177. Stabpendel mit Kugeln

$$L = 0.3 \text{ m}; \qquad r_1 = 0.02 \text{ m}; \qquad r_2 = 0.03 \text{ m}$$
$$m_0 = 0.1 \text{ kg}; \qquad m_1 = 0.1 \text{ kg}; \qquad m_2 = 0.3 \text{ kg}$$

a) $I_{ges} = I_{Stab} + I_{Kugel_1} + I_{Kugel_2}$

$I_{Stab} = \frac{1}{12} m_0 L^2 = 7.5 * 10^{-4} \text{ kg m}^2$

$I_{Kugel_1} = \frac{2}{5} m_1 r_1^2 + m_1 (\frac{L}{2} + r_1)^2 = 2.9 * 10^{-3} \text{ kg m}^2$

$I_{Kugel_2} = \frac{2}{5} m_2 r_2^2 + m_2 (\frac{L}{2} + r_2)^2 = 9.8 * 10^{-3} \text{ kg m}^2$

$\Rightarrow I_{ges} = \underline{\underline{1.3 * 10^{-2} \text{ kg m}^2}}$

b)

$x_{Stab_{sp}} = 0 \text{ m}$

$x_{Kugeln_{sp}} = \frac{m_1 \left(-\frac{2r_1 + L}{2}\right) + m_2 \left(\frac{2r_2 + L}{2}\right)}{m_1 + m_2} = 0.0925 \text{ m}$

$x_{sp} = \frac{x_{Stab_{sp}} * m_0 + x_{Kugeln_{sp}} * (m_1 + m_2)}{m_0 + m_1 + m_2} = \underline{\underline{0.074}} \text{ m}$

c) $T = 2\pi \sqrt{\frac{I}{Mgl}}$

$T = 2\pi \sqrt{\frac{I}{(m_0 + m_1 + m_2)\, g \left(\frac{2r_2 + L}{2}\right)}}$

$= \underline{\underline{0.69 \text{ s}}}$

184. Resonanzverhalten einer Stimmgabel

185. Resonante Anregung eines Federpendels

$m = 0.1 \text{ kg}; \quad k = 40 \text{ N/m}$

a) $\omega = \sqrt{\frac{k}{m}} = 20 \text{ rad/s}; \quad \omega_0 = \sqrt{\frac{k}{m} - \frac{\beta^2}{4m^2}}$

$\frac{x_m}{2} = x_m * e^{-\beta t / 2m}$

$\beta = -\frac{\ln(0.5) 2m}{t} = \underline{\underline{1.4 * 10^{-2} \text{ kg/s}}}$

$\omega_0 = \sqrt{\frac{k}{m} - \frac{\beta^2}{4m^2}} = \underline{\underline{19.99988 \text{ rad/s}}}$

b)

$Q = \omega_0 \frac{m}{\beta} = \underline{\underline{144.269}}$