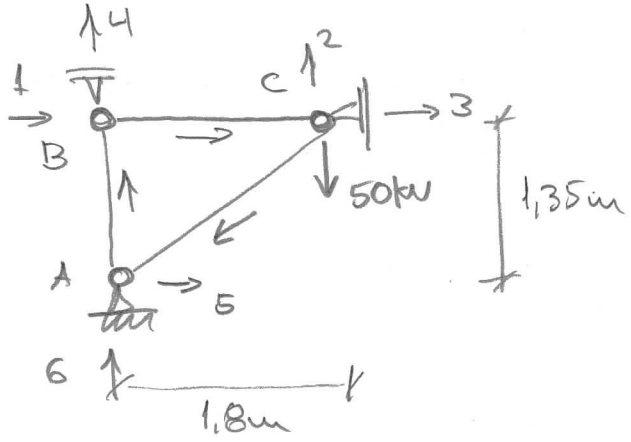
B2T4NA1101B 9,8 PONTOS



- AE = 12000 kN P/ TODAS AS BARRAS
- DESLOC. PRESCRITO DE 3cm P/ A DIREITA NO PONTO A;

Q01) K_{22} DA MATRIZ DE RIGIDEZ GLOBAL EM MÓDULO;

Q02) K_{13} DA MATRIZ DE RIGIDEZ GLOBAL EM MÓDULO;

Q03) REAÇÃO VA (kN ⊕ ↑)

Q04) DESLOC. HORIZ EM B (m → ⊕);

Q05) EST. AXIAL EM $\overline{AC}$; (kN);

BARRA BC: $\lambda x = 1$ $\lambda y = 0$ $L = 1,8$

$$12000 \begin{bmatrix} 5/9 & 0 & -5/9 & 0 \\ 0 & 0 & 0 & 0 \\ -5/9 & 0 & 5/9 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \begin{matrix} 1 \\ 4 \\ 3 \\ 2 \end{matrix}$$

(1 4 3 2)

BARRA AB: $\lambda x = 0$ $\lambda y = 1$ $L = 1,35$

$$12000 \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 20/27 & 0 & -20/27 \\ 0 & 0 & 0 & 0 \\ 0 & -20/27 & 0 & 20/27 \end{bmatrix} \begin{matrix} 5 \\ 6 \\ 1 \\ 4 \end{matrix}$$

(5 6 1 4)

BARRA CA $L = \sqrt{1,8^2 + 1,35^2} = 2,25$

$\lambda x = (0 - 1,8)/2,25 = -0,8$

$\lambda y = (0 - 1,35)/2,25 = -0,6$

$$12000 \begin{bmatrix} 64/225 & 16/75 & -64/225 & -16/75 \\ 16/75 & 4/25 & -16/75 & -4/25 \\ -64/225 & -16/75 & 64/225 & 16/75 \\ -16/75 & -4/25 & 16/75 & 4/25 \end{bmatrix} \begin{matrix} 3 \\ 2 \\ 5 \\ 6 \end{matrix}$$

(3 2 5 6)

$\lambda x^2/2,25 = 64/225$

$\lambda y^2/2,25 = 0,16$

$\lambda x \lambda y / 2,25 = 16/75$

Sistema de Equações Global:

		1	2	3	4	5	6			
	1	5/9	0	-5/9	0	0	0	D1		0
	2	0	4/25	16/75	0	-16/75	-4/25	D2		-50
12000	3	-5/9	16/75	5/9 + 64/225	0	-64/225	-16/75	0	=	R_3
	4	0	0	0	20/27	0	-20/27	0		R_4
	5	0	-16/75	-64/225	0	64/225	16/75	0,03		R_5
	6	0	-4/25	-16/75	-20/27	16/75	20/27 + 4/25	0		R_6

$$K_{11} \cdot D_D + K_{12} \cdot D_C = F_C$$

$$EA \cdot K_{12} \cdot D_C = EA \begin{Bmatrix} 0 \\ \frac{-16}{75} \times 0{,}03 \end{Bmatrix} = \begin{Bmatrix} 0 \\ -76{,}8 \end{Bmatrix}$$

$$F_C - K_{12} \cdot D_C = \begin{Bmatrix} 0 \\ -50 \end{Bmatrix} - \begin{Bmatrix} 0 \\ -76{,}8 \end{Bmatrix} = \begin{Bmatrix} 0 \\ 26{,}8 \end{Bmatrix}$$

$$K_{11} \cdot D_D = F_C - K_{12} \cdot D_C$$

$$D_D = \frac{1}{12000} \begin{bmatrix} 5/9 & 0 \\ 0 & 4/25 \end{bmatrix}^{-1} \begin{Bmatrix} 0 \\ 268 \end{Bmatrix} = \underline{\begin{Bmatrix} 0 \\ 0{,}013958\ m \end{Bmatrix}} \quad Q04$$

$$K_{22} = \frac{4}{25} \times 12000 = 1920\ kN/m \quad Q01$$

$$K_{13} = -\frac{5}{9} \times 12000 = -6666{,}6\ kN/m \quad Q02$$

$$K_{21} \times D_D + K_{22} \times D_C = R$$

$$12000 \begin{Bmatrix} 16/75 \times 0{,}013958 \\ 0 \\ -16/75 \times 0{,}013958 \\ -4/25 \times 0{,}013958 \end{Bmatrix} + 12000 \begin{Bmatrix} -64/225 \times 0{,}03 \\ 0 \\ 64/225 \times 0{,}03 \\ 16/75 \times 0{,}03 \end{Bmatrix} = \begin{Bmatrix} - \\ - \\ - \\ - \\ 50\,kN \end{Bmatrix} Q03$$

ESF AXIAL EM $\bar{AC}$

$$q_F = \frac{12000}{2{,}25} \left[+0{,}8 \;\; +0{,}6 \;\; -0{,}8 \;\; -0{,}6 \right] \begin{Bmatrix} 0 \\ 0{,}013958 \\ 0{,}03 \\ 0 \end{Bmatrix} \begin{matrix} D3 \\ D2 \\ D5 \\ D6 \end{matrix}$$

$$q_{F_{AC}} = \frac{12000}{2{,}25} \left(0{,}6 \times 0{,}013958 - 0{,}8 \times 0{,}03 \right) = -83{,}333\,kN \; Q05$$