

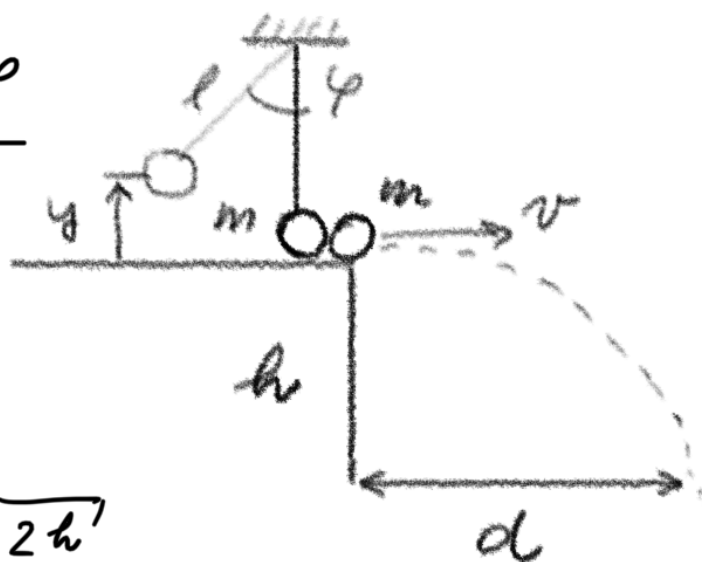
F1 LS 2023 Skūsts - 1. termiņu RIEŠENIA

1. $\frac{v, t,}{v_m, s, a}$

$$\begin{aligned} s &= vt \\ s &= \frac{1}{2} at^2 \Rightarrow vt = \frac{1}{2} at^2 \\ v_m &= at \qquad \qquad \underline{\underline{a = \frac{2v}{t}}} \end{aligned}$$

$$v_m = \frac{2v}{t} t = \underline{\underline{2v}}$$

2. $\frac{h, m_1 = m_2 = m, l, \varphi}{d, j}$



i) vodorovnājs urh

$$d = vt$$

$$0 = h - \frac{1}{2} gt^2 \Rightarrow t = \sqrt{\frac{2h}{g}}$$

$$d = v \sqrt{\frac{2h}{g}}$$

ii) priznā centrālā zražēka

$$\text{ZZME: } \frac{1}{2} m v_1^2 = \frac{1}{2} m v_1'^2 + \frac{1}{2} m v^2$$

$$\text{ZZH: } \underline{\underline{m v_1 = m v_1' + m v}}$$

$$v_1^2 = v_1'^2 + v^2$$

$$v_1 = v_1' + v$$

$$v_1^2 = v_1'^2 - 2v_1'v + v^2 + v^2$$

$$2v^2 = 2v_1'v$$

$$\underline{\underline{v = v_1'}}$$

iii) guľôčka na zavesení
 $mg y = \frac{1}{2} m v_1^2$

$$\frac{l-y}{l} = \cos \varphi$$

$$y = l(1 - \cos \varphi)$$

$$v_1 = \sqrt{2gy}$$

$$v_1 = \sqrt{2gl(1 - \cos \varphi)} = v$$

$$d = \sqrt{2gl(1 - \cos \varphi)} \sqrt{\frac{2h}{g}} = \underline{\underline{2 \sqrt{hl(1 - \cos \varphi)}}}$$

3. m, k, y_m

$$\omega; T; v_m; a_m; E$$

$$T = \frac{2\pi}{\omega} = \underline{\underline{2\pi \sqrt{\frac{m}{k}}}}$$

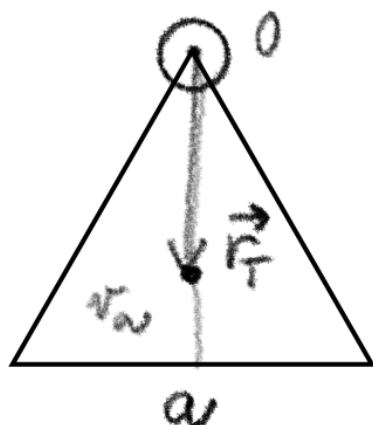
$$a_m = y_m \omega^2 = \underline{\underline{y_m \frac{k}{m}}}$$

$$\underline{\underline{\omega = \sqrt{\frac{k}{m}}}}$$

$$v_m = \omega y_m = \underline{\underline{y_m \sqrt{\frac{k}{m}}}}$$

$$E = \frac{1}{2} k y_m^2 = \underline{\underline{\frac{1}{2} y_m^2 \sqrt{\frac{k}{m}}}}$$

