10.12a) $F_{buckle} = \dfrac{\pi^2 E I}{L^2}$

$$= \frac{\pi^2 \times 200 \times 10^9 \times \frac{1}{12}(12 \times 10^{-3})^4}{(1.5)^2}$$

$$= 1515.971236 \, N$$

$$\approx 1516 \, N$$

b) $1515.971236 = \dfrac{\pi^2 \times 70 \times 10^9 \times \frac{d^4}{12}}{1.5^2}$

$$d = 0.0156014 2382 \, m$$

$$\approx 15.6 \, mm$$

c) Percentage $= \dfrac{15.6^2 \times 1.5 \times 2800}{12^2 \times 1.5 \times 7860}$

$$= 60.2145525 \, \%$$

$$\approx 60.2 \, \%$$

10.22) $F_{buckle} = \dfrac{\pi^2 EI}{L^2}$

$2.2 \times 60 \times 10^3 = \dfrac{\pi^2 \times 200 \times 10^9 \times 4.73 \times 10^{-6}}{(0.7L)^2} \rightarrow$ Fixed - pinned

$L = 12.01463095$

$\approx 12.01\,m$