AKADEMIA EDUKACYJNO - INŻYNIERSKA

www.e-MECHANiK.com.pl

MATURA STUDIA PRAKTYKA STAŻ PRACA BIZNES PRZEMYSŁ STEAM

KOMPLEKSOWE WSPARCIE EDUKACYJNE **ON – LINE** NA KAŻDYM ETAPIE KSZTAŁCENIA INŻYNIERSKIEGO

email: **kontakt@e-mechanik.com.pl**
web: **www.e-MECHANiK.com.pl**
fb: www.facebook.com/groups/emechanik
tel: **(+48) - 697-165-075**

MECHANIKA II

"DYNAMIKA PUNKTU MATERIALNEGO"

PROJEKT

Oblicz:

- siłę wiatru "W"

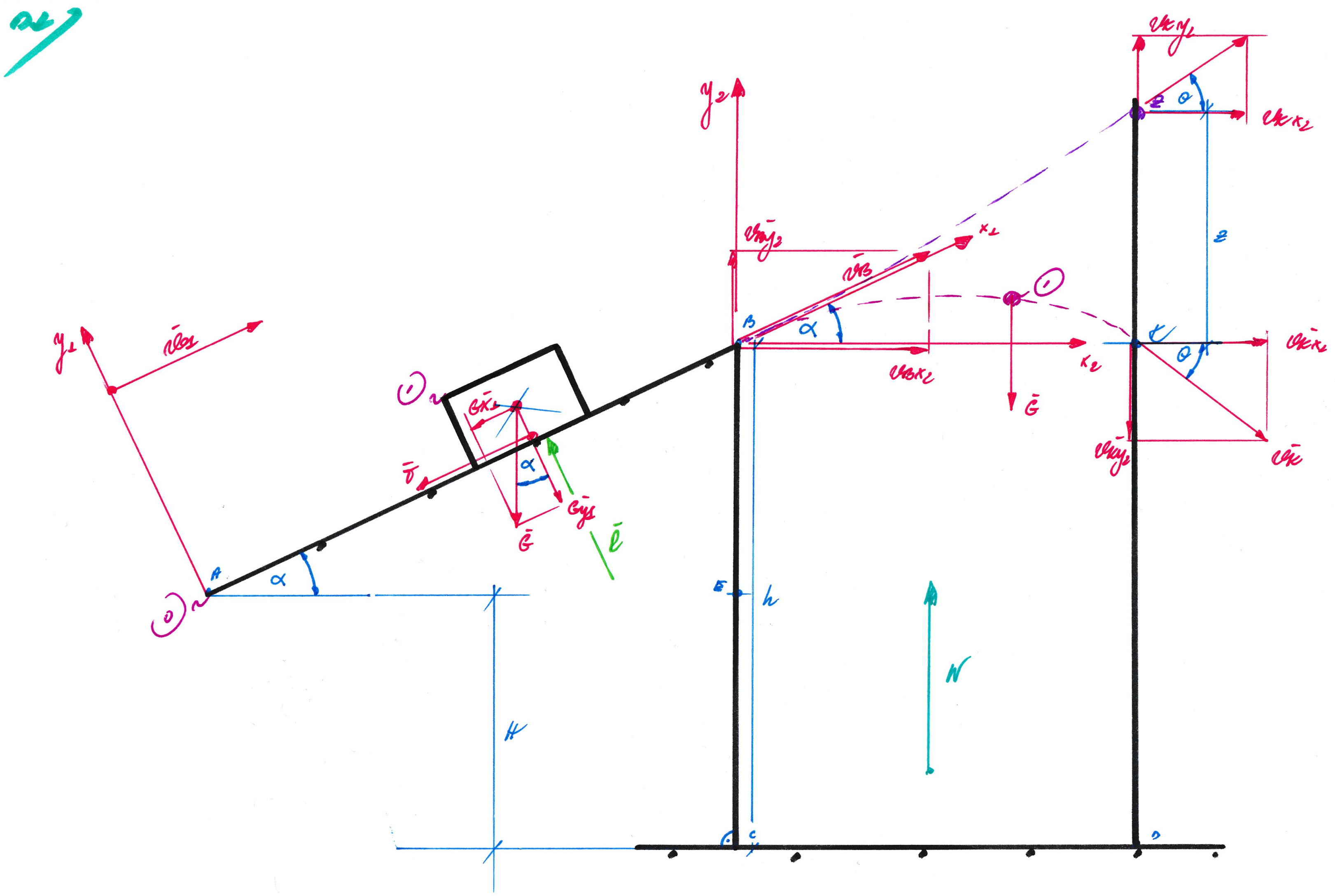
jaka musi działać na klocek, aby uderzył on w ścianę w punkcie "K" znajdującym się na wysokości punktu "B".

