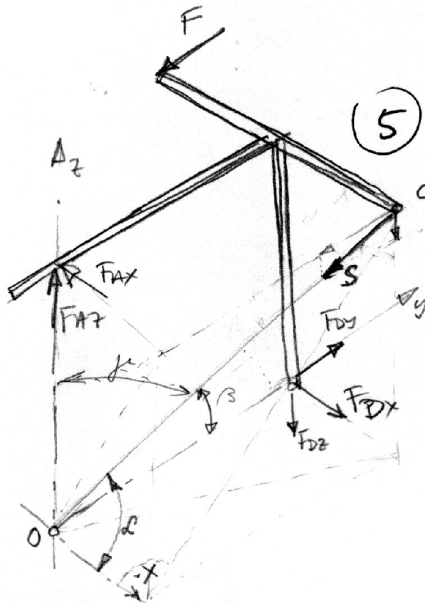
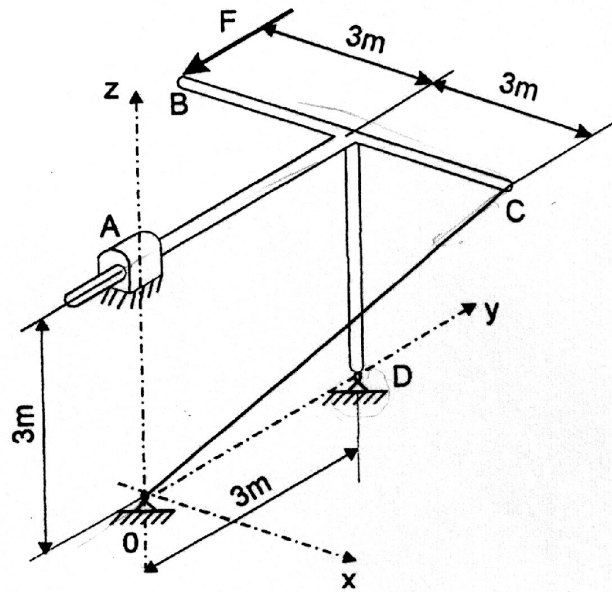


(A)

1. Zadatak.

Prostorni okvir, prikazan na slici, učvršćen je na horizontalnoj podlozi nepomičnim zglobnim osloncem D, apridržava se pomoću radijalnog ležaja A i užeta OC. Zanimajući težinu okvira u odnosu na silu $F=10\text{kN}$, odrediti silu u užetu i reakcije u ležajevima.

Rješenje:



$$OC = \sqrt{3^2 + 3^2 + 3^2} = \sqrt{27}$$

$$\cos \alpha = \frac{3}{\sqrt{27}} \quad (3)$$

$$\cos \beta = \frac{3}{\sqrt{27}} \quad (3)$$

$$\cos \gamma = \frac{3}{\sqrt{27}} \quad (3)$$

$$\sum F_x = 0; \quad -F_{Ax} + F_{Dx} - S \cos \alpha = 0 \quad (1) \quad (3)$$

$$\sum F_y = 0; \quad F_{Dy} - F - S \cos \beta = 0 \quad (2) \quad (3)$$

$$\sum F_z = 0; \quad F_{Az} - F_{Dz} - S \cos \gamma = 0 \quad (3) \quad (3)$$

$$\sum M_x = 0; \quad F \cdot 3 - F_{Dz} \cdot 3 = 0 \quad (4) \quad (5) \quad \Rightarrow F_{Dz} = F = 10 \text{ kN} \quad (1)$$

$$\sum M_y = 0; \quad -F_{Ax} \cdot 3 = 0 \quad (5) \quad (5) \quad \Rightarrow F_{Ax} = 0 \quad (1)$$

$$\sum M_z = 0; \quad F \cdot 3 - F_{Dx} \cdot 3 = 0 \quad (6) \quad (5) \quad \Rightarrow F_{Dx} = F = 10 \text{ kN} \quad (1)$$

$$\text{iz (1)} \quad S = \frac{\sqrt{27}}{3} F_{Dx} = 17,321 \text{ kN} \quad (1)$$

$$\text{iz (2)} \quad F_{Dy} = F + S \cos \beta = 10 + \frac{\sqrt{27} \cdot 10 \cdot \frac{3}{\sqrt{27}}}{3} = 20 \text{ kN} \quad (1)$$

$$\text{iz (3)} \quad F_A = F_{Az} = F_{Dz} + S \cos \gamma = 10 + \frac{\sqrt{27} \cdot 10 \cdot \frac{3}{\sqrt{27}}}{3} = 20 \text{ kN} \quad (1)$$

$$F_A = F_{Dz}$$

$$F_D = \sqrt{F_{Dx}^2 + F_{Dy}^2 + F_{Dz}^2} \approx 24,495 \text{ kN} \quad (1)$$

(A)

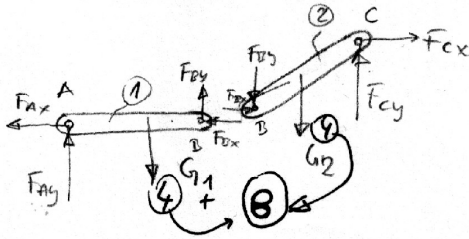
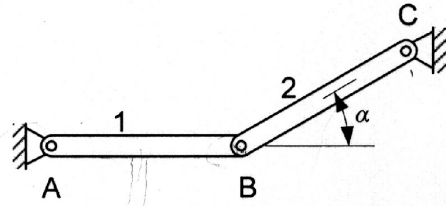
Σ 35

2. Zadatak.

Homogene grede 1 i 2 spojene su i oslonjene kao što je prikazano na slici. Odrediti silu u zglobu B i reakcije oslonaca A i C ako su zadane težine grede $G_1=2\text{kN}$, $G_2=3\text{kN}$ i kut $\alpha=45^\circ$.

