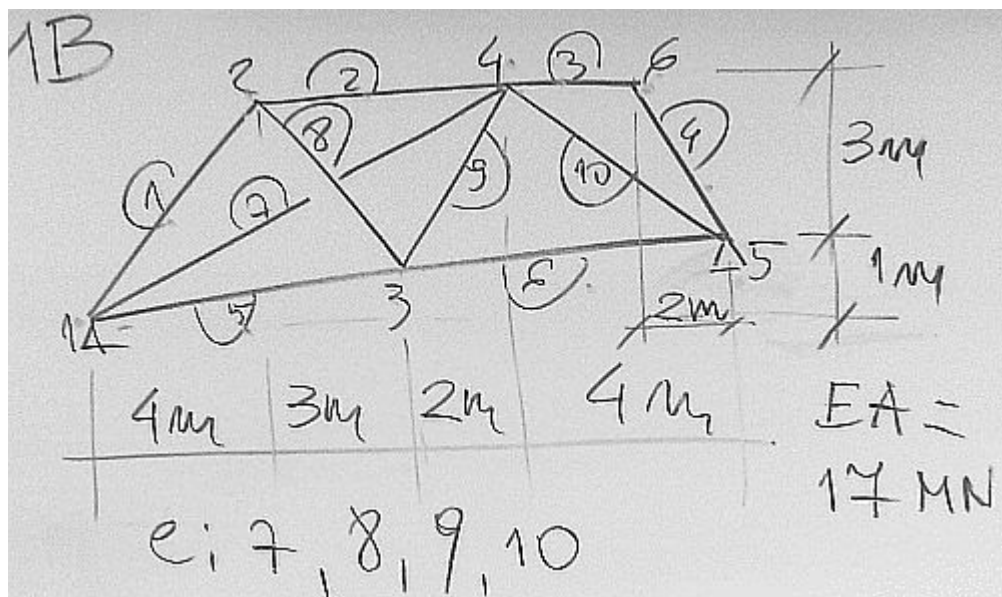


Macierze sztywności elementów kratownicy



elementy := (7, 8, 9, 10) $EA := 17 \text{ MN}$

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

Element "7" - blok macierzy sztywności

$$L_x := 9\text{m} \quad L_y := 4\text{m} = 4\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 9.848858\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 1441 & 641 \\ 641 & 285 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "8" - blok macierzy sztywności

$$L_x := 3\text{m} \quad L_y := -\left(4\text{m} - 1\text{m} \cdot \frac{7}{13}\right) = -3.461538\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 4.580638\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 1592 & -1837 \\ -1837 & 2119 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "9" - blok macierzy sztywności

$$L_x := 2\text{m} \quad L_y := 4\text{m} - 1\text{m} \cdot \frac{7}{13} = 3.461538\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.99778\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 1064 & 1842 \\ 1842 & 3188 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "10" - blok macierzy sztywności

$$L_x := 4\text{m} \quad L_y := -3\text{m} = -3\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 5\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 2176 & -1632 \\ -1632 & 1224 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$