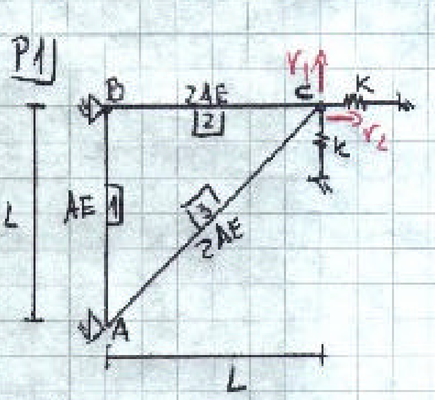
P1

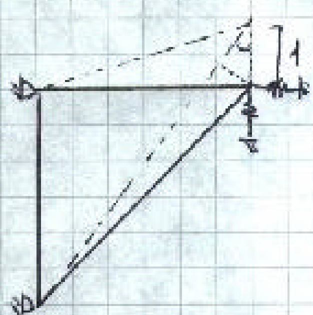


Calcule los esfuerzos normales de todas las barras para:

a) Todas las barras tienen un ΔT

b) En el nodo C hay una carga vertical hacia abajo igual a P.

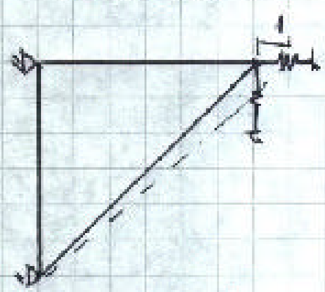
$r_1 = 1 \quad r_2 = 0$



$$K_{11} = k + \left(\frac{\sqrt{2}}{2}\right)^2 \frac{AE}{L\sqrt{2}}\,2 = \left(2 + \frac{\sqrt{2}}{2}\right)\frac{AE}{L}$$

$$K_{12} = \left(\frac{\sqrt{2}}{2}\right)^2 \frac{AE}{L\sqrt{2}}\,2 = \frac{\sqrt{2}}{2}\,\frac{AE}{L}$$

$r_1 = 0 \quad r_2 = 1$



$$K_{22} = k + \frac{2AE}{L} + \left(\frac{\sqrt{2}}{2}\right)^2 \frac{AE}{L\sqrt{2}}\,2 = \left(4 + \frac{\sqrt{2}}{2}\right)\frac{AE}{L}$$

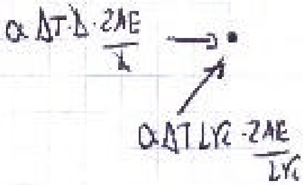
$$K_{21} = \left(\frac{\sqrt{2}}{2}\right)^2 \frac{2AE}{L\sqrt{2}} = \frac{\sqrt{2}}{2}\,\frac{AE}{L}$$

$$\Rightarrow [K] = \frac{AE}{L}\begin{bmatrix} \left(2+\frac{\sqrt{2}}{2}\right) & \frac{\sqrt{2}}{2} \\ \frac{\sqrt{2}}{2} & \left(4+\frac{\sqrt{2}}{2}\right) \end{bmatrix} \Rightarrow [K]^{-1} = \frac{L}{AE}\begin{bmatrix} 0{,}385 & -0{,}058 \\ -0{,}058 & 0{,}221 \end{bmatrix}$$

Vector de carga

Caso a) Todas las barras sometidas a un $\Delta T = 20°C$

Nudo C)



$$\Rightarrow R = 2AE\alpha\Delta T \begin{Bmatrix} \frac{\sqrt{2}}{2} \\ 1+\frac{\sqrt{2}}{2} \end{Bmatrix}$$

$$\{r\} = [K]^{-1}\{R\} = \frac{L}{AE}\,\alpha\Delta T\, 2AE \begin{bmatrix} 0{,}385 & -0{,}058 \\ -0{,}058 & 0{,}221 \end{bmatrix} \begin{Bmatrix} 0{,}7071 \\ 1{,}7071 \end{Bmatrix}$$

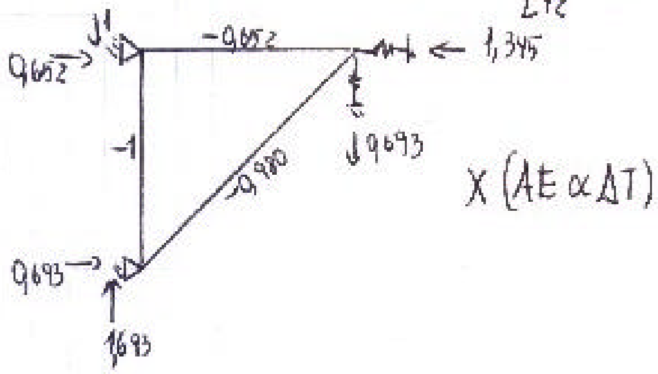
$$\begin{Bmatrix} r_1 \\ r_2 \end{Bmatrix} = 2\alpha\Delta T L \begin{Bmatrix} 0{,}173 \\ 0{,}337 \end{Bmatrix}$$

Esfuerzos axiales

$$N_1 = -AE\alpha\Delta T$$

$$N_2 = -2AE\alpha\Delta T + \frac{2AE}{L}\alpha\Delta T\, 2L\, 0{,}337 = -0{,}652\ AE\alpha\Delta T$$

$$N_3 = -2AE\alpha\Delta T + \alpha\Delta T\, 2L\, \frac{2AE}{L\sqrt{2}}\,(0{,}173+0{,}337)\frac{\sqrt{2}}{2} = -0{,}98\ AE\alpha\Delta T$$



b) Vector de carga producido por P en C

$$\Rightarrow \quad R = \begin{Bmatrix} -P \\ 0 \end{Bmatrix}$$

$$\{r\} = [K]^{-1}\{R\} = \frac{PL}{AE}\begin{Bmatrix} -0{,}385 \\ 0{,}058 \end{Bmatrix} = \begin{Bmatrix} r_1 \\ r_2 \end{Bmatrix}$$

$$N_1 = 0$$

$$N_2 = \frac{2AE}{L}\,\frac{PL}{AE}\cdot 0{,}058 = 0{,}116\,P$$

$$N_3 = \frac{2AE}{L\sqrt{2}}\cdot\frac{PL}{AE}\left(-0{,}385\left(\frac{\sqrt{2}}{2}\right) + 0{,}058\,\frac{\sqrt{2}}{2}\right) = -0{,}327\,P$$