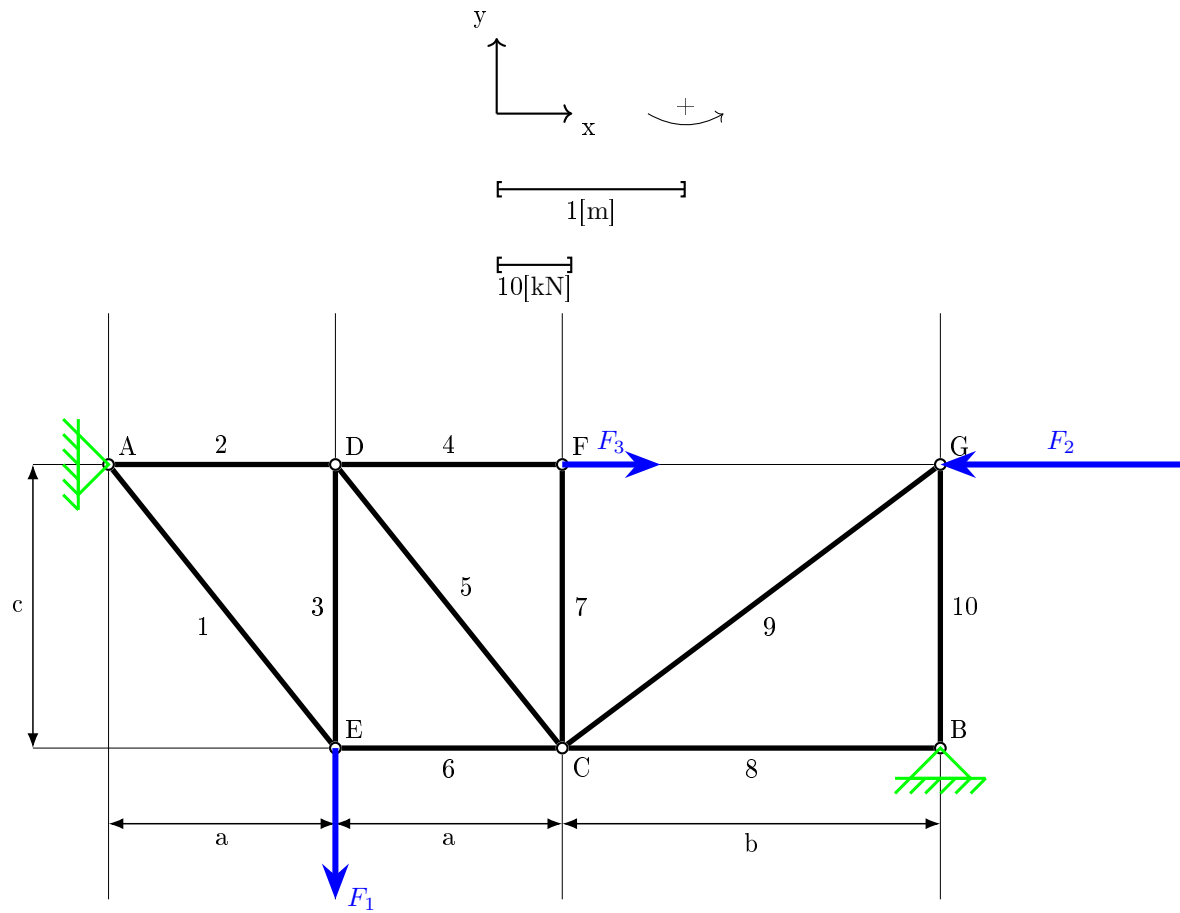


Statika 3. HF

Vári Gergő

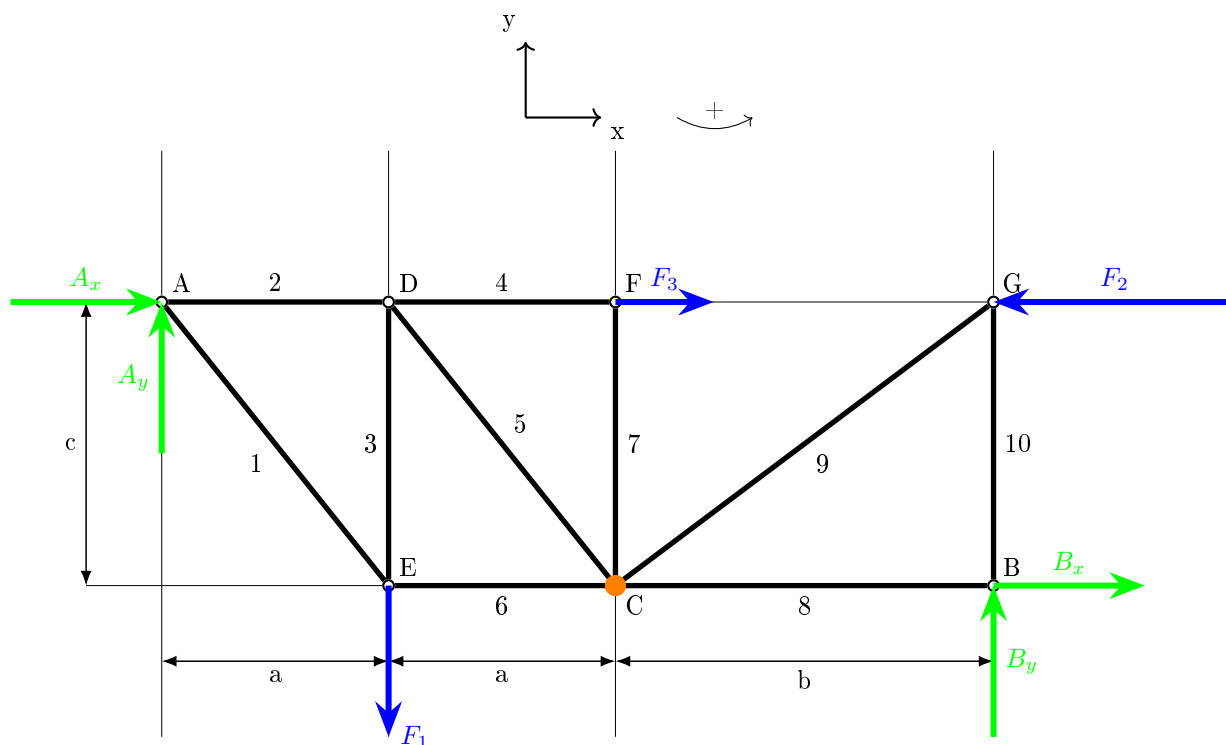
2024. november 5.

1. Méretarányos ábra



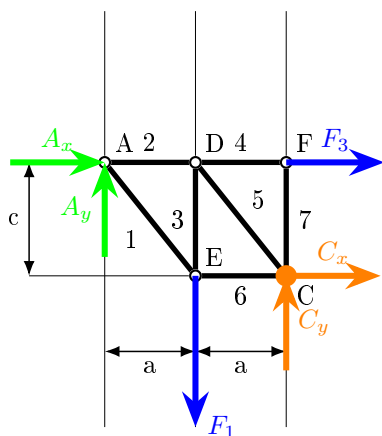
2. Részekre bontás elve

2.1. Szabadtest-ábra (SZTÁ)



2.2. Részek vizsgálata

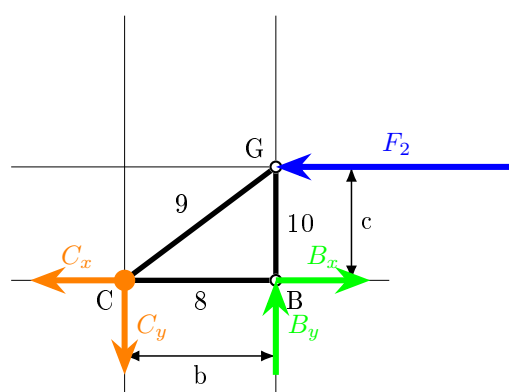
2.2.1.



$$\begin{aligned}\sum \vec{F}_x &:= 0 = A_x + F_3 + C_x \\ \sum \vec{F}_y &:= 0 = A_y - F_1 + C_y \\ \sum \vec{M}_C &:= 0 = -A_x \times c - A_y \times 2a + F_1 \times a - F_3 \times c\end{aligned}$$

$$\begin{aligned}A_y &= F_1 - C_y &= 44[\text{kN}] \\ A_x &= \frac{-A_y \times 2a + F_1 \times a - F_3 \times c}{c} &= -67.4[\text{kN}] \\ C_x &= -A_x - F_3 &= 54.4[\text{kN}]\end{aligned}$$

2.2.2.