Rješenje: $F_A=F_B=2.69\text{kN}$, $F_C=4.717\text{kN}$

, obje dužine l ,



Ravnoteža grede (1)

$$\sum M_B = 0; -F_{Ay} \cdot l + G_1 \cdot \frac{l}{2} = 0 \quad (1) \quad (5)$$

$$\sum F_x = 0; -F_{Ax} - F_{Bx} = 0 \quad (2) \quad (2)$$

$$\sum F_y = 0; F_{Ay} + F_{By} - G_1 = 0 \quad (3) \quad (2)$$

Ravnoteža grede (2)

$$\sum M_B = 0; -G_2 \cdot \frac{l}{2} \cos \alpha + F_{Cy} \cdot l \cos \alpha - F_{Cx} \cdot l \sin \alpha = 0 \quad (5) \quad (4)$$

$$\sum F_x = 0; F_{Bx} + F_{Cx} = 0 \quad (5) \quad (2)$$

$$\sum F_y = 0; -F_{By} - G_2 + F_{Cy} = 0 \quad (6) \quad (2)$$

iz (1) $F_{Ay} = \frac{G_1}{2} = 1 \text{ kN} \quad (1)$

iz (3) $F_{By} = G_1 - F_{Ay} = 1 \text{ kN} \quad (1)$

iz (6) $F_{Cy} = G_2 + F_{By} = 4 \text{ kN} \quad (1)$

iz (4) $F_{Cx} = -\frac{G_2}{2} \cot \alpha + F_{Cy} \cot \alpha = 4 - 1.5 = 2.5 \text{ kN} \quad (1)$

iz (5) $F_{Bx} = -F_{Cx} = -2.5 \text{ kN} \quad (1)$

iz (2) $F_{Ax} = -F_{Bx} = 2.5 \text{ kN} \quad (1)$

$$F_A = \sqrt{1^2 + 2.5^2} = \sqrt{7.25} \approx 2.69 \text{ kN}; \quad F_B = \sqrt{(-2.5)^2 + 1^2} \approx 2.69 \text{ kN}; \quad F_C = \sqrt{2.5^2 + 4^2} = \sqrt{22.5} \approx 4.717 \text{ kN}$$

(1) $\text{tg } \varphi_A =$

(1)

(1)

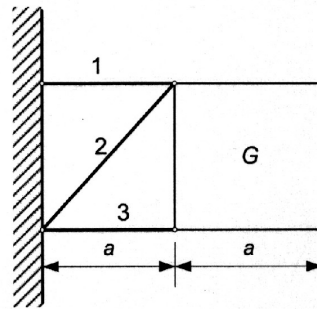
$\text{tg } \varphi_B =$

$\text{tg } \varphi_C =$

(A)

Σ 20 b.

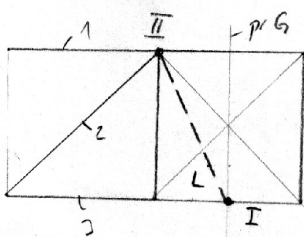
3. Zadatak. Grafički odrediti sile u štapovima 1, 2 i 3 kojima se pridržava homogena kvadratna ploča težine $G=200N$.



Rješenje: $F_1=300N$, $F_2=282.8N$, $F_3=100N$

• plan položaja

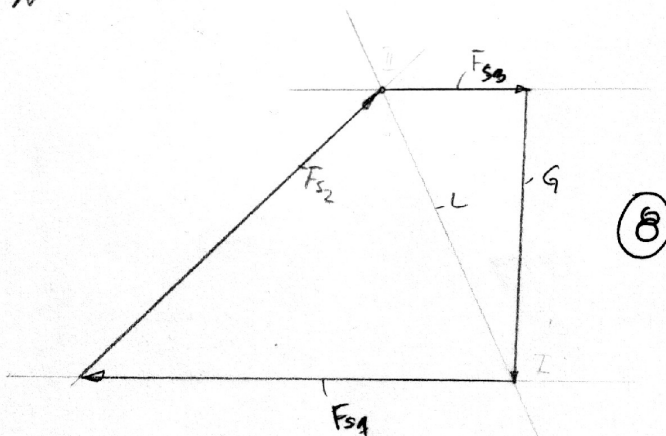
$1cm \hat{=} \frac{a}{2}$



(10)

• plan sila

$1cm \hat{=} 50 N$



(8)

očitanje:

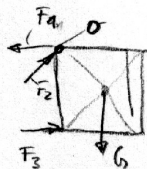
$F_{s3} \approx 100 N \hat{=} 2cm$

$F_{s1} \approx 300 N \quad (2) \hat{=} 6cm$

$F_{s2} \approx 285 N =$

ne treba

Analički:



$\sum F_x = 0; F_1 + F_2 \frac{1}{\sqrt{2}} + F_3 = 0 \quad (1)$

$\sum F_y = 0; F_2 \frac{1}{\sqrt{2}} = G \quad (2) \Rightarrow F_2 = G\sqrt{2} = 282,84 N$

(2)

$\sum M_O = 0; F_2 \cdot a - G \frac{a}{2} = 0 \quad (3) \Rightarrow F_3 = \frac{G}{2} = 100 N$

$F_1 = \frac{G\sqrt{2}}{\sqrt{2}} + F_3 = 200 + 100 = 300 N$