DANE:

$|AB|$, α, μ, m, F, $\tau_{AB} = OK$

SZUKAM:

$|BC|$, $y(x)$, V_A, V_C, Ek_C $T_{BC} = ?$



$$\bar{F} = m \cdot \bar{a}$$

XIII) $x_1(t), y_1(t)$:

I) $\sum F_{ix_1} = m\ddot{x}_1 = -G_{x_1} - T$

II) $\sum F_{iy_1} = m\ddot{y}_1 = R - G_{y_1}$

$\frac{G_{x_1}}{G} = \sin\alpha \Rightarrow G_{x_1} = mg\sin\alpha$

$\frac{G_{y_1}}{G} = \cos\alpha \Rightarrow G_{y_1} = mg\cos\alpha$

$\mu = \frac{F_T}{F_N}$

$\Rightarrow T = \mu \cdot R = \mu \cdot G_{y_1} = mg\mu\cos\alpha$

I) $m\ddot{x}_1 = -mg\sin\alpha - mg\mu\cos\alpha$

II) $m\ddot{y}_1 = R - mg\cos\alpha$

II) $m\ddot{y}_1 = R - mg\cos\alpha$ ($\ddot{y}_1 = 0$)

$\Rightarrow R = mg\cos\alpha$

I) $m\ddot{x}_1 = -mg\sin\alpha - mg\mu\cos\alpha \quad /:m$

$\ddot{x}_1(t) = -g(\sin\alpha + \mu\cos\alpha) = A$

I) $\ddot{x}_1(t) = A$

II) $\dot{x}_1(t) = At + C_1$

III) $x_1(t) = \frac{1}{2}At^2 + C_1 t + C_2$

II) $\dot{x}_1(t=0) = v_{01}$

III) $x_1(t=0) = s_{01}$

II) $v_{01} = A(0) + C_1$

III) $s_{01} = \frac{1}{2}A(0)^2 + C_1(0) + C_2$

II) $C_1 = v_{01}$

III) $C_2 = s_{01}$

I) $\ddot{x}_1(t) = A$

II) $\dot{x}_1(t) = At + v_{01}$

III) $x_1(t) = \frac{1}{2}At^2 + v_{01}t + s_{01}$ ($s_{01} = 0$)

$\tilde{t}$ - na $|AB|$

II) $\dot{x}_1(t=\tilde{t}) = v_B$

III) $x_1(t=\tilde{t}) = s_B$

II) $v_B = A\tilde{t} + v_{01}$

III) $s_B = \frac{1}{2}A\tilde{t}^2 + v_{01}\tilde{t}$ ($s_B = |AB|$)

II) $v_B = A\tilde{t} + v_{01}$ (??)

III) $|AB| = \frac{1}{2}A\tilde{t}^2 + v_{01}\tilde{t}$

$$\begin{cases} v_B = A\tau + v_{01} \\ |AB| = \frac{1}{2}A\tau^2 + v_{01}\tau \end{cases}$$ (2?)

$$A = -g(\sin\alpha + \mu\cos\alpha)$$

$$\frac{|BE|}{|AB|} = \sin\alpha \rightarrow |AB| = \frac{|BE|}{\sin\alpha} = \frac{h - H}{\sin\alpha}$$

$x_2 y_2$

$x_2(t); y_2(t)$

$$\begin{cases} \sum F_{ix_2} = m\ddot{x}_2 = 0 \\ \sum F_{iy_2} = m\ddot{y}_2 = N - G \end{cases}$$

1) $m\ddot{x}_2 = 0 \quad /:m$

$$\begin{cases} \ddot{x}_2(t) = 0 \\ \dot{x}_2(t) = C_3 \\ x_2(t) = C_3 t + C_4 \end{cases}$$

$$\begin{cases} \dot{x}_2(t=0) = v_{Bx_2} \\ x_2(t=0) = x_{B2} \end{cases}$$

$$\begin{cases} v_{Bx_2} = C_3 \\ x_{B2} = C_3(0) + C_4 \end{cases}$$

$$\begin{cases} C_3 = v_{Bx_2} \\ C_4 = x_{B2} \end{cases}$$

$$\begin{cases} \ddot{x}_2(t) = 0 \\ \dot{x}_2(t) = v_{Bx_2} \\ x_2(t) = v_{Bx_2} t + x_{B2} \ (= 0) \end{cases}$$

$$\begin{cases} \ddot{x}_2(t) = 0 \\ \dot{x}_2(t) = v_B\cos\alpha \\ x_2(t) = v_B t\cos\alpha \end{cases}$$

τ – czas lotu

$$\begin{cases} \dot{x}_2(t=\tau) = v_{Cx_2} \\ x_2(t=\tau) = |CD| \end{cases}$$

$$\begin{cases} v_{Cx_2} = v_B\cos\alpha \\ |CD| = v_B\tau\cos\alpha \end{cases}$$ (2?)

