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1.

$$H_c = H_t + \frac{I_o}{H_t \cdot A} = \frac{2v}{3} + \frac{\frac{av^3}{36}}{\frac{2v}{3} \cdot \frac{va}{2}}$$

mom. tromosti

a - baza trokuta

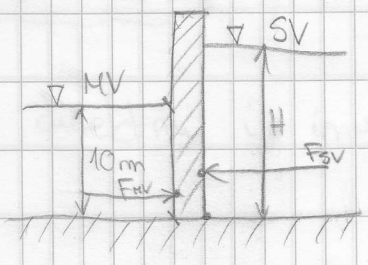
H_t ↓ težište trokuta

NA ISPITU !!!

2.

$$H_c = \frac{d}{2} + \frac{\frac{\pi d^4}{64}}{\frac{d}{2} \cdot \frac{\pi d^2}{4}}$$

3.



(širina pregrade) ovo uzimamo da je 1m

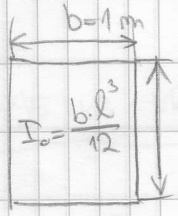
$$F_{MV} = F_{SV} \Rightarrow \rho_{MV} \cdot g \cdot H_{tMV} \cdot A_{MV} = \rho_{SV} \cdot g \cdot H_{tSV} \cdot A_{SV}$$

$$1030 \cdot 9{,}81 \cdot \frac{10}{2} \cdot (10 \cdot 1) = 1000 \cdot 9{,}81 \cdot \frac{H}{2} \cdot H \cdot 1$$

$$H = 10{,}15 \text{ m}$$

hvatište MV

$$y_{cMV} = H_{tMV} + \frac{I_o}{H_{tMV} \cdot A_{MV}} = \frac{10}{2} + \frac{\frac{1 \cdot 10^3}{12}}{\frac{10}{2} \cdot 10 \cdot 1} = 6{,}67 \text{ m}$$



$y_{cSV} = 6{,}77$ m

$10 - 6{,}67 = 3{,}33$ m → hvatište MV

$10{,}15 - 6{,}77 = 3{,}38$ m → hvatište SV

} postoji moment koji zakreće branu u smjeru obrnutom od kazaljke na satu

4.

1)

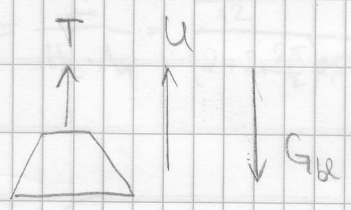
$$\Sigma F_{ver} = 0$$

$$T = G_{iv} - G_g$$

$$G_{iv} = \rho \cdot g \cdot V_{iv} = 1000 \cdot 9{,}81 \cdot \frac{1}{2} \cdot 1 \cdot 2 = 981 \text{ kN}$$

$$T = 9{,}81 - 7{,}5 = 2{,}31 \text{ kN}$$

2)

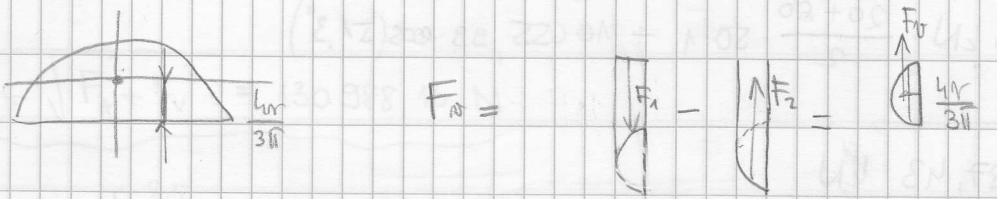


$$U = G_{bl} - T \Rightarrow \rho \cdot g \cdot V_{bl} = \rho_{bl} \cdot g \cdot V_{bl} - 2{,}31$$

$$\rho_{bl} = \frac{\rho g V_{bl} + 2{,}31}{g V_{bl}} = 2177{,}4 \text{ kg/m}^3$$

• vrijek rješavamo u 2 koraka !!!

