

F7 - Příklady na mechaniku

$m_1 = 0$
 $m_2 = 1 \text{ kg}$
 $v_1 = 36 \text{ km/h}$
 $v_2 = 400 \text{ m/s}$

$E_{k1} = \frac{1}{2} m_1 v_1^2 = \frac{1}{2} \cdot 36 \cdot 10^{-3} \cdot 160000 = 2880 \text{ J}$

$m_1 = 0,5 \text{ kg}$
 $m_2 = 9,6 \text{ m/s}$

$E_{k2} = \frac{1}{2} m_2 v_2^2 = \frac{1}{2} \cdot 0,5 \cdot 9,6^2 = 2880 \text{ J}$

$\frac{E_{k2}}{E_{k1}} = \frac{m_1}{m_1 + m_2}$

$1 - \frac{E_{k2}}{E_{k1}} = 1 - \frac{m_1}{m_1 + m_2} = \frac{m_1 + m_2 - m_1}{m_1 + m_2} = \frac{m_2}{m_1 + m_2}$

$\frac{\Delta U_k}{E_{k1}} = \frac{m_2}{m_1 + m_2} = \frac{1}{0,036 + 1} \rightarrow \Delta U_k = \frac{1}{0,036 + 1} \cdot E_{k1} = \frac{1}{0,036 + 1} \cdot 2880 \text{ J} \approx 2780 \text{ J}$

$\frac{\Delta U_k}{E_{k1}} = \frac{m_2}{m_1 + m_2} \rightarrow \Delta U_k = \frac{1}{0,036 + 1} \cdot E_{k1} = \frac{1}{0,036 + 1} \cdot 2880 \text{ J} \approx 45 \text{ J}$

$m_1 = 10 \text{ g} = 0,01 \text{ kg}$
 $m_2 = 4 \text{ g}$
 $h = 5 \text{ cm} = 0,05 \text{ m}$

$U: v_1 = ?$

Stav 1: před nárazem
 Stav 2: během nárazu
 Stav 3: po nárazu

$m_1 \cdot v_1 + m_2 \cdot v_2 = (m_1 + m_2) \cdot v_2$

$v_1 = \frac{m_1 + m_2}{m_1} v_2$

Z ZKE: $E_{k1} = E_{k2}$

$E_{k1} + E_{k2} = E_{k3} + E_{k4}$

$\frac{1}{2} (m_1 + m_2) v_2^2 + 0 = 0 + (m_1 + m_2) \cdot g \cdot h$

$\frac{1}{2} v_2^2 = g \cdot h$

$v_2 = \sqrt{2gh}$

$$v_0 = \frac{m_A + m_B}{m_A} \cdot \sqrt{v_{A1}^2 + v_{A2}^2}$$

$$v_0 = \frac{0,01 + 0,01}{0,01} \cdot \sqrt{2 \cdot 0,05^2} = 39,7 \text{ m/s}$$



$$\text{Z.H.: } \vec{F}_1 + \vec{F}_2 = 0$$

$$K_0 = K_{\text{fin}}$$

$$\vec{p}_1 = -\vec{p}_2$$

$$D: \quad m = 120 \text{ kg}$$

$$m_B = 0,030 \text{ kg}$$

$$v_0 = 400 \text{ m/s}$$

$$\alpha = 30^\circ$$

$$p_{2\parallel} = p_2 \cdot \cos \alpha$$

$$p_{2\perp} = p_2 \cdot \sin \alpha$$

$$p_{1\parallel} = p_1 \cdot \cos \alpha$$

$$p_{1\perp} = p_1 \cdot \sin \alpha$$

$$\begin{bmatrix} p_{1\parallel} \\ p_{1\perp} \end{bmatrix} = - \begin{bmatrix} p_{2\parallel} \\ p_{2\perp} \end{bmatrix}$$

$$p_{2\parallel} = -p_{1\parallel}$$

$$m \cdot v_{1\parallel} = -p_1 \cdot \cos \alpha$$

$$m \cdot v_{1\parallel} = -m_B \cdot v_0 \cdot \cos \alpha$$

$$v_{1\parallel} = -\frac{m_B}{m} \cdot v_0 \cdot \cos \alpha$$

$$v_{1\parallel} = -\frac{0,03}{120} \cdot 400 \cdot \cos 30^\circ$$

$$v_{1\parallel} = -\frac{120}{120} \cdot \cos 30^\circ = -\frac{\sqrt{3}}{2} \approx -0,866 \text{ m/s}$$

$$v_1 \approx 2780 \text{ m/s}$$

$$45 \text{ J}$$