$$\frac{v_{Bx_2}}{v_B} = \cos\alpha \rightarrow v_{Bx_2} = v_B\cos\alpha$$

$$\frac{v_{By_2}}{v_B} = \sin\alpha \rightarrow v_{By_2} = v_B\sin\alpha$$

II) $m\ddot{y}_2 = N - mg \quad |:m$

$$\ddot{y}_2(t) = \frac{N}{m} - g = B$$

I) $\ddot{y}_2(t) = B$

II) $\dot{y}_2(t) = Bt + C_5$

III) $y_2(t) = \frac{1}{2}Bt^2 + C_5 t + C_6$

II) $\dot{y}_2(t=0) = v_{0y_2}$

III) $y_2(t=0) = s_{0y_2}$

II) $v_{0y_2} = B(0) + C_5$

III) $s_{0y_2} = \frac{1}{2}B(0)^2 + C_5(0) + C_6$

II) $C_5 = v_{0y_2}$

III) $C_6 = s_{0y_2}$

I) $\ddot{y}_2(t) = B$

II) $\dot{y}_2(t) = Bt + v_{0y_2}$

III) $y_2(t) = \frac{1}{2}Bt^2 + v_{0y_2}t + s_{0y_2}$ ($s_{0y_2} = 0$)

I) $\ddot{y}_2(t) = B$

II) $\dot{y}_2(t) = Bt + v_B \sin\alpha$

III) $y_2(t) = \frac{1}{2}Bt^2 + v_B t \sin\alpha$

τ – czas lotu.

II) $\dot{y}_2(t=\tau) = + v_{ky_2}$

III) $y_2(t=\tau) = z$

II) $v_{ky_2} = B\tau + v_B \sin\alpha$

III) $z = \frac{1}{2}B\tau^2 + v_B \tau \sin\alpha$

(2?)

$$B = \frac{N}{m} - g$$ (?)

x=1: t – czas $|AB|$

I) II) $v_B = At + v_{01}$

II) III) $|AB| = \frac{1}{2}At^2 + v_{01}t$

(2?)

$$A = -g(\sin\alpha + \mu\cos\alpha)$$

$$|AB| = \frac{h - H}{\sin\alpha}$$

x=2: τ – czas lotu.

III) II) $v_{kx_2} = v_B \cos\alpha$

III) III) $|CD| = v_B \tau \cos\alpha$

(4?)

V) II) $v_{ky_2} = B\tau + v_B \sin\alpha$

VI) III) $z = \frac{1}{2}B\tau^2 + v_B \tau \sin\alpha$

$$B = \frac{N}{m} - g$$ (?)

II) $|AB| = \frac{1}{2} A\tilde{t}^2 + v_{01}\tilde{t}$?

$\frac{1}{2} A\tilde{t}^2 + v_{01}\tilde{t} - |AB| = 0$

$\Delta = b^2 - 4ac$

$\Delta = v_{01}^2 + 4 \cdot \frac{1}{2} A\,|AB|$

$\Delta = v_{01}^2 + 2A\,|AB|$

$\sqrt{\Delta} = \sqrt{v_{01}^2 + 2A\,|AB|}$

$$\left|\begin{array}{l} \tilde{t}_1 = \dfrac{-v_{01} - \sqrt{\Delta}}{A} \\ \tilde{t}_2 = \dfrac{-v_{01} + \sqrt{\Delta}}{A} \end{array}\right.$$

✓ ✗

$\tilde{t} = \tilde{t}_2$

$v_B = + \sqrt{v_{01}^2 - 2g(\sin\alpha + \mu\cos\alpha) \cdot \frac{h - H}{\sin\alpha}}$ (under $\sqrt{\Delta}$)

III) $v_{Bx_2} = v_B \cos\alpha$

$v_{Bx_2} = \sqrt{\Delta}\cos\alpha$

IV) $|CD| = v_B \tilde{T} \cos\alpha$

$T = \frac{|CD|}{v_B \cos\alpha} = \frac{|CD|}{\sqrt{\Delta}\cos\alpha}$

I) $v_B = A\tilde{t} + v_{01}$

$v_B = A \cdot \frac{-v_{01} - \sqrt{\Delta}}{A} + v_{01}$

$v_B = -\sqrt{\Delta} = -\sqrt{v_{01}^2 + 2A\,|AB|} =$

$= -\sqrt{v_{01}^2 - 2g(\sin\alpha + \mu\cos\alpha) \cdot \frac{h - H}{\sin\alpha}}$

VII) $S = \frac{1}{2}(B)^{?} T^2 + v_B T \sin\alpha$

$B = \frac{2(S - v_B T \sin\alpha)}{T^2}$

$\frac{N}{m} - g = \frac{2(S - v_B T \sin\alpha)}{T^2}$

$N = \left| \frac{2(S - v_B T \sin\alpha)}{T^2} + g \right| \cdot m$

$\Rightarrow N = \left| \frac{2\left(S - \sqrt{\Delta} \cdot \frac{|CD|}{\sqrt{\Delta}\cos\alpha} \cdot \sin\alpha\right)}{\left(\frac{|CD|}{\sqrt{\Delta}\cos\alpha}\right)^2} - g \right| \cdot m$

$$N = \left| \frac{\varepsilon (2 - |\cos| + \alpha) \cdot \cos^2 \alpha}{|\cos|^2} + g \right| \cdot m =$$

$$= \left| \varepsilon \cdot (2 - |\cos| + \alpha) \left(\frac{\cos \alpha}{|\cos|} \right)^2 + g \right| \cdot m$$


e
-mechanik
.COM
.PL