

6 Deformation of solids – Part 2 — Answers

Answers

6.1 (a) series: $\frac{1}{k} = \frac{1}{30} + \frac{1}{30} = \frac{2}{30}$, so $k = 15 \text{ N m}^{-1}$.

(b) parallel: $k = 30 + 30 = 60 \text{ N m}^{-1}$.

6.2 It stays permanently longer (it does not return to its original length).

6.3 $E = \frac{FL_0}{Ax} = \frac{18 \times 2.0}{(3.0 \times 10^{-7})(0.60 \times 10^{-3})} = 2.0 \times 10^{11} \text{ Pa}.$

6.4 So the extension is large enough to measure accurately (a small extension would have a large percentage uncertainty).

6.5 $A = \frac{\pi d^2}{4} = \frac{\pi(0.40 \times 10^{-3})^2}{4} = 1.3 \times 10^{-7} \text{ m}^2.$

6.6 The area depends on d^2 , so the percentage uncertainty in the area is *twice* the percentage uncertainty in d . Since E depends on the area (through A), that doubled uncertainty carries straight into E — whereas length enters only to the first power.