4. $m, a; J_T = \frac{1}{12} m l^2$
 $T;$



$$\omega = \sqrt{\frac{mgr}{J}}$$

$$T = 2\pi \sqrt{\frac{J}{mgr}}$$

$$i) r = r_T = \frac{2}{3} a$$

$$\text{alebo: } \vec{r}_T = \frac{m_1 \vec{r}_1 + m_2 \vec{r}_2 + m_3 \vec{r}_3}{3m_1}$$

$$\vec{r}_1 = -\frac{a}{2} \vec{i} + \frac{a}{2} \vec{j}$$

$$\vec{r}_2 = \frac{a}{2} \vec{i} + \frac{a}{2} \vec{j}$$

$$\vec{r}_3 = a \vec{j}$$

$$r_{Tx} = \frac{1}{3} \left(-\frac{a}{2} + \frac{a}{2} \right) = 0 \quad r_{Ty} = \frac{1}{3} \left(\frac{v_a}{2} + \frac{v_a}{2} + v_a \right) = \frac{2}{3} v_a$$

$$\vec{r}_T = \frac{2}{3} v_a \vec{j} \Rightarrow r_T = \frac{2}{3} v_a$$

$$v_a^2 + \frac{a^2}{4} = a^2 \Rightarrow v_a = \frac{\sqrt{3}}{2} a \Rightarrow r_T = \frac{\sqrt{3}}{3} a = r$$

$$ii) J = J_1 + J_2 + J_3 \quad m_1 = \frac{m}{3}$$

$$J_1 = J_2 = \frac{1}{12} m_1 a^2 + m_1 \frac{a^2}{4} = \frac{1}{3} m_1 a^2 = \frac{1}{9} m a^2$$

$$J_3 = \frac{1}{12} m_1 a^2 + m_1 v_a^2 = \frac{1}{12} m_1 a^2 + m_1 \frac{3}{4} a^2 = \frac{5}{6} m_1 a^2 = \frac{5}{18} m a^2$$

$$J = 2 \frac{1}{9} m a^2 + \frac{5}{18} m a^2 = \frac{1}{2} m a^2$$

$$T = 2\pi \sqrt{\frac{\frac{1}{2} m a^2}{m g \frac{\sqrt{3}}{3} a}} = 2\pi \sqrt{\frac{\sqrt{3} a}{2 g}}$$

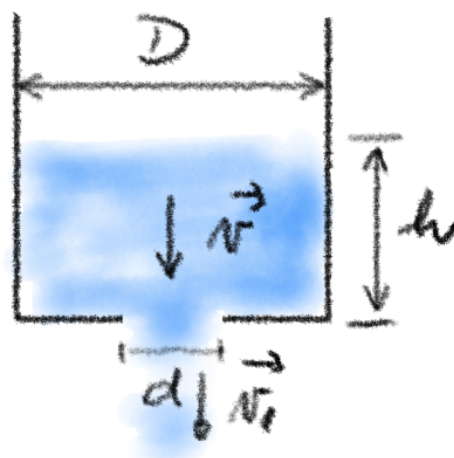
5. $\frac{d; D; h}{v(h);}$

rovnica spojitosti

$$v \cdot S = v_1 \cdot S_1$$

$$S = \pi \frac{D^2}{4} ; S_1 = \pi \frac{d^2}{4}$$

$$D^2 v = d^2 v_1 \Rightarrow v_1 = v \frac{D^2}{d^2}$$



Bernoulliho rovnice

$$\frac{1}{2} \rho v^2 + \rho g h = \frac{1}{2} \rho v_1^2$$

$$v^2 + 2gh = v_1^2 = v^2 \frac{D^4}{d^4}$$

$$v^2 \left(\frac{D^4}{d^4} - 1 \right) = 2gh$$

$$v = \sqrt{\frac{2gh}{\frac{D^4}{d^4} - 1}}$$

6. $\frac{l, F = \gamma x^2}{W}$

$$W = \int_0^l F dx =$$

$$= \int_0^l \gamma x^2 dx = \gamma \left[\frac{1}{3} x^3 \right]_0^l = \underline{\underline{\frac{1}{3} \gamma l^3}}$$