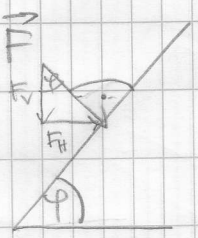
5.



$$F_v = F_1 - F_2 = \rho \cdot g \cdot V = 1000 \cdot 9{,}81 \cdot \frac{1^2 \pi}{2} \cdot 9 = 138\,685{,}6 \text{ N}$$

$$M_c = \text{sila} \times \text{krak} = F_v \cdot \text{krak} = F_v \cdot \frac{4r}{3\pi} = 138\,685{,}6 \cdot \frac{4 \cdot 1}{3\pi} = 58\,860 \text{ Nm}$$

8.



$$\sin\varphi = \frac{F_H}{F} \qquad F = \rho \cdot g \cdot H_t \cdot A$$

$$\cos\varphi = \frac{F_V}{F}$$

$$A = \frac{40 \cdot 1}{\sin 51{,}3^\circ} \rightarrow \varphi = \operatorname{arctg}\frac{50}{40}$$

$$F = 1000 \cdot 9{,}81 \cdot \frac{40}{2} \cdot \frac{40 \cdot 1}{\sin 51{,}3^\circ} = \underline{10\,055{,}99\ kN}$$

$$\Sigma F_x = 0 \Rightarrow F_R = F_{tr} = \mu \cdot N$$

$$F \cdot \sin(51{,}3^\circ) = \mu N = F_{tr}$$

$$\Sigma F_y = 0 \Rightarrow N = F_V + G_B \qquad G_B = \underbrace{\rho \cdot g}_{\gamma_b} \cdot V$$

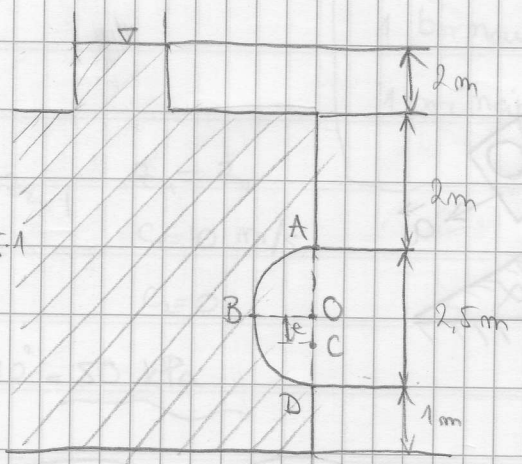
$$N = 23{,}6\ kN \cdot \frac{20+80}{2} \cdot 50 \cdot 1 + 10\,055{,}99 \cdot \cos(51{,}3^\circ)$$

$$\underline{N = 53\,487{,}43\ kN}$$

$$\mu = \frac{F \cdot \sin(51{,}3^\circ)}{N} = \underline{0{,}147}$$

9.

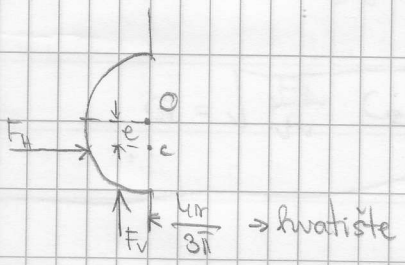
$F_R = \rho \cdot g \cdot H_t \cdot A_x$

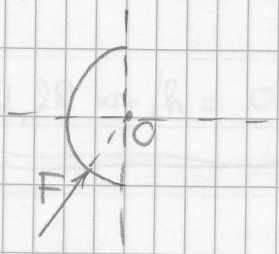


$F_R = 1000 \cdot 9{,}81 \cdot \frac{(2+2+2{,}5)}{2} \cdot 2{,}5 \cdot 1$

$F_R = 128\,758{,}25\ N$

$l = \frac{I_o}{H_t \cdot A_x} = \frac{\frac{1 \cdot 2{,}5^3}{12}}{\left(2+2+\frac{2{,}5}{2}\right) 2{,}5 \cdot 1} = 0{,}099\ m$



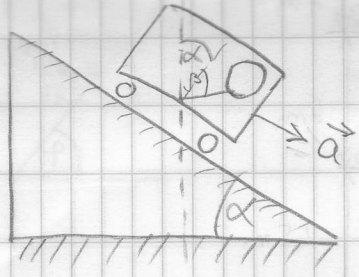


$F_V = U = \rho g V = 1000 \cdot 9{,}81 \cdot \frac{\left(\frac{2{,}5}{2}\right)^2 \pi}{2} \cdot 1 = 24\,077{,}36\ N$

