PGF 5005 - Mecânica Clássica

Prof. Iberê L. Caldas

Respostas - Segunda Lista de Exercícios

1.

(b)

$$\begin{aligned}\theta_1(t) &= \alpha_1 + (1 - 2\beta_1 - 3\beta_2)t,\\ I_1(t) &= \beta_1\\ ,\theta_2(t) &= \alpha_2 + (1 - 3\beta_1 + 2\beta_2)t,\\ I_2(t) &= \beta_2.\end{aligned}$$

2.

(a)

$$\begin{aligned}I_1 &= F_1 - \frac{\alpha m F_1 F_2}{m\omega_1 - n\omega_2}\cos(m\phi_1 - n\phi_2) + \mathcal{O}(\alpha^2),\\ \theta_1 &= \phi_1 + \frac{\alpha F_2}{m\omega_1 - n\omega_2}\sin(m\phi_1 - n\phi_2) + \mathcal{O}(\alpha^2),\\ I_2 &= F_2 + \frac{\alpha n F_1 F_2}{m\omega_1 - n\omega_2}\cos(m\phi_1 - n\phi_2) + \mathcal{O}(\alpha^2),\\ \theta_2 &= \phi_2 + \frac{\alpha F_1}{m\omega_1 - n\omega_2}\sin(m\phi_1 - n\phi_2) + \mathcal{O}(\alpha^2).\end{aligned}$$

(b)

$$h_0(F_1, F_2) = F_1 + F_2 - F_1^2 + F_2^2 - 3F_1F_2$$

(d)

$$\nu_1 = 1 - 2F_1 - 3F_2, \qquad \nu_2 = 1 + 2F_2 - 3F_1$$

(e) Correção:

$$\bar{\omega_i} = \frac{1}{\tau}\int_0^\tau \frac{\partial H}{\partial I_i}dt$$

$\bar{\omega_1} = \omega_1$, $\bar{\omega_2} = \omega_2$.

(f)

$$\begin{aligned}F_1(t) &= F_1(t=0), \qquad \phi_1(t) = \phi_1(0) + \nu_1 t,\\ F_2(t) &= F_2(t=0), \qquad \phi_2(t) = \phi_2(0) + \nu_2 t.\end{aligned}$$

(g)

$$\begin{aligned}I_1 &= F_1(0) + \frac{\alpha m F_1(0)F_2(0)}{m\omega_1 - n\omega_2}\cos[\phi_0 - (n\nu_2 - m\nu_1)],\\ \theta_1 &= \phi_1(0) + \frac{\alpha F_2(0)}{m\omega_1 - n\omega_2}\sin[\phi_0 - (n\nu_2 - m\nu_1)],\\ I_2 &= F_2(0) - \frac{\alpha n F_1(0)F_2(0)}{m\omega_1 - n\omega_2}\cos[\phi_0 - (n\nu_2 - m\nu_1)],\\ \theta_2 &= \phi_2(0) + \frac{\alpha F_1(0)}{m\omega_1 - n\omega_2}\sin[\phi_0 - (n\nu_2 - m\nu_1)].\end{aligned}$$

$$\phi_0 = m\phi_1(0) - n\phi_2(0)$$

4.

(a) $\omega = I$

(c) $I = 1/2$

(d) $\Delta_a = 4\sqrt{a}$

(e) $\Delta_b = 4\sqrt{b}$

(g) $4\sqrt{a} + 4\sqrt{b} \gtrsim 1$

5.

(a) $J(t) = \beta, \quad \phi(t) = \alpha + \dfrac{3\beta^2}{8}t.$

(b) $\omega_0 = \dfrac{3\beta^2}{8}.$

(c) $\beta_r \approx 2.$

6.

(d) $I = \pm\sqrt{\dfrac{2\epsilon\beta_r}{3}(1 - \cos\theta)}$

(e) $\delta = \sqrt{\dfrac{\epsilon\beta_r}{3}}$

7.

(a)

$$\theta = 2\phi - 3t, \quad J = 2I.$$

(b)

$$I(t) = \frac{\beta}{} \qquad —$$