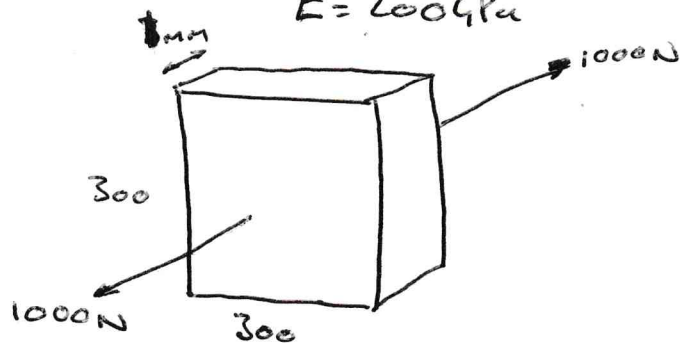


QUESTION 3

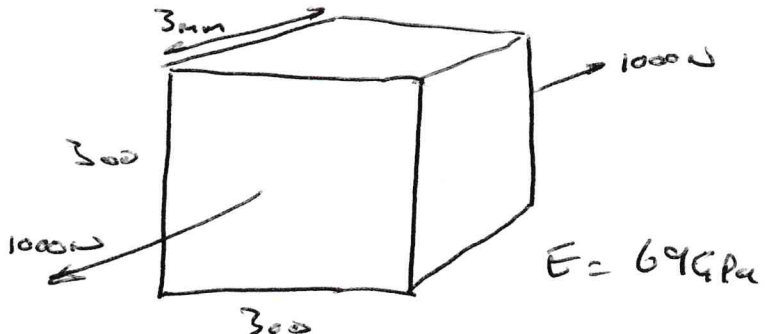
a)

STEEL

$E = 200 \text{ GPa}$



ALUMINIUM



$E = 69 \text{ GPa}$

$$E = \frac{\text{FORCE}}{\text{AREA}} \times \frac{\Delta L}{L}$$

$$\Delta L = \frac{FL}{AE}$$

$$\Delta L = \frac{1000 \times 0.001}{(0.03 \times 0.03) \times 200 \times 10^9}$$

$$= \frac{1}{18 \times 10^7}$$

$$\Delta L = 5.56 \times 10^{-9} \text{ m}$$

$$\Delta L = \frac{FL}{AE}$$

$$= \frac{1000 \times 0.003}{(0.03 \times 0.03) \times 69 \times 10^9}$$

$$= \frac{3}{621000000}$$

$$\Delta L = 4.8 \times 10^{-8} \text{ m}$$

$$\text{RESILANCE} = \frac{\sigma^2}{2E}$$

$$= \frac{\left(\frac{1000}{(0.03 \times 0.03)} \right)^2}{2 \times 200 \times 10^9}$$

$$= \frac{10000000}{4 \times 10^{11}}$$

$$= 2.5 \times 10^{-6}$$

$$= \frac{\sigma^2}{2E}$$

$$= \frac{\left(\frac{1000}{(0.03 \times 0.03)} \right)^2}{2 \times 69 \times 10^9}$$

$$= \frac{10000000}{1.38 \times 10^{11}}$$

$$= 7.2 \times 10^{-6}$$

ALUMINIUM HAS HIGHER STIFFNESS