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Solved Examples

Example 16.1:

A force of 500N is applied to one end of cylindrical steel rod of diameter 50cm. What is the tensile stress?

Solution:

Since Stress= $\frac{force}{area} = \frac{500}{\pi(25 \times 10^{-2})^2}$

Stress = 2.5×10^5 Nm^{-2}

Thus, the tensile stress in the rod is

2.5×10^5 Nm^{-2}

Example 16.2:

In an experiment to measure Young's modulus, a load of 500 Kg hanging from a steel wire 2.4m long, of cross section 16cm², was found 'to stretch the wire .30cm from its un-stretched length. What is (a) the stress? (b) the strain (c) the value of Young's modulus for the steel of which the wire is composed?

Solution:

Stretching in wire = x = .30cm = 3×10^{-3}m

Cross section of wire = A = .16cm² = 1.6×10^{-5}m²

(a) Stress = $\frac{F}{A} = \frac{500}{1.6 \times 10^{-5} m^2} = 3.1 \times 10^8 Nm^{-2}$

(b)Strain = $\frac{x}{L} = \frac{3.0 \times 10^{-3}}{2.4} = 1.25 \times 10^{-3}$

(c) Young's Modulus y = $\frac{Stress}{Strain} = \frac{3.1 \times 10^8}{1.25 \times 10^{-3}} = 2.48 \times 10^{11}$ Nm^{-2}

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