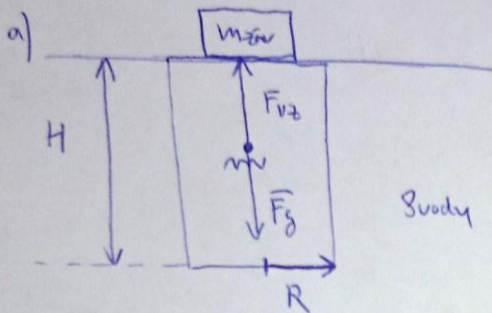


- ① $R = 20 \text{ cm} = 0,2 \text{ m}$
 $H = 1 \text{ m}$
 $m = 55 \text{ kg}$
 $\rho_{\text{vody}} = 1025 \text{ kg m}^{-3}$
 a) $m_{\text{zav}} = ? \text{ [kg]}$
 b) $T = ? \text{ [s]}$



$$|\vec{F}_g| = |\vec{F}_{vz}|$$

$$(m_{\text{zav}} + m)g = m'g \quad m' = \text{hmotnosť vytlačenej vody}$$

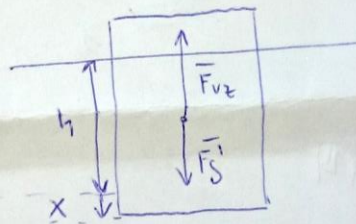
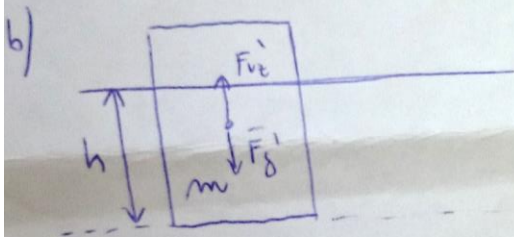
$$(m_{\text{zav}} + m)g = V \rho_{\text{vody}} g$$

$$(m_{\text{zav}} + m)g = \pi R^2 H \rho_{\text{vody}} g$$

$$m_{\text{zav}} = \pi R^2 H \rho_{\text{vody}} - m$$

$$m_{\text{zav}} = \pi (0,2)^2 \cdot 1 \cdot 1025 - 55 = 73,87 \text{ kg} \quad 15$$

Rovnovážna poloha



$$|\vec{F}'_g| = |\vec{F}'_{vz}|$$

$$m'g = \pi R^2 h \rho_{\text{vody}} g$$

$$h = \frac{m}{\pi R^2 \rho_{\text{vody}}} \quad 15$$

$$\vec{F} = \vec{F}_{vz} + \vec{F}'_g$$

$$|\vec{F}| = |\vec{F}_{vz}| - |\vec{F}'_g|$$

$$|\vec{F}| = \pi R^2 (h+x) \rho_{\text{vody}} g - m'g$$

$$|\vec{F}| = \pi R^2 h \rho_{\text{vody}} g + \pi R^2 x \rho_{\text{vody}} g - \pi R^2 h \rho_{\text{vody}} g$$

$$|\vec{F}| = \pi R^2 \rho_{\text{vody}} g x \quad 15$$

k

$$\omega_0 = \sqrt{\frac{k}{m}}$$

$$\frac{d\pi}{T_0} = \sqrt{\frac{k}{m}}$$

$$T_0 = 2\pi \sqrt{\frac{m}{k}}$$

$$T_0 = 2\pi \sqrt{\frac{m}{\pi R^2 \rho_{\text{vody}} g}}$$

$$T_0 = 2\pi \sqrt{\frac{55}{\pi (0,2)^2 \cdot 1025 \cdot 9,81}} = 1,37 \text{ s} \quad 15$$

45

2

$$b = 50 \text{ m}$$

$$y_{00} = 0,5 \text{ m}$$

$$y_{10} = 0,3 \text{ m}$$

$$t = 8 \text{ s} \dots \text{Dauer}$$

$$k = ?$$

$$y_{10} = y_{00} e^{-k(t+10T)} \cos[\omega_0(t+10T)] \quad 1b$$

$$y_{00} = y_{00} e^{-k t} \cos \omega_0 t$$

$$T = \frac{8}{10} = 0,8 \text{ s} \quad 1b$$

$$\frac{y_{00}}{y_{10}} = e^{k \cdot 10T} \Rightarrow 10kT = \ln \frac{y_{00}}{y_{10}}$$

$$k = \frac{1}{10T} \ln \frac{y_{00}}{y_{10}} \quad 1b$$

$$k = \frac{1}{10 \cdot 0,8} \ln \frac{0,5}{0,3} = \underline{\underline{0,028 \text{ s}^{-1}}}$$

3

$$r_1 = 48 \text{ mm}$$

$$r_2 = 50,4 \text{ mm}$$

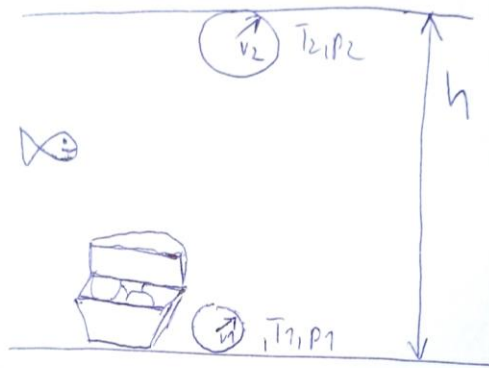
$$t_1 = 25^\circ \text{C}; T_1 = 298 \text{ K}$$

$$t_2 = ?^\circ \text{C}$$

$$h = 1,5 \text{ m}$$

$$b = 10^5 \text{ Pa}$$

$$g = 1025 \text{ kg m}^{-3}$$



$$\begin{aligned} p_1 v_1 &= n R T_1 \\ p_2 v_2 &= n R T_2 \end{aligned} \quad // \quad (1b)$$

$$\frac{p_1 v_1}{p_2 v_2} = \frac{T_1}{T_2}$$

$$T_2 = T_1 \frac{p_2 v_2}{p_1 v_1} = T_1 \frac{b \frac{4}{3} \pi r_2^3}{(b + h g g) \frac{4}{3} \pi r_1^3} = T_1 \frac{b}{(b + h g g)} \frac{r_2^3}{r_1^3} \quad (1b)$$

$$T_2 = 298 \frac{10^5}{(10^5 + 1,5 \cdot 1025 \cdot 9,81)} \left(\frac{0,0504}{0,048} \right)^3 = 299,76 \text{ K} \quad (1b)$$

$$t_2 = 26,76^\circ \text{C}$$

35