

81) α) $T = 2\pi\sqrt{LC} \Rightarrow C = 2 \cdot 10^{-5} \text{ F}$ β) $E = \frac{1}{2}LI^2 \Rightarrow I = 0,15 \text{ A}$

γ) $U_E = 3U_B \Rightarrow E - U_B = 3U_B \Rightarrow 4U_B = E \Rightarrow 4 \cdot \frac{1}{2}Li^2 = \frac{1}{2}LI^2 \Rightarrow i = \pm \frac{I}{2} \Rightarrow$
 $(i \Rightarrow \text{φ}_{\text{π/2}}) i = -\frac{I}{2} \Rightarrow i = -0,075 \text{ A}$

δ) $w = \frac{2\pi}{T} \Rightarrow w = 2500 \text{ rad/s}$ $i = -\frac{I}{2} \Rightarrow -I \sin wt_1 = -\frac{I}{2} \Rightarrow t_1 = \frac{\pi}{15000} \text{ s}$

82) α) $T = 2\pi\sqrt{LC} \Rightarrow T = 2\pi \cdot 10^{-3} \text{ s}$ β) $w = \frac{2\pi}{T} \Rightarrow w = 10^3 \text{ rad/s}$

$I = Q \cdot w \Rightarrow I = 5 \cdot 10^{-4} \text{ A}$

β) $\frac{1}{2}Li^2 + \frac{1}{2}\frac{q^2}{C} = \frac{1}{2}LI^2 \Rightarrow i^2 = I^2 - \frac{q^2}{LC} \Rightarrow i = \pm 4 \cdot 10^{-4} \text{ A}$

83) Ελαστική κρούση

84) α) ΑΔΟ: $mV_1 = mV_2 + M \cdot V \Rightarrow V = 1 \text{ m/s}$

β) $w = \sqrt{\frac{k}{M}} \Rightarrow w = 100 \text{ rad/s}$ $V = V_{\text{max}} \Rightarrow wA = V \Rightarrow A = 0,01 \text{ m}$

γ) $T = 2\pi\sqrt{\frac{M}{k}} \Rightarrow T = 2\pi \cdot 10^{-2} \text{ s}$ δ) $|\Delta E| = E_{\text{αρχ}} - E_{\text{τελ}} = \frac{1}{2}mV_1^2 - (\frac{1}{2}mV_2^2 + \frac{1}{2}MV^2) \Rightarrow$

$\Rightarrow |\Delta E| = \frac{1}{2}mV_1^2 - \frac{1}{2}m(\frac{V_1}{2})^2 - \frac{1}{2}MV^2 \Rightarrow |\Delta E| = 7,45 \text{ Joule}$

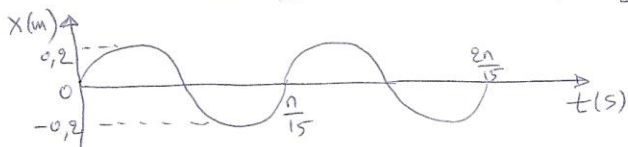
85) α) $T = 2\pi\sqrt{LC} \Rightarrow L = 10^{-3} \text{ H}$ β) $E = \frac{1}{2}LI^2 \Rightarrow I = 0,3 \text{ A}$

γ) $w = \frac{2\pi}{T} \Rightarrow w = 2500 \text{ rad/s}$ άρα $I = Q \cdot w \Rightarrow Q = 12 \cdot 10^{-5} \text{ C}$

δ) $U_B = 3U_E \Rightarrow E - U_E = 3U_E \Rightarrow 4U_E = E \Rightarrow 4 \cdot \frac{1}{2}\frac{q^2}{C} = \frac{1}{2}\frac{Q^2}{C} \Rightarrow q = \pm \frac{Q}{2} \Rightarrow q = 6 \cdot 10^{-5} \text{ C}$

86) α) $w = \frac{2\pi}{T} \Rightarrow w = 30 \text{ rad/s}$ $V = V_{\text{max}} \Rightarrow wA = V \Rightarrow A = 0,2 \text{ m}$

β) $T = 2\pi\sqrt{\frac{m}{k}} \Rightarrow m = 1 \text{ kg}$ γ) $x = A \sin wt \Rightarrow x = 0,2 \sin 30t \text{ (SI)}$



δ) $K = 3U \Rightarrow E - U = 3U \Rightarrow 4U = E \Rightarrow 4 \cdot \frac{1}{2}kx^2 = \frac{1}{2}kA^2 \Rightarrow x = \pm \frac{A}{2} \Rightarrow$