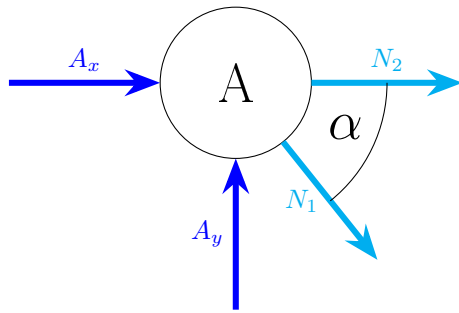


$$\begin{aligned}\sum \vec{F}_x &:= 0 = B_x - F_2 - C_x \\ \sum \vec{F}_y &:= 0 = B_y - C_y \\ \sum \vec{M}_C &:= 0 = F_2 \times c + B_y \times b\end{aligned}$$

$$\begin{aligned}B_y &= -F_2 \frac{c}{b} &= -24[\text{kN}] \\ C_y &= B_y &= -24[\text{kN}] \\ B_x &= C_x + F_2 &= 86.4[\text{kN}]\end{aligned}$$

$$\begin{array}{l} A = \begin{bmatrix} -67.4 \\ 44 \end{bmatrix} \quad [\text{kN}] \\ B = \begin{bmatrix} 86.4 \\ -24 \end{bmatrix} \quad [\text{kN}] \end{array}$$

