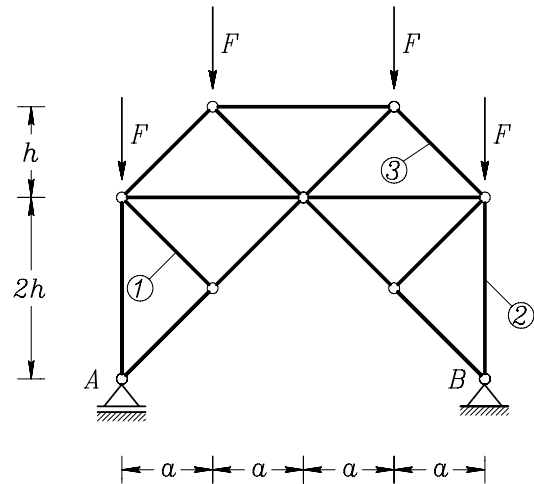


Drugi kolokvij iz STATIKE (Izredni študij), 1. junij 2007

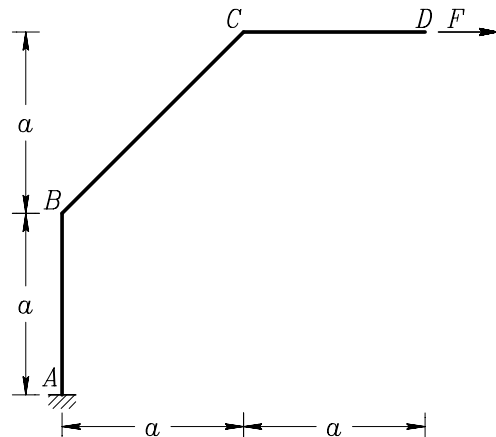
1. Ravninski paličje na sliki je obremenjeno z navpičnimi silami F . Izračunaj stopnjo statične nedoločnosti n , reakcije ter osne sile v palicah 1, 2 in 3.

Podatki: $a = 3\text{ m}$, $h = 3\text{ m}$, $F = 5\text{ kN}$.



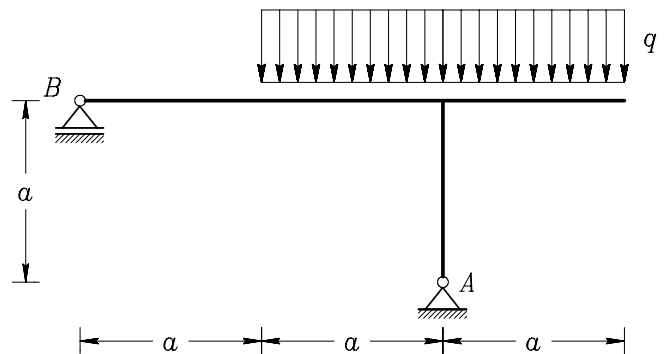
2. Ukrivljena konzola je obremenjena z vodoravno silo F . Izračunaj reakcije, notranje sile in nariši diagrame notranjih sil.

Podatki: $a = 3\text{ m}$, $F = 10\text{ kN}$.



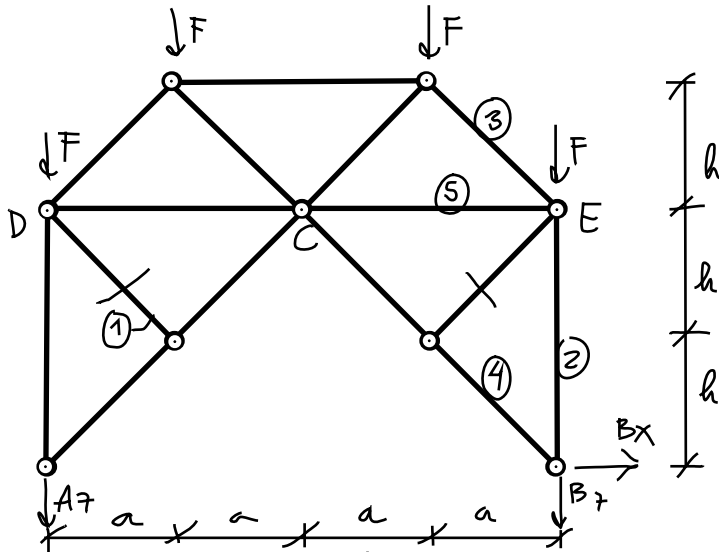
3. Ravninski okvir na sliki je obremenjen z enakomerno zvezno obtežbo. Izračunaj računsko število prostostnih stopenj, reakcije, notranje sile in nariši diagrame notranjih sil.

Podatki: $a = 3\text{ m}$, $q = 5\frac{\text{kN}}{\text{m}}$.



Točkovanje: 40 % + 30 % + 40 % = 110 %

1)



STOPNJA
 STATIČNE
 NEDOLOČENOSTI
 $n = -\widetilde{nps}$
 $n = 2n_v - n_f - n_r$
 $= 2 \cdot 9 - 15 - (2+1)$
 $= 0$
 \Downarrow
 PALIČJE VE
 STATIČNO DOLŽENO

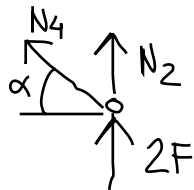
REAKCIJE : $\sum X = 0 \Rightarrow B_x = 0$

$\sum Z = 0 \Rightarrow 4 \cdot F + A_z + B_z = 0 \Rightarrow A_z = -2F$

$\sum M_y^A = 0 \Rightarrow -B_z \cdot 4a - F(a + 3a + 4a) = 0 \Rightarrow B_z = -2F$

OSNA SILA : OSNA SILA V PALICI ① JE PO PRAVLU 2 ENAKA NIČ.

