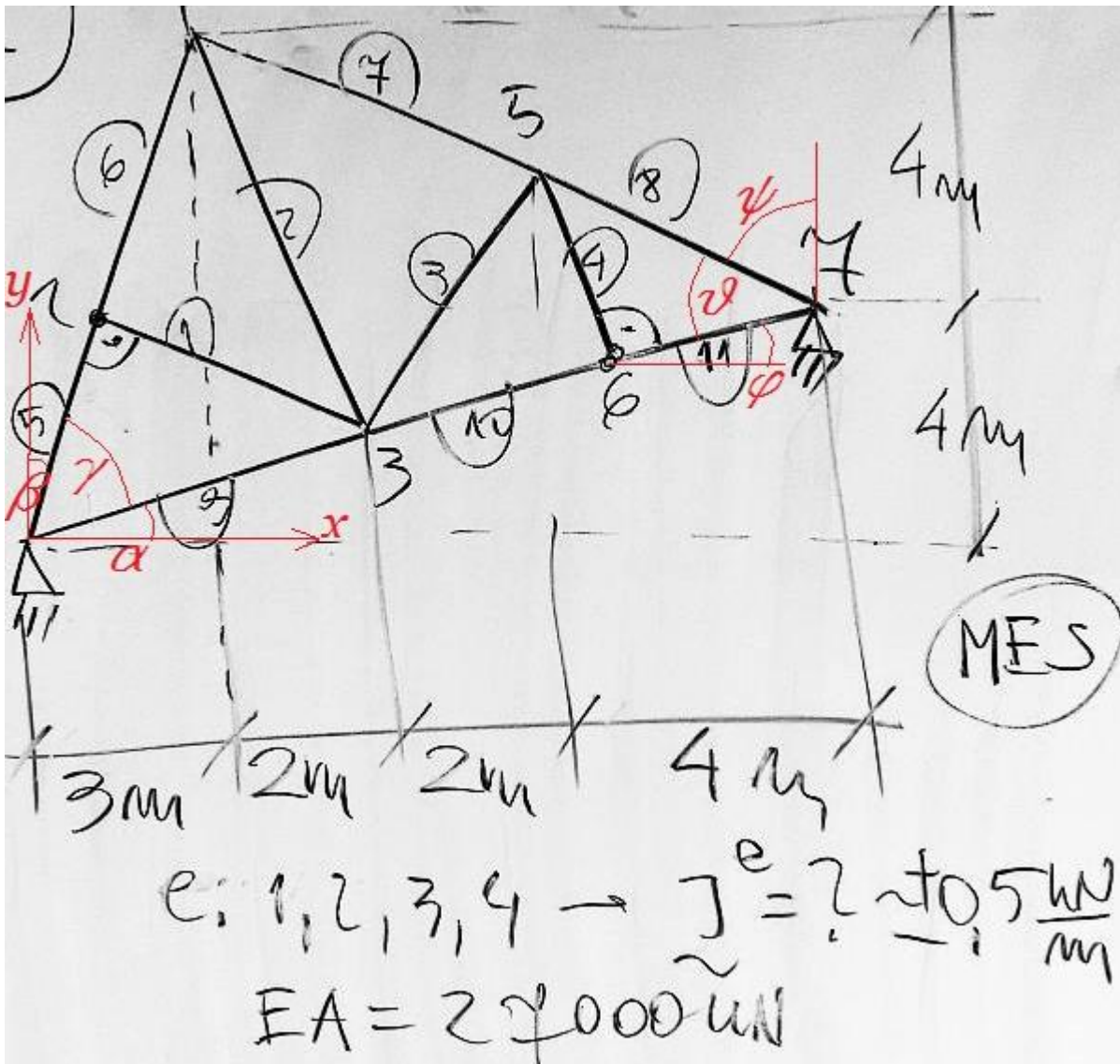


G2 - Macierze sztywności elementów



elementy := (1, 2, 3, 4)

EA := 27MN

dokładność $\pm 0.5 kN/m$

$$\alpha := \operatorname{atan}\left(\frac{4}{11}\right) = 19.983 \cdot \text{deg}$$

$$\beta := \operatorname{atan}\left(\frac{3}{8}\right) = 20.556 \cdot \text{deg}$$

$$\gamma := \frac{\pi}{2} - \alpha - \beta = 49.46085 \cdot \text{deg}$$

$$\varphi := \alpha$$

$$\psi := \operatorname{atan}\left(\frac{8}{4}\right) = 63.435 \cdot \text{deg}$$

$$Y3 := 4m \cdot \frac{5}{11}$$

$$Y5 := 4m + 4m \cdot \frac{4}{8}$$

$$\theta := \frac{\pi}{2} + \varphi - \psi = 46.54816 \cdot \text{deg}$$

$$L9 := \sqrt{(5m)^2 + (Y3)^2} = 5.3203m$$

$$L5 := L9 \cdot \cos(\gamma)$$

$$Y2 := L5 \cdot \cos(\beta) = 3.2379m$$

$$X2 := L5 \cdot \sin(\beta) = 1.2142m$$

$$L8 := \sqrt{(4m)^2 + (Y5 - 4m)^2} = 4.4721m$$

$$L11 := L8 \cdot \cos(\theta) = 3.0757m$$

$$Y6 := 4m - L11 \cdot \sin(\varphi) = 2.9489m$$

$$X6 := 11m - L11 \cdot \cos(\varphi) = 8.1095m$$

Element "1" - blok macierzy sztywności

$$L_x := 5\text{m} - X_2 = 3.7858\text{ m}$$

$$L_y := Y_3 - Y_2 = -1.419676\text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 4.04324\text{ m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 5855 & -2195 \\ (-2195) & 823 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "2" - blok macierzy sztywności

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

$$L_y := 8\text{m} - Y_3 = 6.181818\text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 6.497298\text{ m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 394 & -1217 \\ (-1217) & 3762 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "3" - blok macierzy sztywności

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

$$L_y := Y_5 - Y_3 = 4.181818\text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 4.635472\text{ m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 1084 & 2267 \\ (2267) & 4740 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$

Element "4" - blok macierzy sztywności

$$L_x := X_6 - 7\text{m} = 1.109489\text{ m}$$

$$L_y := Y_6 - Y_5 = -3.051095\text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.246559\text{ m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{bmatrix} 971 & -2671 \\ (-2671) & 7345 \end{bmatrix} \frac{\text{kN}}{\text{m}}$$