3. Csomóponti módszer



$$\sum \vec{F}_x := 0 = A_x + N_2 + N_{1x}$$

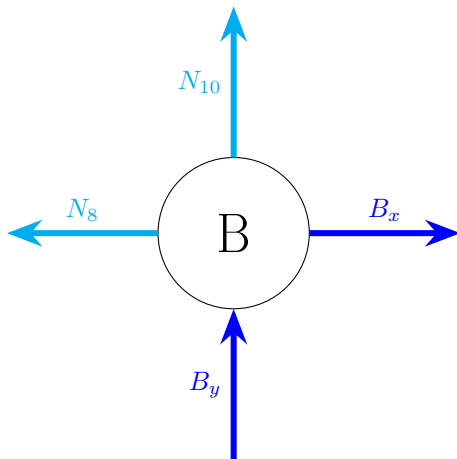
$$\sum \vec{F}_y := 0 = A_y - N_{1y}$$

$$\tan \alpha = \frac{c}{a} \Rightarrow \alpha = 51.33^\circ$$

$$N_{1y} = A_y = 44[\text{kN}]$$

$$\mathbf{N}_1 = \frac{N_{1y}}{\sin \alpha} = 56.36[\text{kN}]$$

$$N_{1x} = N_1 \times \cos \alpha = 35.21[\text{kN}]$$

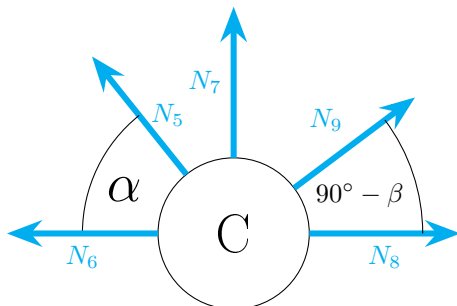


$$\sum \vec{F}_x := 0 = B_x - N_8$$

$$\sum \vec{F}_y := 0 = B_y + N_{10}$$

$$\mathbf{N}_8 = B_x = 86.4[\text{kN}]$$

$$\mathbf{N}_{10} = -B_y = 24[\text{kN}]$$

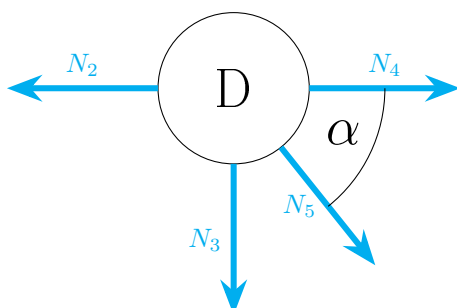


$$\sum \vec{F}_x := 0 = N_8 - N_6 + N_{9x} - N_{5x}$$

$$\sum \vec{F}_y := 0 = N_7 + N_{5y} + N_{9y}$$

$$\mathbf{N}_6 = N_8 + N_{9x} - N_{5x} = 35.21[\text{kN}]$$

$$\mathbf{N}_7 = -N_{5y} - N_{9y} = 0[\text{kN}]$$



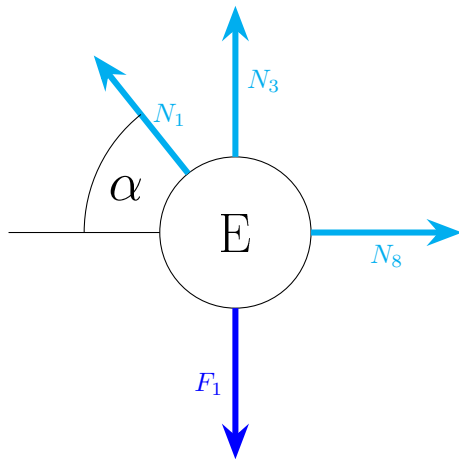
$$\sum \vec{F}_x := 0 = N_4 - N_2 + N_{5x}$$

