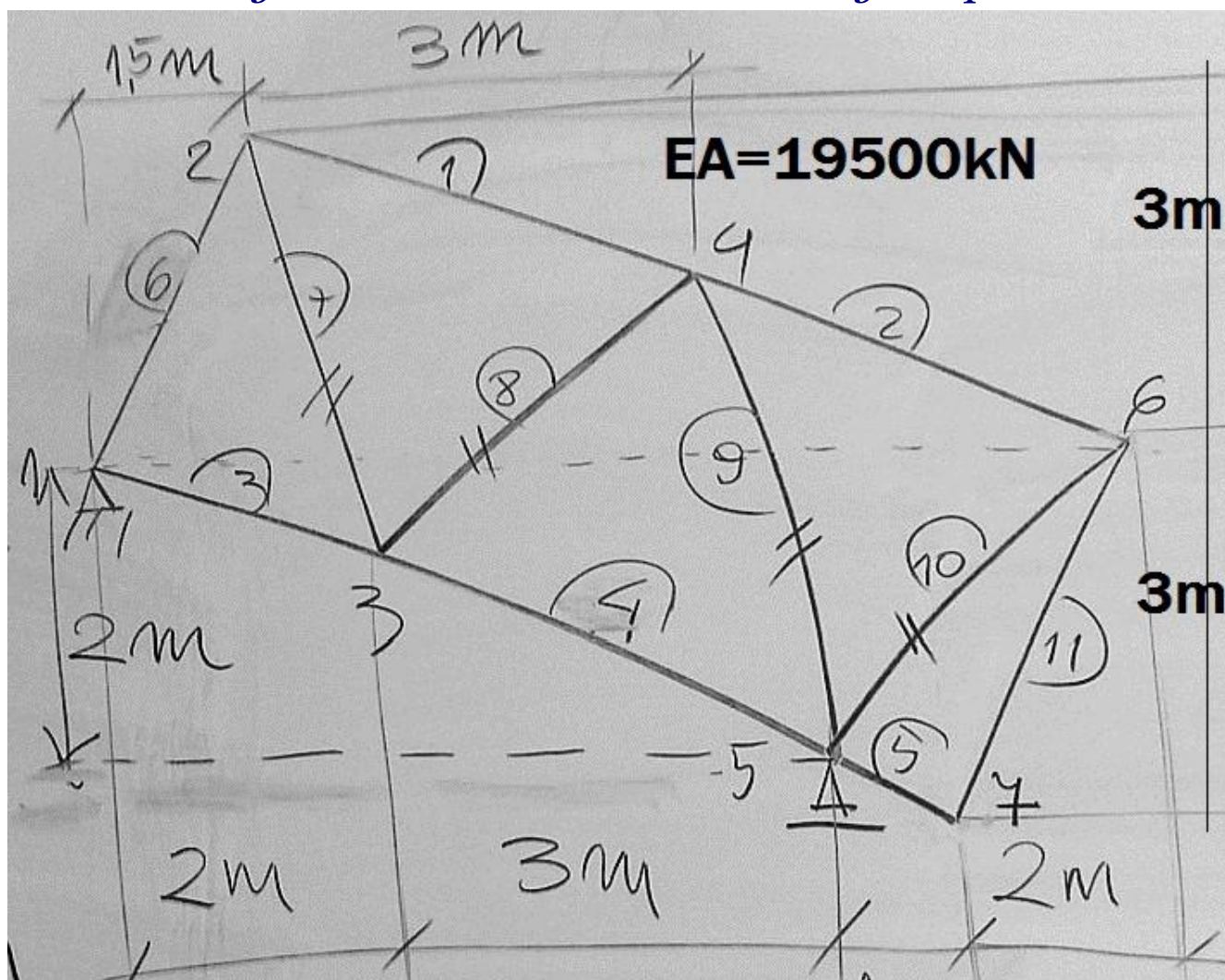


Macierze sztywności elementów kratownicy Grupa B



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

EA := 19.5MN

e := 1 .. 11

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

$$Y7 := -2 \cdot \frac{6}{5} = -2.4$$

$$Y2 := Y7 + 6 = 3.6$$

$$Y6 := Y7 + 3 = 0.6$$

$$X := \begin{pmatrix} 0 \\ 1.5 \\ 2 \\ 4.5 \\ 5 \\ 8 \\ 6 \end{pmatrix} \text{ m} \quad Y := \begin{pmatrix} 0 \\ Y2 \\ -2 \cdot \frac{2}{5} \\ Y2 - 3 \cdot \frac{3}{6.5} \\ -2 \\ Y6 \\ Y7 \end{pmatrix} \text{ m} \quad Wp := \begin{pmatrix} 2 \\ 4 \\ 1 \\ 3 \\ 5 \\ 1 \\ 2 \\ 3 \\ 4 \\ 4 \\ 5 \\ 7 \end{pmatrix} \quad Wk := \begin{pmatrix} 4 \\ 6 \\ 3 \\ 5 \\ 7 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 6 \\ 6 \end{pmatrix}$$

$$Lx_e := X_{(Wk_e)} - X_{(Wp_e)}$$

$$Ly_e := Y_{(Wk_e)} - Y_{(Wp_e)}$$

$$L_e := \sqrt{(Lx_e)^2 + (Ly_e)^2}$$

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

Element $e := 7$

$$Lx_e = 0.5 \text{ m}$$

$$Ly_e = -4.4 \text{ m}$$

$$L_e = 4.428318 \text{ m}$$

$$J_e = \begin{pmatrix} 56.1 & -494.0 \\ -494.0 & 4347.3 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element $e := 8$

$$Lx_e = 2.5 \text{ m}$$

$$Ly_e = 3.015385 \text{ m}$$

$$L_e = 3.916956 \text{ m}$$

$$J_e = \begin{pmatrix} 2028.0 & 2446.1 \\ 2446.1 & 2950.4 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element $\underline{\underline{e}} := 9$

$$Lx_e = 0.5 \text{ m} \quad Ly_e = -4.215385 \text{ m} \quad Le = 4.244934 \text{ m}$$

$$J_e = \begin{pmatrix} 63.7 & -537.3 \\ -537.3 & 4530.0 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element $\underline{\underline{e}} := 10$

$$Lx_e = 3 \text{ m} \quad Ly_e = 2.6 \text{ m} \quad Le = 3.969887 \text{ m}$$

$$J_e = \begin{pmatrix} 2805.1 & 2431.1 \\ 2431.1 & 2106.9 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$