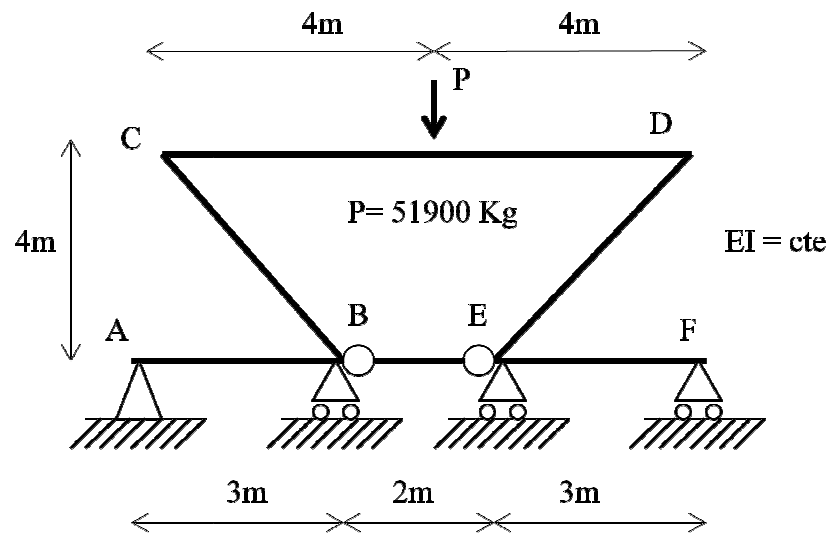


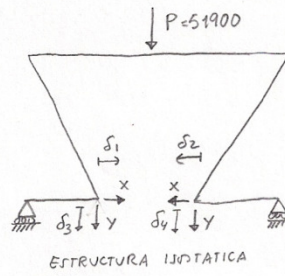
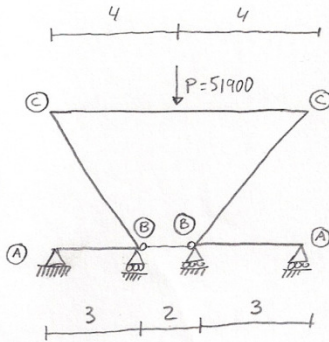
Ejercicio 6: estructura hiperestática por compatibilidad



Suponiendo la barra BE indeformable, determinar con el método de la carga unitaria:

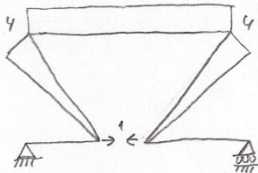
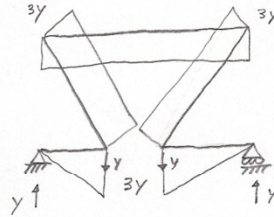
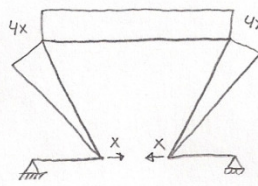
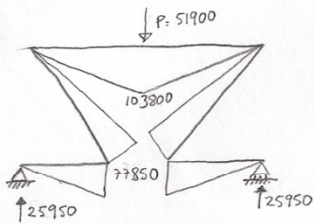
- El esfuerzo de la barra BE
- Las reacciones en los apoyos A y B
- Los diagramas de momentos y de cortantes
- Los giros de A y de C

