ANDRE LOPES FONTANA – 1713007 – POLO ATIBAIA

FÍSICA II

1) $x(t) = 6 * 10^{-2} cos(9{,}42t + 1{,}04)m$

a) Amplitude = $6 * 10^{-2} = 0{,}06m$

b) $9{,}42\ rad/s$

c) $T = \frac{1}{f} = \frac{1}{1{,}499} = 0{,}667s$

d) $f = \frac{\omega}{2\pi} = \frac{9{,}42}{2\pi} \cong 1{,}499Hz$

e) $1{,}04\ rad$

f) $x(0) = 0{,}06 * \cos(9{,}42 * 0 + 1{,}04)\ m$

$x(0) = 0{,}06 * \cos(1{,}04) = 0{,}06 * 0{,}506 = \mathbf{0{,}0304m}$

$v(0) = -9{,}42 * 0{,}06 * sen(9{,}42 * 0 + 1{,}04)$

$v(0) = -0{,}5652 * sen(1{,}04) = -0{,}5652 * 0{,}8624 = \mathbf{-0{,}4874m/s}$

$a(0) = -9{,}42^2 * 0{,}0304 = \mathbf{-2{,}69m/s^2}$

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2) a)

$\omega = \frac{2\pi}{2} = \pi\ rad/s$ $\qquad$ $\omega = \frac{2\pi}{T} = \frac{2\pi}{3} = 2{,}0943\ rad/s$

$k = \omega^2 * m = m\pi^2$ $\qquad$ $k = (m + 2)2{,}0943^2$

$9{,}8696m \cong 4{,}38649m + 8{,}77298$

$5{,}4831m \cong 8{,}77298 \rightarrow m \cong \frac{8{,}77298}{5{,}4831} \cong \mathbf{1{,}6kg}$

b) $\omega^2 = \frac{k}{1{,}6} \rightarrow \pi^2 = \frac{k}{1{,}6} \rightarrow k = \pi^2 * 1{,}6 \cong \mathbf{15{,}79N/m}$

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3) a) $E_{pe} = \frac{kx^2}{2} \rightarrow 0{,}4 = k * \frac{0{,}1^2}{2} \rightarrow k = \frac{0{,}4}{0{,}005} = \mathbf{80N/m}$

b) $\omega^2 = \frac{k}{m} \rightarrow \omega = \sqrt{\frac{80}{0{,}1}} = \mathbf{28{,}284\ rad/s}$

c) 400j – Se a energia potencial máxima é 400, a energia total, desprezado o atrito é 400.

4) a) $\gamma = \frac{b}{2m} = \frac{1,6}{2*0,1} = \frac{1,6}{0,2} = 8\ s^{-1}$ $\omega_0 = \sqrt{\frac{k}{m}} = \sqrt{\frac{10}{0,1}} = 10\ rad/s$

$\gamma < \omega_0$ – Subcrítica

b) $x(t) = Ae^{-\gamma t}\cos(\omega + \varphi_0)$ $\omega = \sqrt{{\omega_0}^2 - \gamma^2} = \sqrt{100 - 64} = 6\ rad/s$

$0,200 = A * cos(\varphi_0)$ $\varphi_0 = arctg\left(-\frac{\gamma}{\omega}\right) \cong -0,674\ rad$

$\frac{0,2}{\cos(-0,674)} = A \cong 0,256\ m$

$\boldsymbol{x(t) = 0,256\ e^{-8t}\cos(6 - 0,674)\ m}$

c) $A_n = A_0 e^{-n\gamma T}$ $T = \frac{2\pi}{6} \cong 1,047s$ $E_n = E_0 e^{-2n\gamma T}$

$$A_5 = 0,256e^{-5*8*1,047} = 0,256 * e^{-41,88} \cong 0$$

$$E_0 = \frac{1}{2} * 10 * 0,2^2 = 0,2j \qquad E_5 = 0,2e^{-2*41,88} \cong 0$$