$$\sum \vec{F}_y := 0 = -N_3 - N_{5y}$$

$$N_{5x} = N_2 - N_4 = 19.19[\text{kN}]$$

$$N_{5y} = -N_3 = 24[\text{kN}]$$

$$\mathbf{N}_5 = \sqrt{N_{5x}^2 + N_{5y}^2} = 30.73[\text{kN}]$$

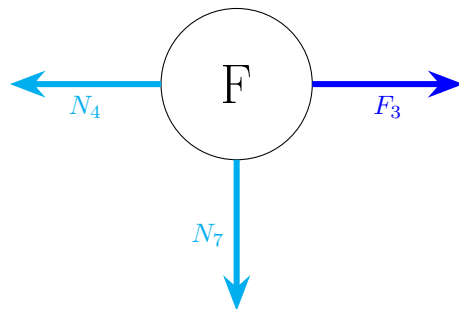


$$\sum \vec{F}_x := 0 = N_6 - N_{1x}$$

$$\sum \vec{F}_y := 0 = N_3 - F_1 + N_{1y}$$

$$N_6 = N_{1x} = 35.21[\text{kN}] \checkmark$$

$$\mathbf{N}_3 = F_1 - N_{1y} = -24[\text{kN}]$$

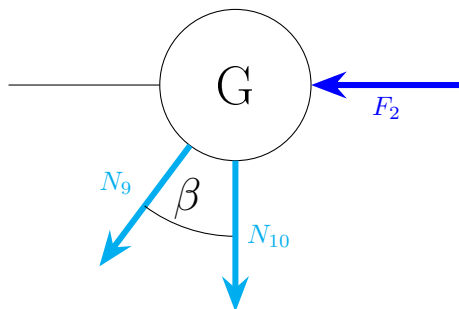


$$\sum \vec{F}_x := 0 = F_3 - N_4$$

$$\sum \vec{F}_y := 0 = -N_7$$

$$\mathbf{N}_4 = F_3 = 13[\text{kN}]$$

$$N_7 = 0[\text{kN}] \checkmark$$



$$\sum \vec{F}_x := 0 = -F_2 - N_{9x}$$

$$\sum \vec{F}_y := 0 = -N_{10} - N_{9y}$$

$$\tan \beta = \frac{b}{c} \Rightarrow \beta = 53.12^\circ$$

$$N_{9x} = -F_2 = -32[\text{kN}]$$

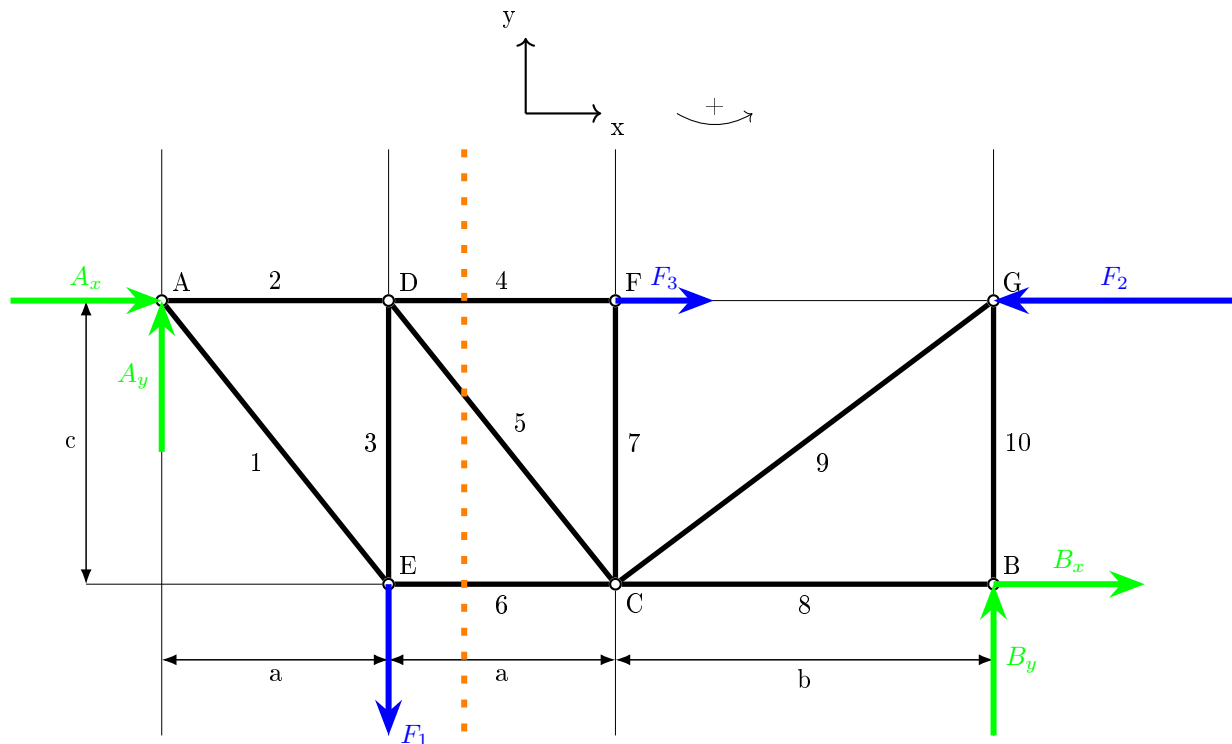
$$\mathbf{N}_9 = \frac{N_{9x}}{\sin \beta} = -40[\text{kN}]$$

$$N_{9y} = N_9 \times \cos \beta = -24.01[\text{kN}]$$

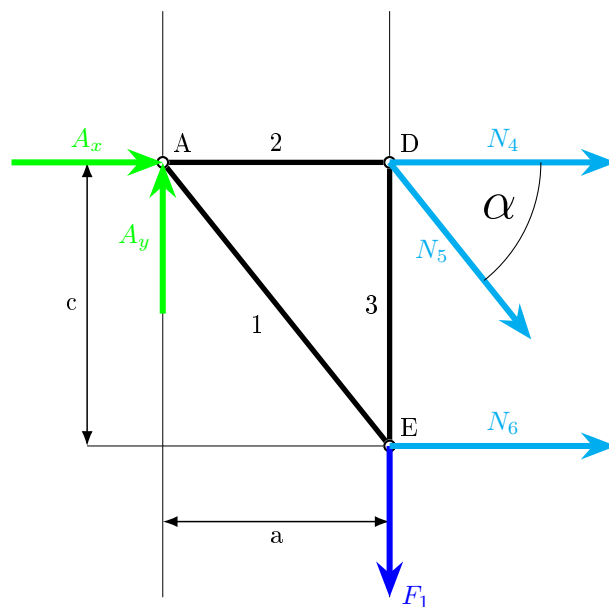
$$\mathbf{N}_{10} = -N_{9y} = 24[\text{kN}]$$

4. Átmetsző módszer

4.1. SZTÁ



4.2. Megmaradt rúderők



$$\sum \vec{F}_x := 0 = A_x + N_4 + N_{5x} + N_6$$

$$\sum \vec{F}_y := 0 = A_y - N_{5y} - F_1$$

$$\sum \vec{M}_D := 0 = A_y \times a + N_6 \times c$$

$$N_{5y} = A_y - F_2 = 24\checkmark$$

$$N_5 = \frac{N_{5y}}{\sin \alpha} = \mathbf{30.73\checkmark}$$

$$N_{5x} = N_5 \times \cos \alpha = 19.19\checkmark$$

$$N_4 = -A_x - N_{5x} - N_6 = 13\checkmark$$

$$N_6 = \frac{A_y \times a}{c} = 35.21\checkmark$$