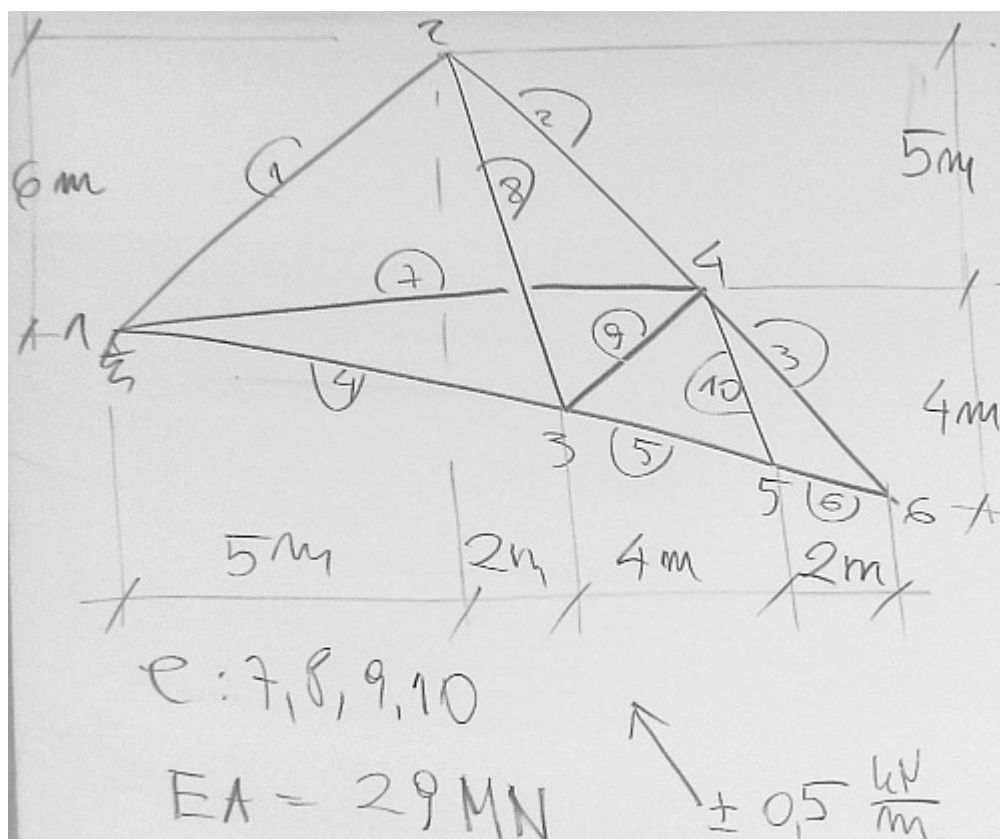


Macierze sztywności elementów kratownicy



elementy := (7, 8, 9, 10)

$EA := 29 \text{ MN}$

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

$$X4 := 13\text{m} - 8\text{m} \cdot \frac{4}{9} = 9.44444\text{m}$$

Element "7" - blok macierzy sztywności

$$L_x := X4 = 9.44444\text{m}$$

$$L_y := 1\text{m} = 1\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 9.497238\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix}$$

$$J = \begin{pmatrix} 3020 & 320 \\ 320 & 34 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "8" - blok macierzy sztywności

$$L_x := 2\text{m}$$

$$L_y := -3\text{m} \cdot \frac{7}{13} - 6\text{m} = -7.615385\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 7.873632\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix}$$

$$J = \begin{pmatrix} 238 & -905 \\ -905 & 3446 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "9" - blok macierzy sztywności

$$L_x := X4 - 7\text{m} = 2.44444\text{m}$$

$$L_y := 1\text{m} + 3\text{m} \cdot \frac{7}{13} = 2.615385\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.579881\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix}$$

$$J = \begin{pmatrix} 3777 & 4041 \\ 4041 & 4324 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "10" - blok macierzy sztywności

$$L_x := 11\text{m} - X4 = 1.555556\text{m}$$

$$L_y := -3\text{m} \cdot \frac{11}{13} - 1\text{m} = -3.538462\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.86529\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix}$$

$$J = \begin{pmatrix} 1215 & -2764 \\ -2764 & 6288 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$