Solución



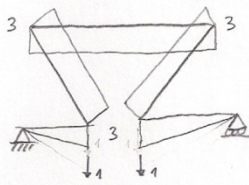
ECUACIONES DE COMPATIBILIDAD =

$$\begin{cases} \delta_1 + \delta_2 = 0 \\ \frac{\delta_3 + \delta_4}{2} = 0 \end{cases}$$



$$\delta_1 + \delta_2 = 0$$

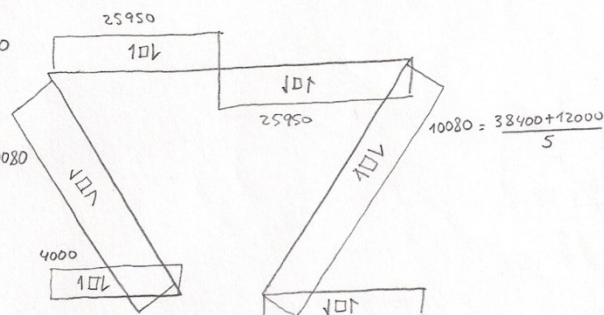
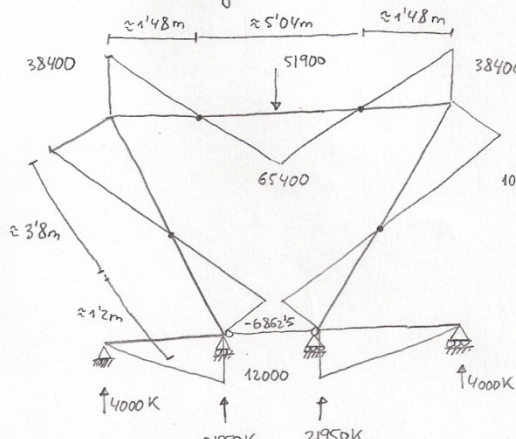
$$\begin{aligned} & -\frac{1}{6EI} \cdot \frac{3}{2} \cdot 51900 \cdot 4.5.2 - \frac{1}{2EI} \cdot 4.2 \cdot 51900 \cdot 8 + \frac{1}{3EI} \cdot 4x \cdot 4.5.2 + \frac{1}{EI} \cdot 4x \cdot 4.8 \\ & - \frac{1}{2EI} \cdot 3y \cdot 4.5.2 - \frac{1}{EI} \cdot 3y \cdot 4.8 = 0 \rightarrow 136x - 117y = 1634850 \end{aligned}$$



$$\delta_3 + \delta_4 = 0$$

$$\begin{aligned} & \frac{1}{3EI} \cdot \frac{3}{2} \cdot 51900 \cdot 3.3.2 + \frac{1}{2EI} \cdot \frac{3}{2} \cdot 51900 \cdot 3.5.2 + \frac{1}{2EI} \cdot 2 \cdot 51900 \cdot 3.8 \\ & - \frac{1}{2EI} \cdot 4x \cdot 3.5.2 - \frac{1}{EI} \cdot 4x \cdot 3.8 + \frac{1}{3EI} \cdot 3y \cdot 3.3.2 + \frac{1}{EI} \cdot 3y \cdot 3.5.2 + \frac{1}{EI} \cdot 3y \cdot 3.8 = 0 \rightarrow \\ & \rightarrow 52x - 60y = 960150 \rightarrow 26x - 30y = 480075 \end{aligned}$$

$$\begin{cases} 136x - 117y = 1634850 \\ 26x - 30y = 480075 \end{cases} \Rightarrow \begin{cases} x = -68625 \text{ kg} \\ y = -24950 \text{ kg} \end{cases}$$



LOCALIZACIÓN DE LOS PUNTO DE INFLEXIÓN =

$$\frac{38400 + 65400}{4} = 38400 \rightarrow d \approx 1'48m \quad \frac{33700 + 12000}{5} = \frac{12000}{d'} \rightarrow d' \approx 1'2m$$

$$\begin{aligned} 20 &= \frac{1}{2EI} \cdot 103800 \cdot 8 + \frac{27450 \cdot 8}{EI} - \frac{1}{EI} \cdot 65380 \cdot 8 \\ &= \frac{103800}{EI} \rightarrow \theta_C = \frac{54000}{EI} \\ \theta_A &= -\frac{1}{6EI} \cdot 12000 \cdot 1.3 = -\frac{6000}{EI} \end{aligned}$$