x}{K \cdot \Delta l} \xrightarrow{t=0} \frac{\Sigma F}{F_{ελ}} = \frac{-D \cdot (-A)}{K \cdot \Delta l} = \frac{+0,1}{0,5} \Rightarrow \boxed{\frac{\Sigma F}{F_{ελ}} = \frac{1}{5}}$

Δ5| $\frac{\Delta U}{\Delta t} = a \Rightarrow \frac{\Delta U}{\Delta t} = +a_{max} = \omega^2 \cdot A \Rightarrow \frac{\Delta U}{\Delta t} = 25 \cdot \frac{1}{10} \Rightarrow \boxed{\frac{\Delta U}{\Delta t} = +9,5\ m/s^2}$

$\frac{\Delta p}{\Delta t} = \Sigma F = -D \cdot x \Rightarrow \frac{\Delta p}{\Delta t} = -195 \cdot (-\frac{1}{10}) \Rightarrow \boxed{\frac{\Delta p}{\Delta t} = 19,5\ \frac{kg \cdot m}{s^2}}$

Δ6| Όταν $\Delta l = 0,45\,m$ τότε το $x = -0,05\,m$ & $U > 0$ 1η φορά από Α.Δ.Ε.Ι: $E = K + U \Rightarrow U = \pm\omega\sqrt{A^2 - x^2} \Rightarrow \boxed{U = +\frac{\sqrt{3}}{4}\ m/s}$

$\frac{\Delta K}{\Delta t} = -D \cdot x \cdot U \Rightarrow \frac{\Delta K}{\Delta t} = -195 \cdot (-\frac{1}{20}) \cdot \frac{\sqrt{3}}{4} \Rightarrow \boxed{\frac{\Delta K}{\Delta t} = \frac{25\sqrt{3}}{16}\ J/s}$