$\Rightarrow x = \pm 0,1 \text{ m}$

87) Ελαστική κρούση

88) a) $T = 2\pi \sqrt{\frac{M}{k}} \Rightarrow T = 0,4 \text{ s}$ $t = \frac{T}{4} \Rightarrow t = 0,1 \text{ s}$
 $h = \frac{1}{2} g t^2 \Rightarrow h = 0,5 \text{ m}$

b) $v_2 = g t \Rightarrow v_2 = \pi \text{ m/s}$ $\omega = \frac{2\pi}{T} \Rightarrow \omega = 5 \text{ rad/s}$ $v_{\text{max}} = \omega A \Rightarrow v_{\text{max}} = 0,25\pi \text{ m/s}$

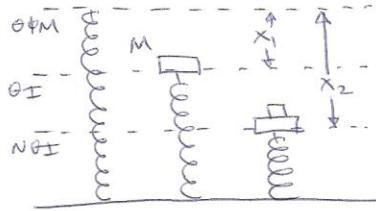
AD0: $M v_2 - M v_{\text{max}} = (m+M) v_k \Rightarrow v_k = 0$

o) θI : $\Sigma F = 0 \Rightarrow k x_1 = M g \Rightarrow x_1 = 0,4 \text{ m}$

$N \theta I$: $\Sigma F = 0 \Rightarrow k x_2 = (M+m) g \Rightarrow x_2 = 0,5 \text{ m}$

$A' = x_2 - x_1 \Rightarrow A' = 0,1 \text{ m}$

o) $F_{\text{el(max)}} = k(x_2 + A') \Rightarrow F_{\text{el(max)}} = 60 \text{ N}$



89) a) $t = \frac{T}{2} \Rightarrow T = 1 \text{ s}$ $\omega = \frac{2\pi}{T} \Rightarrow \omega = 2\pi \text{ rad/s}$ $v_{\text{max}} = \omega A \Rightarrow A = 0,2 \text{ m}$

b) $A' = A$ $v_{\text{max}} = \omega' A' = \omega' A \Rightarrow v_{\text{max}} = 0,5\pi \text{ m/s}$

o) $T' = \frac{2\pi}{\omega'} \Rightarrow T' = 0,8 \text{ s}$ $\frac{T'}{T} = \frac{2\pi \sqrt{\frac{m_1}{k}}}{2\pi \sqrt{\frac{m_1+m_2}{k}}} \Rightarrow \frac{T'}{T} = \sqrt{\frac{m_1}{m_1+m_2}} \Rightarrow m_2 = 0,81 \text{ kg}$

b) $T = 2\pi \sqrt{\frac{m_1+m_2}{k}} \Rightarrow k = 90 \text{ N/m}$

90) a) $E = \frac{1}{2} k A^2 \Rightarrow k = 1200 \text{ N/m}$ $m_1 = \frac{k}{\omega^2} \Rightarrow m_1 = 12 \text{ kg}$ $m_2 = \frac{m_1}{2} = 6 \text{ kg}$

b) $E' = \frac{1}{2} k A'^2 \Rightarrow E' = 36 \text{ Joule}$ $\omega' = \sqrt{\frac{k}{m_1+m_2}} \Rightarrow \omega' = \frac{10\sqrt{6}}{3} \text{ rad/s}$

fix $t = \pi/10 \text{ s}$: $x = 0,1 \text{ m}$ and $v = -0,1 \text{ m/s}$ and $v = 0$

o) AD0T

$k + v = E \Rightarrow \frac{1}{2} (m_1+m_2) v_k^2 + \frac{1}{2} k A'^2 = \frac{1}{2} k A^2 \Rightarrow v_k = \sqrt{\frac{10}{3}} \text{ m/s}$

AD0: $m_2 v_2 = (m_1+m_2) v_k \Rightarrow v_2 = \sqrt{30} \text{ m/s}$

91) a) $T = 2\pi \sqrt{LC} \Rightarrow L = \frac{T^2}{4\pi^2 C} \Rightarrow L = 0,4 \text{ H}$ b) $t = \frac{T}{4} \Rightarrow t = \pi \cdot 10^{-3} \text{ s}$

o) $\omega = \frac{2\pi}{T} \Rightarrow \omega = 500 \text{ rad/s}$ $I = q \omega \Rightarrow q = 4 \cdot 10^{-6} \text{ C}$

$C = \frac{q}{V_{C(\text{max})}} \Rightarrow V_{C(\text{max})} = \frac{q}{C} \Rightarrow V_{C(\text{max})} = 0,4 \text{ V}$

o) $V_E = 3V_B \Rightarrow E - V_B = 3V_B \Rightarrow 4V_B = E \Rightarrow 4 \cdot \frac{1}{2} L i^2 = \frac{1}{2} L I^2 \Rightarrow$

$\Rightarrow i = \pm \frac{I}{2} \Rightarrow i = \pm 10^{-3} \text{ A}$