

Exercici 1

a)

$$\Delta L = L_0 \alpha \Delta T = 0,5 \cdot 18,7 \cdot 10^{-6} \cdot 40 = 0,000374$$

b)

$$\sigma = \frac{F}{A}; \quad \varepsilon = \frac{\Delta L}{L_0}; \quad \sigma = E\varepsilon$$

$$\begin{aligned} F &= \sigma A \\ &= E\varepsilon A \\ &= E \frac{\Delta L}{L_0} A \\ &= E\alpha\Delta T A \\ &= 207 \cdot 10^9 \cdot 18,7 \cdot 10^{-6} \cdot 40 \frac{\pi(20 \cdot 10^{-3})^2}{4} = 48643,16 \text{ N} \end{aligned}$$

Exercici 2

a)

$$P = \frac{\lambda \cdot S \cdot \Delta T}{e} = \frac{1,7 \cdot 1,5 \cdot 12}{0,01} = 3060 \text{ W}$$

b)

$$Q = P \cdot t = 3,06 \text{ kW} \cdot 8 \text{ h} = 24,48 \text{ kW} \cdot \text{h}$$

Exercici 3

$$\Delta L = L_0 \alpha \Delta T = 1 \cdot 2 \cdot 10^{-5} \cdot 100 = 2 \cdot 10^{-3} \text{ m}$$

Exercici 4

$$\sigma = \frac{F}{A} \rightarrow F_{max} = A\sigma_r = \frac{\pi d^2}{4} \sigma = \frac{\pi(3)^2}{4} \cdot 800 = 5654,87 \text{ N}$$

Exercici 5

$$\sigma = \frac{F}{A} \rightarrow A = \frac{F}{\sigma} \rightarrow \pi \frac{d^2}{4} = \frac{F}{\sigma} \rightarrow d = \sqrt{\frac{4F}{\pi\sigma}} = \sqrt{\frac{4 \cdot 1400}{\pi \cdot 85}} = 4,58 \text{ mm}$$

Exercici 6

$$A = \frac{F}{\sigma} = \frac{45 \cdot 10}{67} = 6,716 \text{ mm}^2$$

Exercici 7

$$0,001 = \frac{\Delta L}{L_0} = \alpha \Delta T$$

$$\Delta T = \frac{0,001}{\alpha}$$

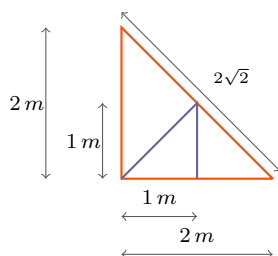
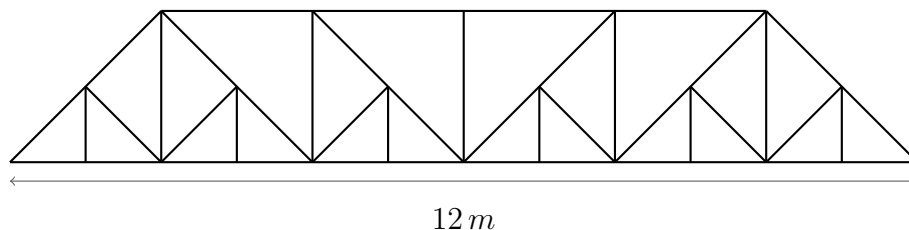
$$T_f - T_i = \frac{0,001}{\alpha}$$

$$T_f = T_i + \frac{0,001}{\alpha}$$

$$T_f = 20 + \frac{0,001}{17,3 \cdot 10^{-6}} = 77,8^\circ \text{C}$$

Exercici 8

A partir de l'estructura general i amb la informació que ens donen, es poden deduir les mesures de les parts que la formen.



D'aquesta manera podem comptar

- 15 segments de longitud $2 m$
- 6 segments de longitud $2\sqrt{2} m$
- 6 segments de longitud $1 m$
- 6 segments de longitud $\sqrt{2} m$

La longitud total serà doncs

$$L = 15 \cdot 2 + 6 \cdot 2\sqrt{2} + 6 \cdot 1 + 6\sqrt{2} = 61,46 m$$

El volum total

$$V = A \cdot L = 10 \cdot 10^{-4} \cdot 61,46 = 0,06146 m^3$$

i finalment, la massa total

$$m = \rho V = 7850 \cdot 0,06146 = 482,43 kg$$

i el pes

$$P = mg = 482,43 \cdot 9,8 = 4727,8 N$$