$F = \sqrt{F_H^2 + F_V^2} = 130\,988{,}13\ N$

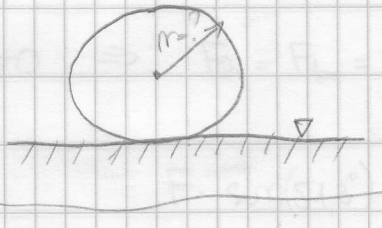
$\frac{4r}{3\pi} = \frac{4 \frac{2{,}5}{2}}{3\pi} = 0{,}53\ m$

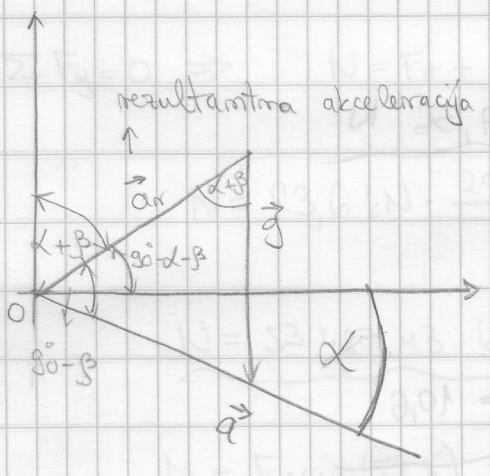
$\varphi = \operatorname{arctg} \frac{F_V}{F_H} = 10{,}6°$



ISPIT !!!

kolici je polumjer lopte





$$\vec{a}_R = g + (-\vec{a})$$

$$\frac{g}{\sin(90°-\beta)} = \frac{a}{\sin(\alpha+\beta)}$$

$$\sin(90°-\beta) = \cos\beta$$

$$\frac{g}{\cos(\beta)} = \frac{a}{\sin(\alpha+\beta)}$$

$$a = g \cdot \frac{\sin(\alpha+\beta)}{\cos(\beta)} = 9{,}81 \frac{\sin 60°}{\cos 30°} = 9{,}81 \ m/s^2$$

(13)

1 bernoullijeva jednadžba
1 princip očuvanja mase

$$\frac{p_1}{\rho g} + \frac{c_1^2}{2g} + z_1 = \frac{p_2}{\rho g} + \frac{c_2^2}{2g} + z_2 \quad | \quad z_1 = z_2, \; c_1 = 10 \text{ m/s}, \; c_2 = 0$$

$$p_2 = \frac{\rho g}{2g} c_1^2 = \frac{1}{2} \rho c_1^2 = \frac{1}{2} 1000 \cdot 10^2 = 50 \text{ kPa}$$

(15)

$$\frac{1}{2} \rho_z \cdot c_z^2 = \frac{1}{2} \rho_v \cdot c_v^2$$

$$c_v = \sqrt{\frac{\rho_z}{\rho_v} \cdot c_z} = 2{,}28 \text{ km/h} = 0{,}633 \text{ m/s}$$

(16.)

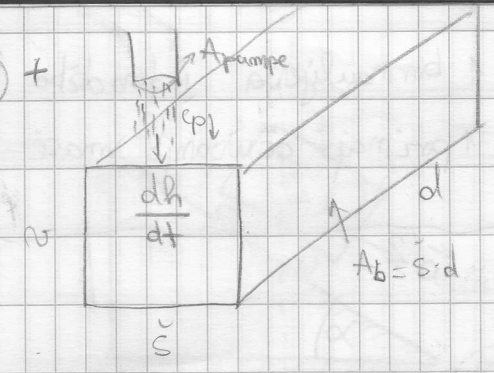
$$\frac{p_1}{\rho g} + \frac{c_1^2}{2g} + z_1 = \frac{p_2}{\rho g} + \frac{c_2^2}{2g} + z_2 \quad | \quad p_1 = p_2 = 0, \; z_1 = 0{,}5 \text{ m}, \; z_2 = 0$$

$$c_1 = \frac{Q}{A_1} \quad | \quad c_2 = \frac{Q}{A_2}$$

$$\left(\frac{Q}{A_1}\right)^2 + 2gz_1 = \left(\frac{Q}{A_2}\right)^2$$

(17 NE)

