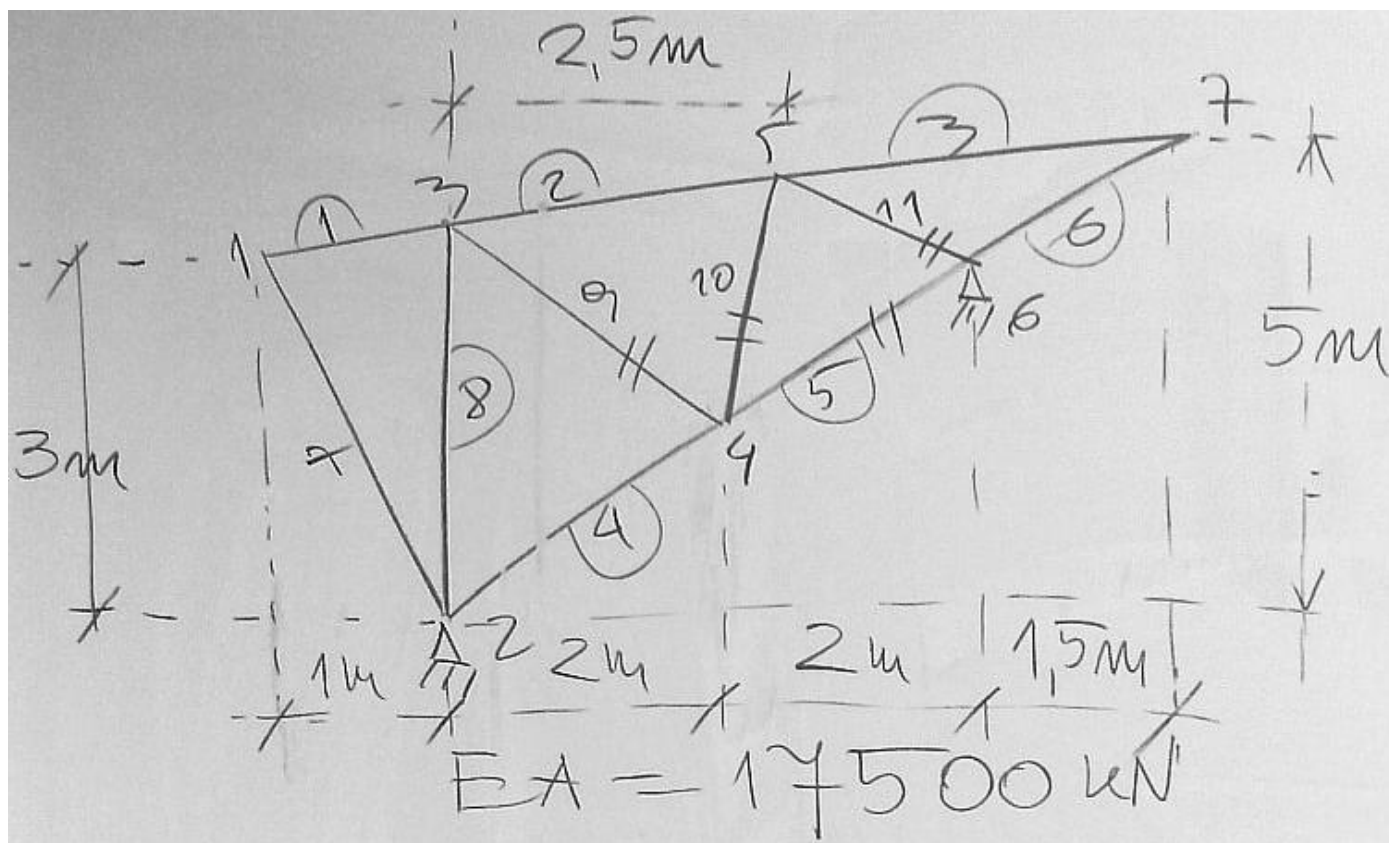


Macierze sztywności elementów kratownicy Grupa A



elementy := (5, 9, 10, 11)

EA := 17.5MN

e := 1 .. 11

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

$$X := \begin{pmatrix} -1 \\ 0 \\ 0 \\ 2 \\ 2.5 \\ 4 \\ 5.5 \end{pmatrix} \text{ m} \quad Y := \begin{pmatrix} 3 \\ 0 \\ 3 + 2 \cdot \frac{1}{6.5} \\ 5 \cdot \frac{2}{5.5} \\ 3 + 2 \cdot \frac{3.5}{6.5} \\ 5 \cdot \frac{4}{5.5} \\ 5 \end{pmatrix} \text{ m} \quad Wp := \begin{pmatrix} 1 \\ 3 \\ 5 \\ 2 \\ 4 \\ 6 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{pmatrix} \quad Wk := \begin{pmatrix} 3 \\ 5 \\ 7 \\ 4 \\ 6 \\ 7 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{pmatrix}$$

$$Lx_e := X_{(Wk_e)} - X_{(Wp_e)} \quad Ly_e := Y_{(Wk_e)} - Y_{(Wp_e)} \quad L_e := \sqrt{(Lx_e)^2 + (Ly_e)^2}$$

$$J_e := \frac{EA}{(L_e)^3} \cdot \begin{bmatrix} (Lx_e)^2 & Lx_e \cdot Ly_e \\ Lx_e \cdot Ly_e & (Ly_e)^2 \end{bmatrix}$$

Element $e := 5$

$$Lx_e = 2 \text{ m} \quad Ly_e = 1.818182 \text{ m} \quad L_e = 2.702922 \text{ m}$$

$$J_e = \begin{pmatrix} 3544.8 & 3222.6 \\ 3222.6 & 2929.6 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element $e := 9$

$$Lx_e = 2 \text{ m} \quad Ly_e = -1.48951 \text{ m} \quad L_e = 2.49372 \text{ m}$$

$$J_e = \begin{pmatrix} 4513.9 & -3361.8 \\ -3361.8 & 2503.7 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element $\text{e} := 10$

$$Lx_e = 0.5 \text{ m} \quad Ly_e = 2.258741 \text{ m} \quad Le = 2.31342 \text{ m}$$

$$J_e = \begin{pmatrix} 353.4 & 1596.3 \\ 1596.3 & 7211.2 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element $\text{e} := 11$

$$Lx_e = 1.5 \text{ m} \quad Ly_e = -0.440559 \text{ m} \quad Le = 1.563359 \text{ m}$$

$$J_e = \begin{pmatrix} 10304.9 & -3026.6 \\ -3026.6 & 888.9 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$