

1.

(1)

応力

$$\sigma = \frac{P}{A}$$

ひずみ

$$\varepsilon = \frac{\lambda}{l}$$

(2)

伸び

$$\lambda = \varepsilon l = \frac{\sigma l}{E} = \frac{Pl}{EA}$$

2. 以下の問題を解きなさい。

(1)

$$\sigma = \frac{P}{A} = \frac{P}{\frac{\pi}{4}d^2} = \frac{4P}{\pi d^2}$$

$$d = \sqrt{\frac{4P}{\pi\sigma}} = \sqrt{\frac{4 \times 200 \times 10^3}{\pi \times 300 \times 10^6}} = 0.0291 \text{ [m]} = 29.1 \text{ [mm]}$$

(2)

①

$$d = \sqrt{\frac{4P}{\pi\sigma}} = \sqrt{\frac{4 \times 100 \times 10^3}{\pi \times 100 \times 10^6}} = 0.0357 \text{ [m]} = 35.7 \text{ [mm]}$$

②

$$\lambda = \frac{Pl}{EA} = \frac{Pl}{E \frac{\pi}{4}d^2} = \frac{4Pl}{\pi E d^2}$$

$$d = \sqrt{\frac{4Pl}{\pi E \lambda}} = \sqrt{\frac{4 \times 100 \times 10^3 \times 2}{\pi \times 70 \times 10^9 \times 0.3 \times 10^{-3}}} = 0.110 \text{ [m]} = 110 \text{ [mm]}$$