(18.)



$$\frac{D_m}{D_t} = \frac{d}{dt}\iiint_{KV} \rho \, dV + \oiint_{KP} \rho \vec{c}_r \, d\vec{A} = 0 \qquad (1)$$

$$\frac{d}{dt}\iiint \rho \, dV = \frac{d}{dt}\left[\rho \cdot \underbrace{h(t)}_{h} \cdot d \cdot \check{s}\right] = \rho \cdot A_b \cdot \frac{dh}{dt} \qquad (2)$$

$$\oiint_{KP} \rho \cdot \vec{c}_r \, d\vec{A} = -\rho \left(c_{pumpe} + \frac{dh}{dt}\right) A_{pumpe} \qquad (3)$$

$\rho \cdot A_{pumpe}$

$c_p + \frac{dh}{dt}$

$$\rho A_b \frac{dh}{dt} = \rho \left(c_{pumpe} + \frac{dh}{dt}\right) A_{pumpe} = \rho \cdot \underbrace{c_{pumpe} \cdot A_{pumpe}}_{Q} + \rho \cdot \frac{dh}{dt} \cdot A_{pumpe} \;/ : \rho$$

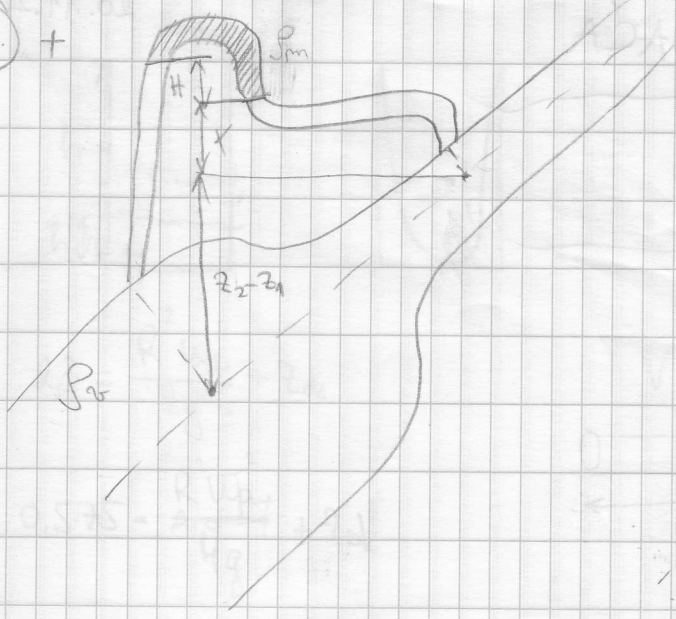
$\rho \cdot Q = \dot{m}$

$$\left(A_b - A_{pumpe}\right) \frac{dh}{dt} = c_{pumpe} \cdot A_{pumpe}$$

$$\frac{dh}{dt} = \frac{Q}{A_b - A_{pumpe}} = \frac{Q}{A_b} \qquad \left(A_{pumpe} \ll A_b\right)$$

↓ puno manje od A_b pa je zanemarivo

19.



kin. energija

$\frac{p}{\rho} + \frac{1}{2}c^2 + gz_1 = konst$

rad strujanja

pot. energija

$$p_1 + \frac{\rho_1 c_1^2}{2} + \rho g z_1 = p_2 + \frac{\rho c_2^2}{2} + \rho g z_2$$

$$Q = c_1 A_1 = c_2 A_2 \qquad c_2 = \frac{Q}{A_2}$$

$$(p_1 - p_2) = \rho g (z_2 - z_1) + \frac{1}{2}\rho c_2^2 \left[1 - \left(\frac{A_2}{A_1}\right)^2\right] \quad (1)$$

$$p_1 - \rho g (z_1 - z_2) - \rho g x - \rho g H + \rho_m g H_g + \rho g x = p_2 \quad (2)$$

$$H = \frac{\frac{1}{2}\rho \left(\frac{Q}{A_2}\right)^2 \cdot \left[1 - \left(\frac{r_2^2}{r_1^2}\right)^2\right]}{(\rho - \rho_m) g}$$

$$\rho g H - \rho_m g H$$