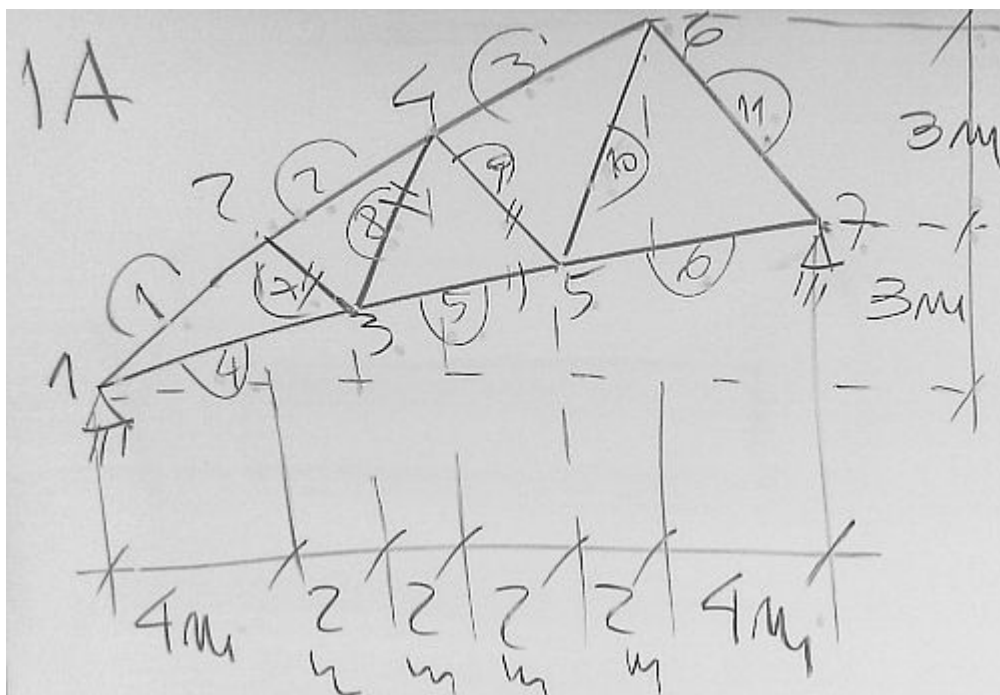


Macierze sztywności elementów kratownicy



elementy := (5, 7, 8, 9)

EA := 27MN

$$\mathbf{K} = \begin{bmatrix}
 \mathbf{J^1 + J^4} & -\mathbf{J^1} & -\mathbf{J^4} & & & & \\
 & \mathbf{J^1 + J^2 + J^7} & -\mathbf{J^7} & -\mathbf{J^2} & & & \\
 & & \mathbf{J^4 + J^5 + J^7 + J^8} & -\mathbf{J^8} & -\mathbf{J^5} & & \\
 & & & \mathbf{J^2 + J^3 + J^8 + J^9} & -\mathbf{J^9} & -\mathbf{J^3} & \\
 \text{Symetria} & \text{Symetria} & \text{Symetria} & \text{Symetria} & \mathbf{J^5 + J^6 + J^9 + J^{10}} & -\mathbf{J^{10}} & -\mathbf{J^6} \\
 & & & & & \mathbf{J^3 + J^{10} + J^{11}} & -\mathbf{J^{11}} \\
 & & & & & & \mathbf{J^6 + J^{11}}
 \end{bmatrix}
 \begin{matrix}
 1 \\
 2 \\
 3 \\
 4 \\
 5 \\
 6 \\
 7
 \end{matrix}$$

Element "5" - blok macierzy sztywności

$$L_x := 4\text{m} \quad L_y := 3\text{m} \cdot \frac{4}{16} = 0.750000\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 4.069705\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 6409 & 1202 \\ 1202 & 225 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "7" - blok macierzy sztywności

$$L_x := 2\text{m} \quad L_y := -\left(6\text{m} \cdot \frac{4}{12} - 3\text{m} \cdot \frac{6}{16}\right) = -0.875000\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 2.183031\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 10381 & -4542 \\ -4542 & 1987 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "8" - blok macierzy sztywności

$$L_x := 2\text{m} \quad L_y := 6\text{m} \cdot \frac{8}{12} - 3\text{m} \cdot \frac{6}{16} = 2.875000\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.502231\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 2514 & 3614 \\ 3614 & 5195 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "9" - blok macierzy sztywności

$$L_x := 2\text{m} \quad L_y := -\left(6\text{m} \cdot \frac{8}{12} - 3\text{m} \cdot \frac{10}{16}\right) = -2.125000\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 2.918154\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 4346 & -4618 \\ -4618 & 4906 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$