



Academic year 2024/2025

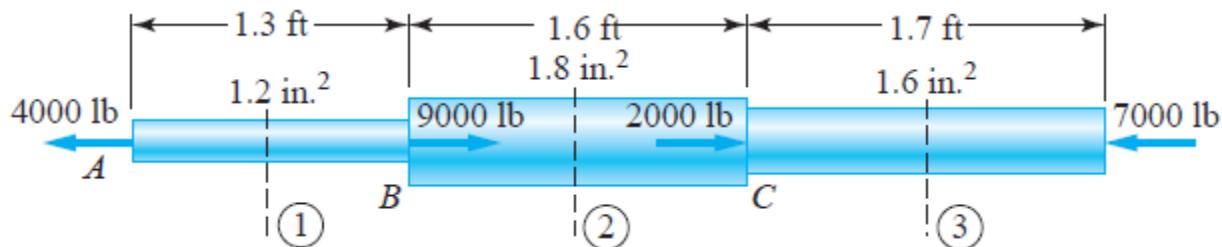
2nd Year

Mechanics of Materials (Material Strength)

T.D N° 7 (Cuts or Method of Sections, Axial Loading)

Problem 1 :

The steel bar ABCD is composed of 3 cylindrical segments with different lengths and diameters. Axial loads are applied. Calculate the normal stress in each segment. Draw the normal force N diagram.

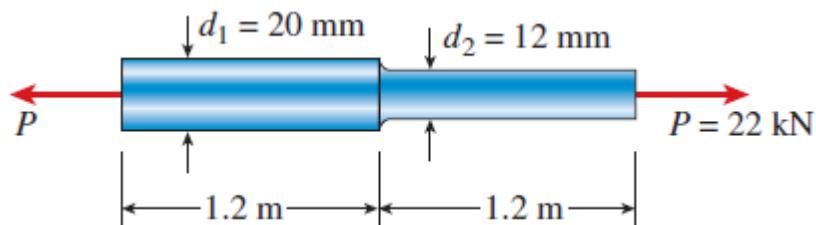


Problem 2 :

A circular steel bar with the modulus of elasticity $E = 205 \text{ GPa}$.

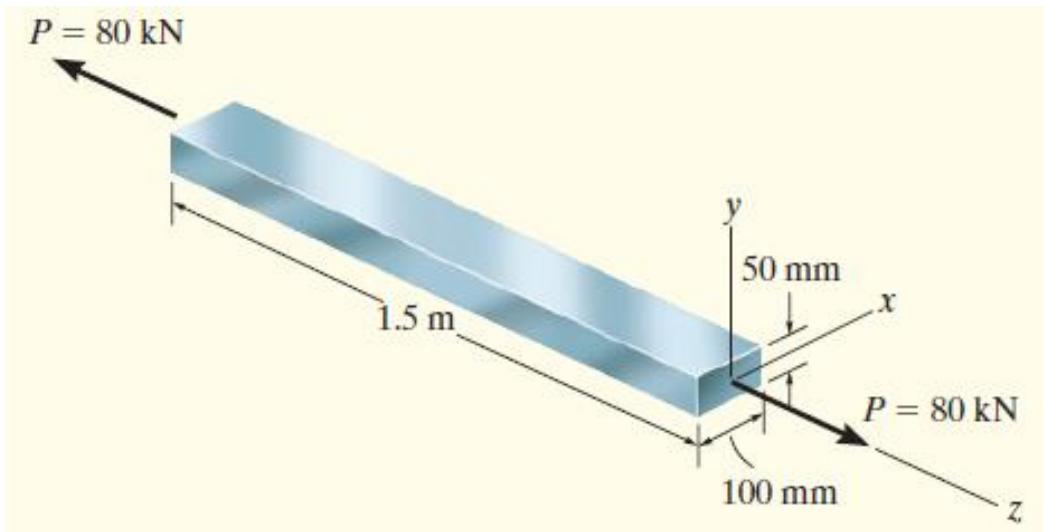
(a) What must the elongation be under a tension $P = 22 \text{ kN}$?

(b) Now the bar has one diameter and for the same length and volume, what must the elongation be in this case for the same load P ?



Problem 3 :

A bar made of A-36 steel ($E = 200$ GPa, $\nu = 0.32$) has the dimensions shown in Fig. If an axial force of $P = 80$ kN is applied to the bar, determine the change in its length and the change in the dimensions of its cross section. The material behaves elastically.



Problem 4 :

The A992 steel rod ($E = 200$ GPa) is subjected to the loading shown. If the cross-sectional area of the rod is $60 \cdot 10^{-6} \text{ m}^2$, determine the displacement of B and A . Neglect the size of the couplings at B , C , and D .

