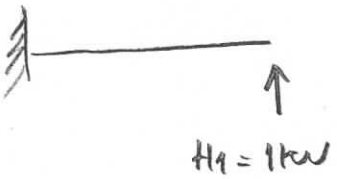
TE2-5.4

ADOTANDO COMO HIPERESTÁTICOS AS REAÇÕES V_C E V_B E RECUPERANDO A CONDIÇÃO DE COMPATIBILIDADE DO EXERCÍCIO 14.1:

$$\frac{1}{EI}\begin{bmatrix} 343/3 & 27 \\ 27 & 9 \end{bmatrix}\begin{Bmatrix} V_C \\ V_B \end{Bmatrix} + \frac{1}{EI}\begin{Bmatrix} -12005/4 \\ -3285/4 \end{Bmatrix} + \begin{Bmatrix} \delta_{T1} \\ \delta_{T2} \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$$

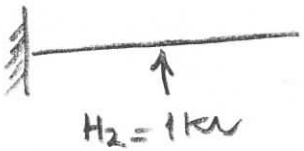
CASO 1



M_1



CASO 2



M_2



$$grad(T) = \frac{\Delta T^i - \Delta T^s}{h} = \frac{5°C - 35°C}{0{,}6m} = -50\,°C/m$$

$$\delta_{T1} = \int_0^7 M_1 \cdot \alpha\, grad(T)\, dx = \frac{7\times 7}{2} \times 1e10^{-5} \times -50 = -0{,}01225$$

$$\delta_{T2} = \int_0^7 M_2 \cdot \alpha\, grad(T)\, dx = \frac{3\times 3}{2} \times 1e10^{-5} \times -50 = -0{,}00225$$

$$\frac{1}{EI}\begin{bmatrix} 343/3 & 27 \\ 27 & 9 \end{bmatrix}\begin{Bmatrix} V_C \\ V_B \end{Bmatrix} + \frac{1}{EI}\begin{Bmatrix} -\frac{12005}{4} \\ -\frac{3285}{4} \end{Bmatrix} + \begin{Bmatrix} -0{,}01225 \\ -0{,}00225 \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$$

$$EI = 72000\ kNm^2$$

MULTIPLICANDO TODOS OS TERMOS POR $EI = 72000\ kNm^2$

$$\begin{bmatrix} 343/3 & 27 \\ 27 & 9 \end{bmatrix} \begin{Bmatrix} V_C \\ V_B \end{Bmatrix} + \begin{Bmatrix} -12005/4 \\ -3285/4 \end{Bmatrix} + \begin{Bmatrix} -882 \\ -162 \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$$

$$\begin{bmatrix} 343/3 & 27 \\ 27 & 9 \end{bmatrix} \begin{Bmatrix} V_C \\ V_B \end{Bmatrix} = \begin{Bmatrix} 15533/4 \\ 3933/4 \end{Bmatrix}$$

$V_C = 5601/200 = 28{,}005\ kN \uparrow$

$V_B = 5047/200 = 25{,}235\ kN \uparrow$

SOBREPOSIÇÃO DE EFEITOS:

$$E_A = E_{A0} + E_{A1} \times H_1 + E_{A2} \times H_2$$

$M_A = -245 + 7 \times 28{,}005 + 3 \times 25{,}235 = +26{,}74\ kNm$

$V_A = 70 - 1 \times 28{,}005 - 1 \times 25{,}235 = +16{,}76\ kN$