

2.5

4m
2m
4m
4m
3m

10.5 $\frac{\text{kN}}{\text{m}}$

27
EA
MN

e: 9, 10, 7, 3 K-sch.

$$EA := 27\text{MN}$$

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

Element "3" - blok macierzy sztywności

$$L_x := 4\text{m} \quad L_y := -3\text{m} \cdot \frac{4}{7} = -1.714286\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 4.35187\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 5242 & -2246 \\ -2246 & 963 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "7" - blok macierzy sztywności

$$L_x := 4\text{m} + 4\text{m} \cdot \frac{4}{6} = 6.66667\text{m} \quad L_y := 3\text{m} + 3\text{m} \cdot \frac{3}{7} - 2\text{m} = 2.285714\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 7.047619\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 3428 & 1175 \\ 1175 & 403 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "9" - blok macierzy sztywności

$$L_x := 4\text{m} - 4\text{m} \cdot \frac{2}{6} = 2.66667\text{m} \quad L_y := 3\text{m} \cdot \frac{4}{11} - 2\text{m} = -0.909091\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 2.817367\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 8586 & -2927 \\ -2927 & 998 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$

Element "10" - blok macierzy sztywności

$$L_x := 4\text{m} \quad L_y := 3\text{m} \cdot \frac{3}{7} + 3\text{m} \cdot \frac{7}{11} = 3.194805\text{m}$$

$$L := \sqrt{(L_x)^2 + (L_y)^2} = 5.119256\text{m}$$

$$J := \frac{EA}{(L)^3} \cdot \begin{bmatrix} (L_x)^2 & L_x \cdot L_y \\ L_x \cdot L_y & (L_y)^2 \end{bmatrix} \quad J = \begin{pmatrix} 3220 & 2572 \\ 2572 & 2054 \end{pmatrix} \cdot \frac{\text{kN}}{\text{m}}$$