OSNA SILA V PALICI ② - IZREŽENO VOZLIŠČE (B)



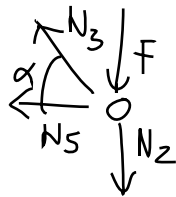
$\alpha = 45^\circ$

$\sum X = 0 \Rightarrow -N_4 \cos 45^\circ = 0 \Rightarrow N_4 = 0$

$\sum Z = 0 \Rightarrow -2F - N_2 - N_4 \sin 45^\circ = 0$

$\Rightarrow N_2 = -2F = -10 \text{ kN}$

OSNA SILA V PALICI ③ - IZREŽENO VOZLIŠČE (E)

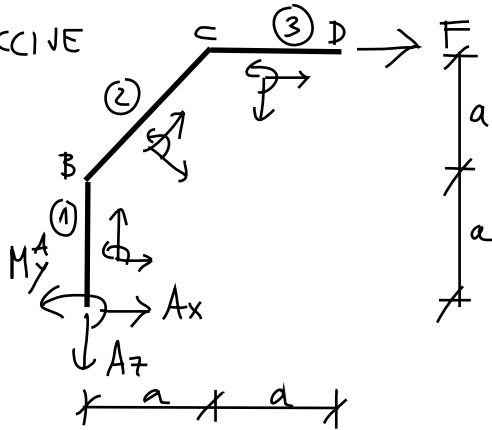


$\sum Z = 0 \Rightarrow F + N_2 - N_3 \sin 45^\circ = 0$

$\Rightarrow N_3 \sin 45^\circ = -F$

$\Rightarrow N_3 = \frac{-F}{\frac{\sqrt{2}}{2}} = -F\sqrt{2} = -7,07 \text{ kN}$

2) REAKCIJE



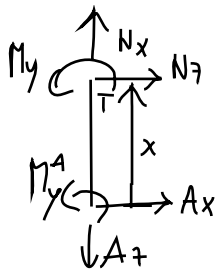
$$\sum X = 0 \quad A_x + F = 0 \Rightarrow A_x = -F$$

$$\sum Z = 0 \quad A_z = 0$$

$$\sum \Pi^A = 0 \quad M_y^A - F \cdot 2a = 0 \Rightarrow M_y^A = F \cdot 2a$$

NOTRANJE SILE

POLJE ① = POLJE \overline{AB}



$$\sum X = 0 \quad N_x = A_z = 0$$

$$\sum Z = 0 \quad N_z + A_x = 0$$

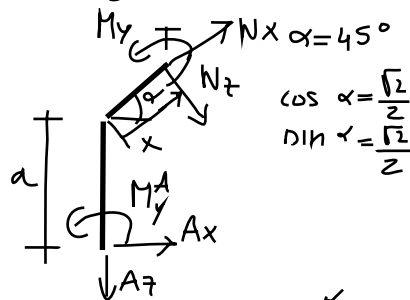
$$N_z = -A_x = 10 \text{ kN}$$

$$\sum \Pi_y^T = 0 \quad M_y + M_y^A + A_x \cdot x = 0$$

$$\Rightarrow M_y = -M_y^A - A_x \cdot x = -60 + 10x$$

$$M_y(0) = -60 \text{ kNm}, \quad M_y(3) = -30 \text{ kNm}$$

POLJE ② = POLJE \overline{BC}



$$\sum X = 0 \quad N_x + A_x \cdot \cos \alpha - A_z \cdot \sin \alpha = 0$$

$$\Rightarrow N_x = -A_x \cdot \frac{\sqrt{2}}{2} = 7.07 \text{ kN}$$

$$\sum Z = 0 \quad N_z + A_x \cdot \sin \alpha + A_z \cdot \cos \alpha = 0$$

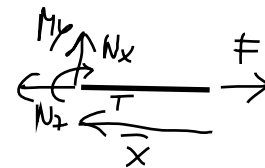
$$N_z = -A_x \cdot \frac{\sqrt{2}}{2} = 7.07 \text{ kN}$$

$$\sum \Pi_y^T = 0 \quad M_y + A_x(a + x \sin \alpha) + A_z x \cos \alpha + M_y^A = 0$$

$$\Rightarrow M_y = -A_x \cdot a - M_y^A - A_x \cdot \frac{\sqrt{2}}{2} x$$

$$M_y(0) = -30 \text{ kNm}, \quad M_y(3\sqrt{2}) = 0$$

POLJE ③ = POLJE \overline{CD}



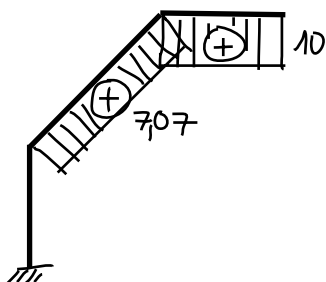
$$\sum X = 0 \quad N_x = F = 10 \text{ kN}$$

$$\sum Z = 0 \quad N_z = 0$$

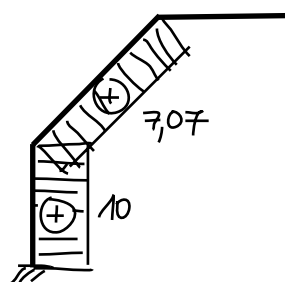
$$\sum \Pi_y^T = 0 \quad M_y = 0$$

DIAGRAMI NOTRANJNH SILE

$[N_x (\text{kN})]$



$[N_z (\text{kN})]$



$[M_y (\text{kNm})]$

