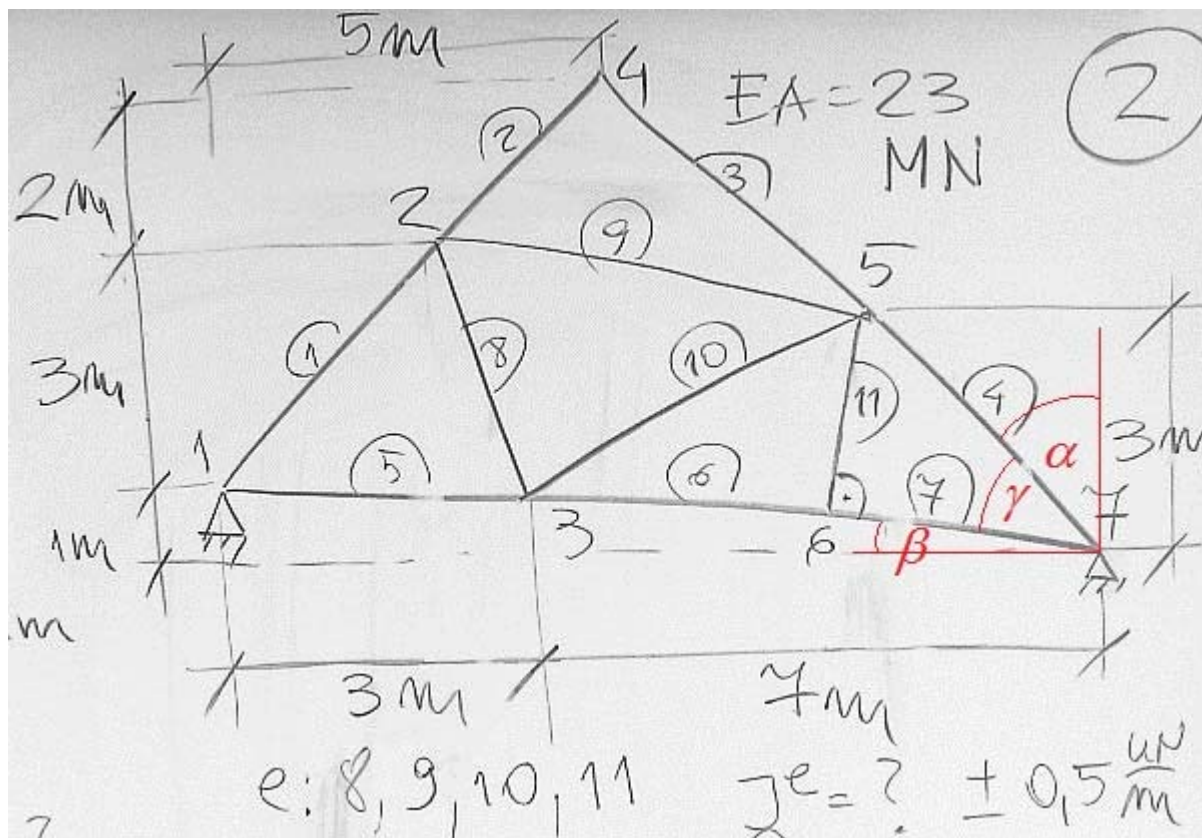


Macierze sztywności elementów kratownicy G2



elementy := (8, 9, 10, 11)

EA := 23MN

dokładność $\pm 0.5 \text{ kN/m}$

$$X2 := 5\text{m} \cdot \frac{3}{5} = 3.00000\text{m} \quad Y3 := -1\text{m} \cdot \frac{3}{10} = -0.30000\text{m} \quad X5 := 10\text{m} - \frac{3 \cdot 5\text{m}}{6} = 7.50000\text{m}$$

$$L_4 := \sqrt{(3\text{m})^2 + (2.5\text{m})^2} = 3.90512\text{m} \qquad \alpha := \text{atan}\left(\frac{5}{6}\right) = 39.80557 \cdot \text{deg}$$

$$\beta := \operatorname{atan}\left(\frac{1}{10}\right) = 5.71059 \cdot \deg \qquad \gamma := \frac{\pi}{2} - \alpha - \beta = 44.48384 \cdot \deg$$

$$L7 := L4 \cdot \cos(\gamma) = 2.78610\text{m} \qquad L11 := L4 \cdot \sin(\gamma) = 2.73635\text{m}$$

$$X6 := 10\text{m} - L7 \cdot \cos(\beta) = 7.22772\text{m} \quad Y6 := -1\text{m} + L7 \cdot \sin(\beta) = -0.72277\text{m}$$

	1	2	3	4	5	6	7	
	$\mathbf{J^{1+J^5}}$	$-\mathbf{J^1}$	$-\mathbf{J^5}$					1
		$\mathbf{J^{1+J^2+J^8+J^9}}$	$-\mathbf{J^8}$	$-\mathbf{J^2}$	$-\mathbf{J^9}$			2
			$\mathbf{J^{5+J^6+J^8+J^{10}}}$		$-\mathbf{J^{10}}$	$-\mathbf{J^6}$		3
				$\mathbf{J^{2+J^3}}$	$-\mathbf{J^3}$			4
K =	Symetria	Symetria	Symetria	Symetria	$\mathbf{J^{3+J^4+J^9+J^{10+J^{11}}}}$	$-\mathbf{J^{11}}$	$-\mathbf{J^4}$	5
						$\mathbf{J^{6+J^7+J^{11}}}$	$-\mathbf{J^7}$	6
							$\mathbf{J^{4+J^7}}$	7

Element "8" - blok macierzy sztywności

$$L_x := 3\text{m} - X_2 = 0.00000\text{m}$$

$$L_y := Y_3 - 3\text{m} = -3.300000\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.3\text{m}$$

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

$$J = \begin{pmatrix} 0 & 0 \\ 0 & 6970 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "9" - blok macierzy sztywności

$$L_x := X_5 - X_2 = 4.50000\text{m}$$

$$L_y := 2\text{m} - 3\text{m} = -1.000000\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 4.609772\text{m}$$

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

$$J = \begin{pmatrix} 4755 & -1057 \\ -1057 & 235 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "10" - blok macierzy sztywności

$$L_x := X_5 - 3\text{m} = 4.50000\text{m}$$

$$L_y := 2\text{m} - Y_3 = 2.300000\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 5.053712\text{m}$$

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

$$J = \begin{pmatrix} 3608 & 1844 \\ 1844 & 943 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "11" - blok macierzy sztywności

$$L_x := X_5 - X_6 = 0.272277\text{m}$$

$$L_y := 2\text{m} - Y_6 = 2.722772\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 2.736352\text{m}$$

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

$$J = \begin{pmatrix} 83 & 832 \\ 832 & 8322 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$