

Gabarito: Lista 01

1: (a) $x(t) = (0,05 \text{ m}) \cos(0,63 \text{ rad/s} \cdot t)$

(b) $k = 0,04 \text{ N/m}$

(c) $U = (5 \cdot 10^{-5} \text{ J}) \cos^2(0,63 \text{ rad/s} \cdot t)$ e $K = (5 \cdot 10^{-5} \text{ J}) \sin^2(0,63 \text{ rad/s} \cdot t)$

(d) f não é alterado; $E' = 4E$ e $v' = 2v$

2: (a) $\omega = 9,77 \text{ rad/s}$; $f = 1,56 \text{ Hz}$; $T = 0,64 \text{ s}$

(b) $A = 0,11 \text{ m}$

(c) $|v_{\max}| = 1,08 \text{ m/s}$ em $x = 0$

(d) $|a_{\max}| = 10,5 \text{ m/s}^2$

(e) $\phi = 0$

(f) $x(t) = (0,11 \text{ m}) \cos(9,8 \text{ rad/s} \cdot t)$; $v(t) = -(1,08 \text{ m/s}) \sin(9,8 \text{ rad/s} \cdot t)$; $a(t) = -(10,5 \text{ m/s}^2) \sin(9,8 \text{ rad/s} \cdot t)$

3: (a) Sim, em $[\pi/2, \pi]$ e $[3\pi/2, 2\pi]$

(b) Sim, em $[0, \pi/2]$ e $[\pi, 3\pi/2]$

(c) Não

5: (a) $y = (mg/k) + L_0$

(b) $A = -mg/k$

6: (a) $k = 245 \text{ N/m}$

(b) $T = 0,28 \text{ s}$

7: (b) $\frac{d^2x}{dt^2} + \frac{(k_1 + k_2)}{m} x = 0$

(c) $\omega = \sqrt{\frac{(k_1 + k_2)}{m}}$

8: $f = \frac{1}{2\pi} \sqrt{\frac{2k}{m}}$

9: (a) $W' = \sqrt{2} W_0$

(b) $v'_{\max} = \sqrt{2} v_{0,\max}$

(c) $U'_{\max} = 2 U_{0,\max}$

10: (a) $E = \frac{k A^2}{2}$

(b) $v = \sqrt{\frac{3kA^2}{4m_1}}$

(c) $t = \frac{\pi}{2} \sqrt{\frac{4m_1}{3k}}$

(d) diminuir

(e) $E = U = \frac{3kA^2}{8}$

$$(f) \Delta x = \left(\frac{v \pi}{2} \sqrt{\frac{m_1}{k}} \right) - A$$

11: $\ddot{x} + 9x = 0$ cuja solução é $x(t) = (0,2m) \cos(3 \text{ rad/s} \cdot t)$

12: $T = 0,50 \text{ s}$; $f = 2,00 \text{ Hz}$, $A = 0,18m$

14: (a) $k = 50 \text{ N/m}$

(b) $F = -2,0 \text{ N}$

(c) $T = 0,28 \text{ s}$

(d) $x = 0,04 \text{ m}$

(e) $\ddot{x} + 500x = 0$ cuja solução é $x(t)$ dado por $x(t) = (0,04 \text{ m}) \cos(22,4 \text{ rad/s} \cdot t)$

15: (a) $k = 1,29 \cdot 10^5 \text{ N/m}$

(b) $f = 2,68 \text{ Hz}$

16: $A = 0,22 \text{ m}$

17: $\theta = 2\pi / 3$

18: (a) $v_f = \frac{m}{(m+M)} v$

(b) $A = \frac{v m}{\sqrt{k(m+M)}}$

19: (a) $x = 3 \text{ m}$

(b) $v = (-15,6 \pi) \text{ m/s}$

(c) $a = (-27 \pi^2) \text{ m/s}^2$

(d) $\varphi = (19 \pi/3)$

(e) $f = (3/2) \text{ Hz}$

(f) $T = (2/3) \text{ s}$

(g) $E = (162 \pi^2 \cdot m) \text{ J}$

(h) $t = (\frac{n}{3} + \frac{1}{18})s$; $n = 0, 1, \dots, 5$

(i) $t = (\frac{n}{3} - \frac{1}{9})s$; $n = 1, 2, \dots, 6$

(j) igual ao item (h)

20: (a) A e $T = 2\pi \sqrt{\frac{m_0}{k}}$

(b) $V = \sqrt{\frac{k}{m_0}} A$

(e) $m_1 = m_0 / 4$

(f) $v' = 2v$ e $K' = K$

21: $g = 9,77 \text{ m/s}^2$

23: $\frac{d^2\theta}{dt^2} + \sqrt{\frac{mgd}{I}} \theta = 0$

24: (a) $F_{\text{res}} = \frac{-2T}{L} x$

(b) $\frac{d^2x}{dt^2} + \frac{2T}{Lm} x = 0$

(c) $T = \pi \sqrt{\frac{2Lm}{T}}$

25: (a) sim

(b) $\gamma' = 6 \text{ s}^{-1}$, subamortecido (subcrítico) pois $\gamma' < \gamma_c = 10 \text{ s}^{-1}$

26: (a) $\gamma = (0,012 \text{ s}^{-1})$

(b) 1/16

27: (a) $A' = \frac{2F}{m} \frac{1}{\gamma w_0} = 2A$

(b) $A' = \frac{F}{2m} \frac{1}{\gamma w_0} = A/2$

(c) $A' = \frac{F}{m} \frac{1}{\sqrt{9w_0^4 + \gamma^2 w_0^2}} = \frac{A}{\sqrt{\frac{9w_0^2}{\gamma^2} + 1}}$

28: (a) $\gamma' = \frac{8}{5} w_0$, subamortecido (subcrítico), pois $\gamma' < \gamma_c = 2 \omega_0$

(b) $\gamma_{SC} > 2 w_0$, $\gamma_c = 2 w_0$

29: (a) $m \sim 100 \text{ g}$

30: (a) $f = 1,01 \text{ Hz}$

(b) $f = 2,01 \text{ Hz}$

(c) $f = 0,35 \text{ Hz}$

31: (a) $z(t) = \left(\frac{w_0^2 A}{w_0^2 - w^2} \right) (\sin(wt) - \frac{w}{w_0} \sin(w_0 t))$

(b) $F(t) = mg + k [z - A \sin(wt)]$

32: (a) $A = 0,05 \text{ m}$

(b) $w = 14,10 \text{ rad/s}$

(c) $A = 0,35 \text{ m}$

(d) $\Delta w = 1,00 \text{ rad/s}$ (Errata: considere $b = 2,00 \text{ kg/s}$)