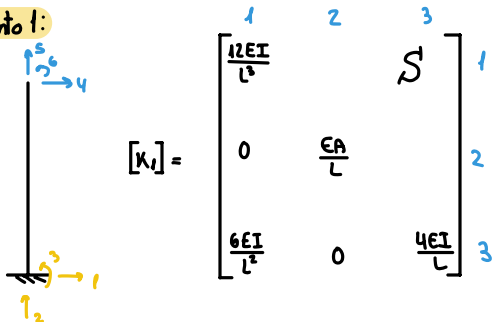


$$-\{FEP\} = \begin{Bmatrix} \frac{3P}{2} \\ \frac{P}{2} \\ 0 \\ 0 \\ -\frac{P}{2} \\ -\frac{P}{2} \end{Bmatrix} \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{matrix}$$

Matriz de rigidez

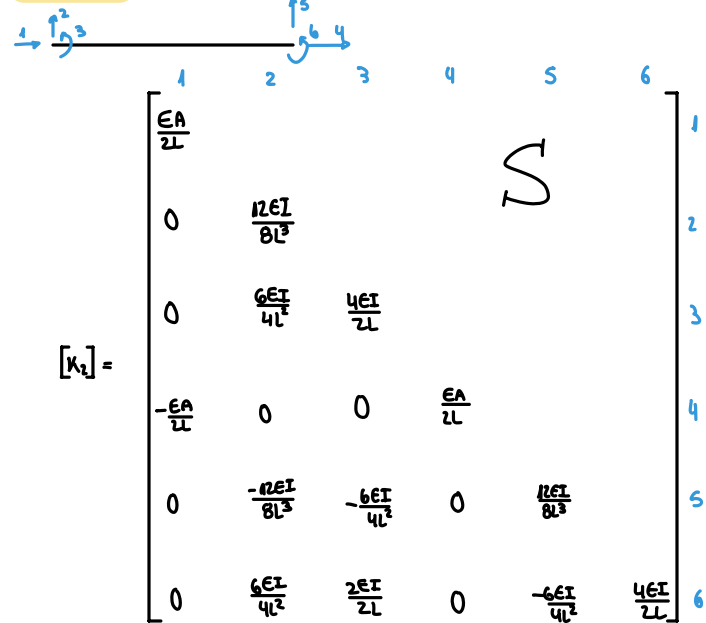
Elemento 1:



$$[K_1] = \begin{bmatrix} \frac{12EI}{L^3} & 0 & \frac{6EI}{L^2} \\ 0 & \frac{EA}{L} & 0 \\ \frac{6EI}{L^2} & 0 & \frac{4EI}{L} \end{bmatrix} \begin{matrix} 1 \\ 2 \\ 3 \end{matrix} \begin{matrix} 4 \\ 5 \\ 6 \end{matrix}$$

Elemento 3: Rigidez igual a la del elemento 1!

Elemento 2:



$$[K_2] = \begin{bmatrix} \frac{EA}{2L} & 0 & 0 & -\frac{EA}{2L} & 0 & 0 \\ 0 & \frac{12EI}{8L^3} & \frac{6EI}{4L^2} & 0 & -\frac{12EI}{8L^3} & \frac{6EI}{4L^2} \\ 0 & \frac{6EI}{4L^2} & \frac{4EI}{2L} & 0 & -\frac{6EI}{4L^2} & \frac{2EI}{2L} \\ -\frac{EA}{2L} & 0 & 0 & \frac{EA}{2L} & 0 & 0 \\ 0 & -\frac{12EI}{8L^3} & -\frac{6EI}{4L^2} & 0 & \frac{12EI}{8L^3} & -\frac{6EI}{4L^2} \\ 0 & \frac{6EI}{4L^2} & \frac{2EI}{2L} & 0 & -\frac{6EI}{4L^2} & \frac{4EI}{2L} \end{bmatrix} \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{matrix}$$

$$[K_0] = \begin{bmatrix} \frac{12EI}{L^3} + \frac{EA}{2L} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{12EI}{8L^3} + \frac{EA}{L} & \frac{6EI}{4L^2} & 0 & 0 & 0 \\ \frac{6EI}{L^2} & \frac{6EI}{4L^2} & \frac{6EI}{L} & 0 & 0 & 0 \\ -\frac{EA}{2L} & 0 & 0 & \frac{12EI}{L^3} + \frac{EA}{2L} & 0 & 0 \\ 0 & -\frac{12EI}{8L^3} & -\frac{6EI}{4L^2} & 0 & \frac{12EI}{8L^3} + \frac{EA}{L} & 0 \\ 0 & \frac{6EI}{4L^2} & \frac{2EI}{2L} & \frac{6EI}{L^2} & -\frac{6EI}{4L^2} & \frac{6EI}{L} \end{bmatrix}$$

Efecto de la temperatura

$$\{f_T\}^{(e)} = -\{FE_T\}^{(e)} = \frac{EI\alpha(\Delta T_i - \Delta T_o)}{h} \cdot \begin{Bmatrix} 0 \\ 0 \\ -1 \\ 0 \\ 0 \\ 1 \end{Bmatrix}$$

Efecto del Asentamiento:

$$[K_{FP}] = \begin{Bmatrix} 0 \\ -\frac{EA}{L} \\ 0 \end{Bmatrix}$$

Planteamiento final de la ecuación

$$\begin{bmatrix} \frac{12EI}{L^3} + \frac{EA}{2L} & & & & & & \\ 0 & \frac{12EI}{8L^3} + \frac{EA}{L} & & & & & \\ \frac{6EI}{L^2} & \frac{6EI}{4L^2} & \frac{6EI}{L} & & & & \\ -\frac{EA}{L} & 0 & 0 & \frac{12EI}{L^3} + \frac{EA}{2L} & & & \\ 0 & -\frac{12EI}{8L^3} & -\frac{6EI}{4L^2} & 0 & \frac{12EI}{8L^3} + \frac{EA}{L} & & \\ 0 & \frac{6EI}{4L^2} & \frac{2EI}{2L} & \frac{6EI}{L^2} & -\frac{6EI}{4L^2} & \frac{6EI}{L} & \end{bmatrix} \cdot \begin{Bmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \\ u_6 \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ -2PL \end{Bmatrix} - \begin{Bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ -\frac{EA}{L} \end{Bmatrix} \cdot \delta + \frac{EI\alpha(\Delta T_i - \Delta T_o)}{h} \cdot \begin{Bmatrix} 0 \\ 0 \\ -1 \\ 0 \\ 0 \\ 1 \end{Bmatrix} + \begin{Bmatrix} \frac{3P}{2} \\ -\frac{P}{2} \\ 0 \\ 0 \\ -\frac{P}{2} \\ \frac{P}{4} \end{Bmatrix}$$