

Problems for Chapter 1

$$E := 206 \cdot 10^9$$

1

$$d := \frac{4}{100}$$

$$L := \frac{500}{100}$$

$$u := \frac{0.1}{100}$$

$$\varepsilon := \frac{u}{L}$$

$$\sigma := E \cdot \varepsilon$$

$$\sigma = 4.12 \cdot 10^7$$

$$A := \frac{\pi \cdot d^2}{4}$$

$$P := \sigma \cdot A$$

$$P = 5.177 \cdot 10^4$$

N

2

$$d := \frac{2}{100}$$

$$L := \frac{300}{100}$$

$$P := 24000$$

$$A := \frac{\pi \cdot d^2}{4}$$

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

$$\sigma = 7.639 \cdot 10^7$$

$$\varepsilon := \frac{\sigma}{E}$$

$$\varepsilon = 3.708 \cdot 10^{-4}$$

$$u := \varepsilon \cdot L$$

$$u = 1.113 \cdot 10^{-3}$$

m

3

$$E_c := E \cdot \frac{3}{5}$$

$$E_c = 1.236 \cdot 10^{11}$$

4

$$P := \frac{40000}{2}$$

$$\sigma := 60000000$$

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

$$d := \sqrt{\frac{4}{\pi} \cdot A}$$

$$d = 0.021 \quad \text{m}$$

$$\varepsilon := \frac{\sigma}{E}$$

$$L := 1$$

$$u := \varepsilon \cdot L$$

$$u = 2.913 \cdot 10^{-4}$$

m

5

$$P := 40000$$

$$A := \frac{50}{10000}$$

$$P1 := \frac{P}{2 \cdot \sin\left(\frac{\pi}{4}\right)}$$

$$P1 = 2.828 \cdot 10^4 \text{ N}$$

$$S := \frac{P1}{A}$$

$$S = 5.657 \cdot 10^6$$

Pa

$$6 \quad P := 100000 \quad A := \frac{50}{10000}$$

$$\text{AB} \quad P_{ab} := \frac{P}{\sin\left(\frac{\pi}{6}\right)} \quad P_{ab} = 2 \cdot 10^5 \quad \sigma_{ab} := \frac{P_{ab}}{A} \quad \sigma_{ab} = 4 \cdot 10^7 \quad \text{Pa}$$

$$\text{BC} \quad P_{bc} := P_{ab} \cdot \cos\left(\frac{\pi}{6}\right) \quad P_{bc} = 1.732 \cdot 10^5 \quad \sigma_{bc} := \frac{P_{bc}}{A} \quad \sigma_{bc} = 3.464 \cdot 10^7 \quad \text{Pa}$$

7

$$P := 20000 \quad \theta := \frac{\pi}{6}$$

$$P_1 := \frac{P}{2 \cdot \sin(\theta)} \quad P_1 = 2 \cdot 10^4 \quad \sigma_{al} := 50 \cdot 10^6 \quad A := \frac{P_1}{\sigma_{al}}$$

$$A = 4 \cdot 10^{-4} \quad \text{m}^2$$

8

$$P := 24000$$

$$P_{ab} := P \cdot \frac{5}{3} \quad P_{ab} = 4 \cdot 10^4 \quad \sigma_{al} := 60 \cdot 10^6 \quad A := \frac{P_{ab}}{\sigma_{al}} \quad A = 6.667 \cdot 10^{-4} \quad \text{m}^2$$

$$P_{bc} := P \cdot \frac{4}{3} \quad P_{bc} = 3.2 \cdot 10^4 \quad \sigma_{al} := 60 \cdot 10^6 \quad A := \frac{P_{bc}}{\sigma_{al}} \quad A = 5.333 \cdot 10^{-4} \quad \text{m}^2$$

9

$$\varepsilon_{ab} := \frac{1.011}{1000} \quad \varepsilon_{bc} := \frac{-2.023}{1000} \quad A := \frac{4}{10000} \quad E := 206 \cdot 10^9$$

$$P_{ab} := E \cdot \varepsilon_{ab} \cdot A \quad P_{ab} = 8.331 \cdot 10^4 \quad P_{bc} := E \cdot \varepsilon_{bc} \cdot A \quad P_{bc} = -1.667 \cdot 10^5$$

$$P_{AB} := P_{ab} \cdot \begin{bmatrix} 1 \\ 0 \end{bmatrix} \quad P_{AB} = \begin{bmatrix} 8.331 \cdot 10^4 \\ 0 \end{bmatrix} \quad P_{BC} := P_{bc} \cdot \begin{bmatrix} \frac{4}{5} \\ \frac{3}{5} \end{bmatrix} \quad P_{BC} = \begin{bmatrix} -1.334 \cdot 10^5 \\ -1 \cdot 10^5 \end{bmatrix}$$

$$P := P_{AB} + P_{BC} \quad P = \begin{bmatrix} -5.005 \cdot 10^4 \\ -1 \cdot 10^5 \end{bmatrix}$$