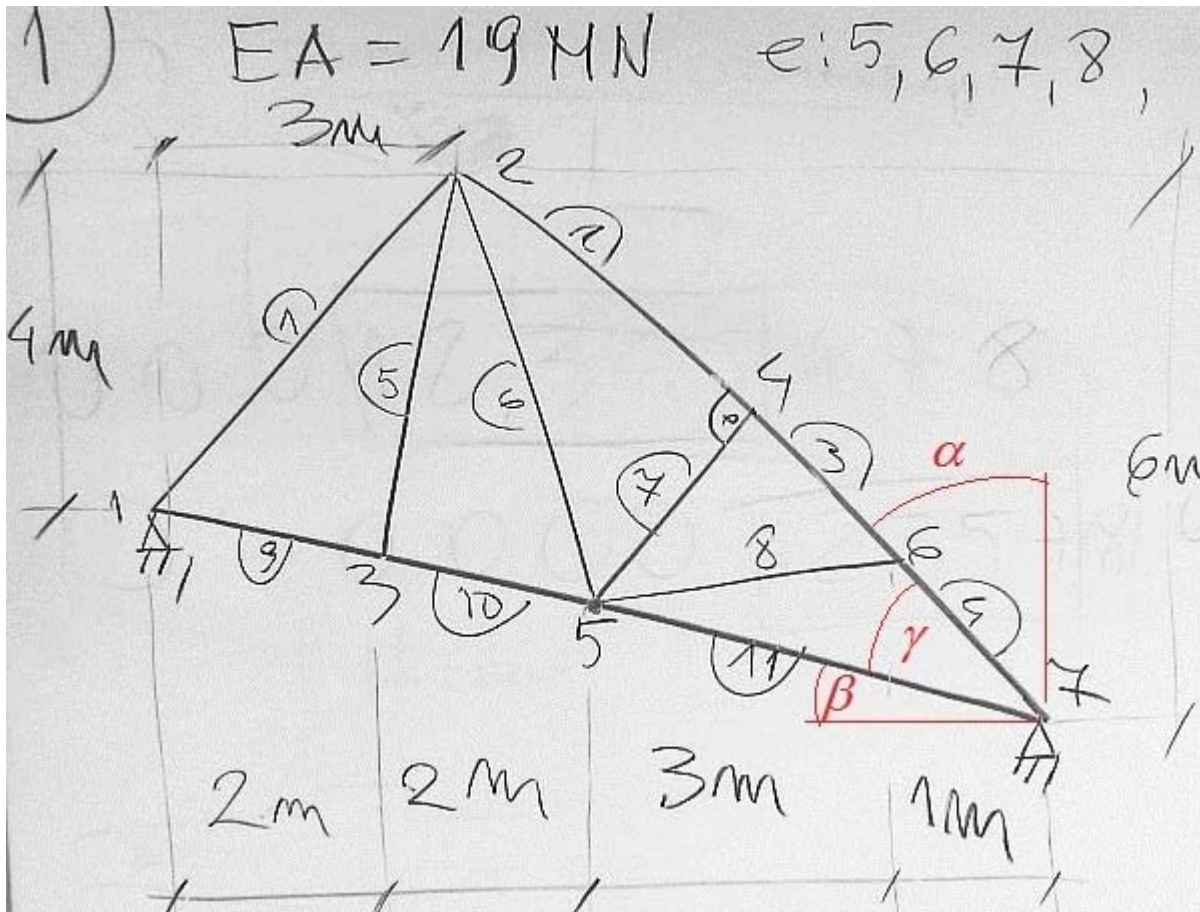


Macierze sztywności elementów kratownicy G1



elementy := (5, 6, 7, 8)

EA := 19 MN

dokładność $\pm 0.5 \text{ kN/m}$

$$Y3 := -2\text{m} \cdot \frac{2}{8} = -0.50000\text{m}$$

$$Y5 := -1\text{m} = -1.00000\text{m}$$

$$Y6 := -2\text{m} + 6\text{m} \cdot \frac{1}{5} = -0.80000\text{m}$$

$$\alpha := \text{atan}\left(\frac{5}{6}\right) = 39.8056 \cdot \text{deg}$$

$$\beta := \text{atan}\left(\frac{2}{8}\right) = 14.0362 \cdot \text{deg}$$

$$\gamma := \frac{\pi}{2} - \alpha - \beta = 36.1582 \cdot \text{deg}$$

$$L11 := \sqrt{(4\text{m})^2 + (1\text{m})^2} = 4.12311\text{m}$$

$$L7 := L11 \cdot \sin(\gamma) = 2.4327\text{m}$$

$$X4 := 4\text{m} + L7 \cdot \cos(\alpha) = 5.86885\text{m}$$

$$Y4 := Y5 + L7 \cdot \sin(\alpha) = 0.55738\text{m}$$

K =

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

Element "5" - blok macierzy sztywności

$$L_x := 1\text{ m} = 1\text{ m}$$

$$L_y := 4\text{ m} - Y_3 = 4.500000\text{ m}$$

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

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

$$J = \begin{pmatrix} 194 & 873 \\ 873 & 3928 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "6" - blok macierzy sztywności

$$L_x := 1\text{ m} = 1\text{ m}$$

$$L_y := Y_5 - 4\text{ m} = -5.000000\text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 5.09902\text{ m}$$

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

$$J = \begin{pmatrix} 143 & -717 \\ -717 & 3583 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "7" - blok macierzy sztywności

$$L_x := X_4 - 4\text{ m} = 1.86885\text{ m}$$

$$L_y := Y_4 - Y_5 = 1.557377\text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 2.432701\text{ m}$$

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

$$J = \begin{pmatrix} 4609 & 3841 \\ 3841 & 3201 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "8" - blok macierzy sztywności

$$L_x := 3\text{ m}$$

$$L_y := Y_6 - Y_5 = 0.200000\text{ m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 3.006659\text{ m}$$

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

$$J = \begin{pmatrix} 6291 & 419 \\ 419 & 28 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$