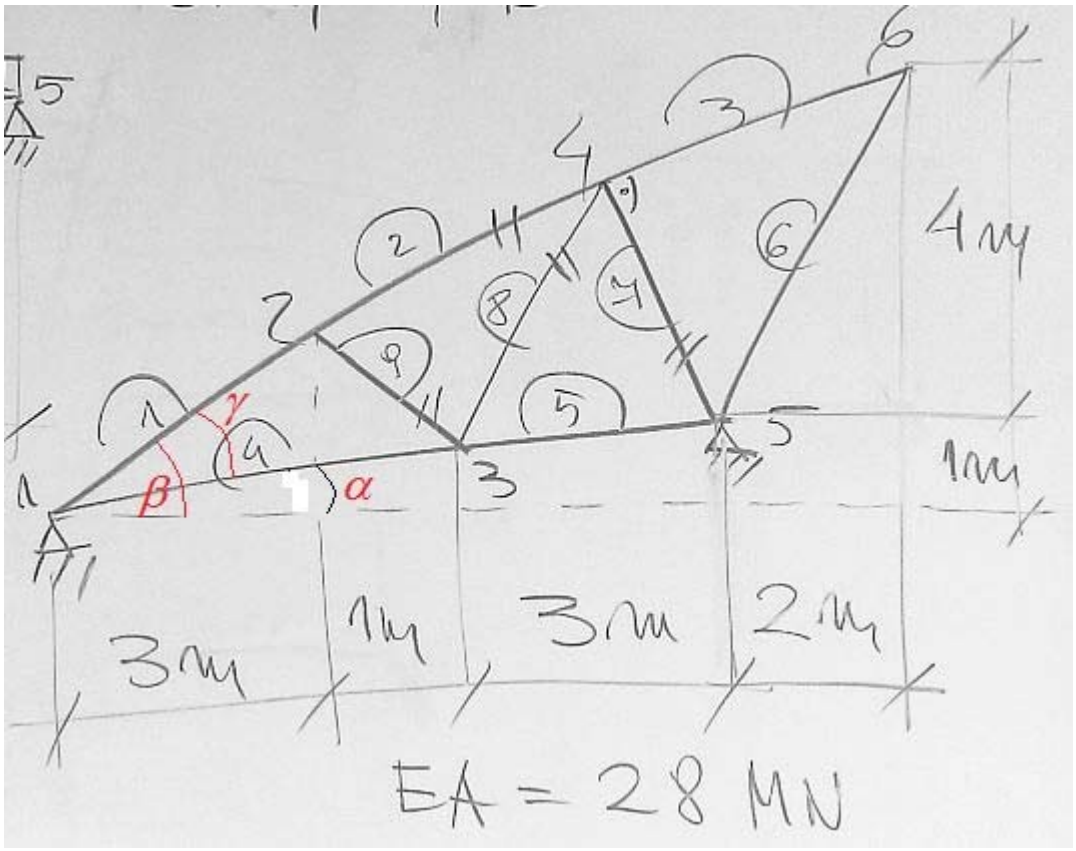
Macierze sztywności elementów kratownicy

Grupa 1 - wariant "a"



elementy := (2 , 7 , 8 , 9) EA := 28MN

$\alpha := \operatorname{atan}\left(\frac{1}{7}\right)$ $\beta := \operatorname{atan}\left(\frac{5}{9}\right)$ $\gamma := \beta - \alpha$

$L15 := \sqrt{(7m)^2 + (1m)^2} = 7.071068\,m$

$L14 := L15 \cdot \cos(\gamma) = 6.604744\,m$

$X4 := L14 \cdot \cos(\beta) = 5.773585\,m$

$Y4 := L14 \cdot \sin(\beta) = 3.207547\,m$

Element "2" - blok macierzy sztywności

$Lx := X4 - 3m = 2.773585\,m$ $\qquad Ly := Y4 - \frac{3}{9}\cdot 5m = 1.540881\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 3.172867\,m$

$$J := \frac{EA}{(L)^3}\cdot\begin{bmatrix}(Lx)^2 & Lx\cdot Ly\\ Lx\cdot Ly & (Ly)^2\end{bmatrix} \qquad J = \begin{pmatrix}6743 & 3746\\ 3746 & 2081\end{pmatrix}\cdot\frac{kN}{m}$$

Element "7" - blok macierzy sztywności

$Lx := 7m - X4 = 1.226415\,m$ $\qquad Ly := -(Y4 - 1m) = -2.207547\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 2.525343\,m$

$$J := \frac{EA}{(L)^3}\cdot\begin{bmatrix}(Lx)^2 & Lx\cdot Ly\\ Lx\cdot Ly & (Ly)^2\end{bmatrix} \qquad J = \begin{pmatrix}2615 & -4707\\ -4707 & 8473\end{pmatrix}\cdot\frac{kN}{m}$$

Element "8" - blok macierzy sztywności

$Lx := X4 - 4m = 1.773585\,m$ $\qquad Ly := Y4 - \frac{4}{9}1m = 2.763103\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 3.283343\,m$

$$J := \frac{EA}{(L)^3}\cdot\begin{bmatrix}(Lx)^2 & Lx\cdot Ly\\ Lx\cdot Ly & (Ly)^2\end{bmatrix} \qquad J = \begin{pmatrix}2488 & 3877\\ 3877 & 6040\end{pmatrix}\cdot\frac{kN}{m}$$

Element "9" - blok macierzy sztywności

$Lx := 1m = 1\,m$ $\qquad Ly := \frac{4}{7}1m - \frac{3}{9}\cdot 5m = -1.095238\,m$

$L := \sqrt{(Lx)^2 + (Ly)^2} = 1.483087\,m$

$$J := \frac{EA}{(L)^3}\cdot\begin{bmatrix}(Lx)^2 & Lx\cdot Ly\\ Lx\cdot Ly & (Ly)^2\end{bmatrix} \qquad J = \begin{pmatrix}8583 & -9401\\ -9401 & 10296\end{pmatrix}\cdot\frac{kN}{m}$$