Exercici 1

a)

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

b)

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

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

Exercici 2

a)

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

b)

$$Q = P \cdot t = 3,06\, kW \cdot 8\, h = 24,48\, KW \cdot h$$

Exercici 3

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

Exercici 4

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

Exercici 5

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

Exercici 6

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

Exercici 7

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

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

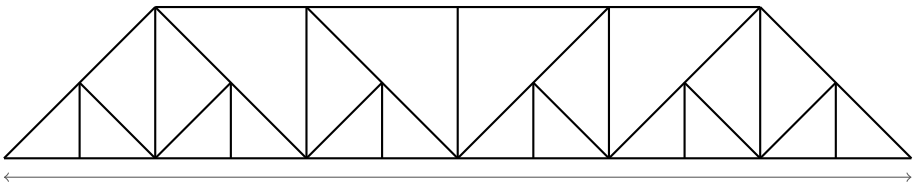
$$T_f - T_i = \frac{0,001}{\alpha}$$

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

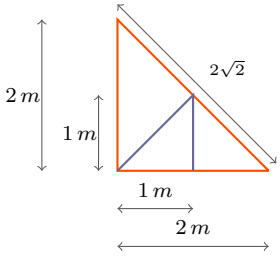
$$T_f = 20 + \frac{0,001}{17,3 \cdot 10^{-6}} = 77,8\,^\circ C$$

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.



$12\,m$



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

$$L = 15 \cdot 2 + 6\sqrt{2} + 6 \cdot 1 + 6\frac{\sqrt{2}}{2} = 48,728\,m$$

El volum total

$$V = A \cdot L = 10 \cdot 10^{-4} \cdot 48,728 = 0,04873\,m^3$$

i finalment, la massa total

$$m = \rho V = 7850 \cdot 0,04873 = 382,5\,kg$$