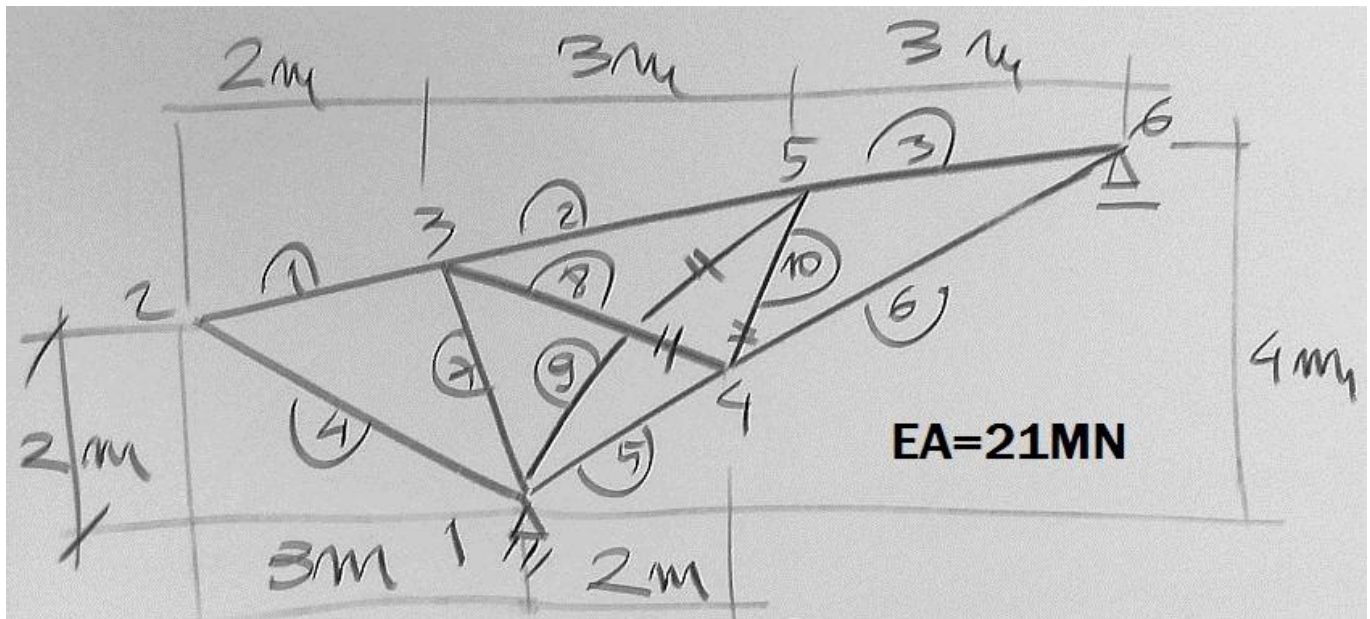


Macierze sztywności elementów kratownicy

Grupa A



elementy := (8, 9, 10) EA := 21MN

Element "8" - blok macierzy sztywności

$$Lx := 3m \quad Ly := \frac{2}{5}4m - 2m - \frac{2}{8} \cdot 2m = -0.9m$$

$$La := \sqrt{(Lx)^2 + (Ly)^2} = 3.132092m$$

$$Ja := \frac{EA}{(La)^3} \cdot \begin{bmatrix} (Lx)^2 & Lx \cdot Ly \\ Lx \cdot Ly & (Ly)^2 \end{bmatrix} \quad Ja = \begin{pmatrix} 6151.2 & -1845.4 \\ -1845.4 & 553.6 \end{pmatrix} \cdot \frac{kN}{m}$$

Element "9" - blok macierzy sztywności

$$\underline{L_x} := 2\text{m} \quad \underline{L_y} := 2\text{m} + \frac{5}{8} \cdot 2\text{m} = 3.25\text{m}$$

$$L_b := \sqrt{(L_x)^2 + (L_y)^2} = 3.816084\text{m}$$

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

$$J_b = \begin{pmatrix} 1511.6 & 2456.3 \\ 2456.3 & 3991.5 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "10" - blok macierzy sztywności

$$\underline{L_x} := 0\text{m} \quad \underline{L_y} := 2\text{m} + \frac{5}{8} \cdot 2\text{m} - \frac{2}{5} \cdot 4\text{m} = 1.65\text{m}$$

$$L_c := \sqrt{(L_x)^2 + (L_y)^2} = 1.65\text{m}$$

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

$$J_c = \begin{pmatrix} 0.0 & 0.0 \\ 0.0 & 12727.3 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

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