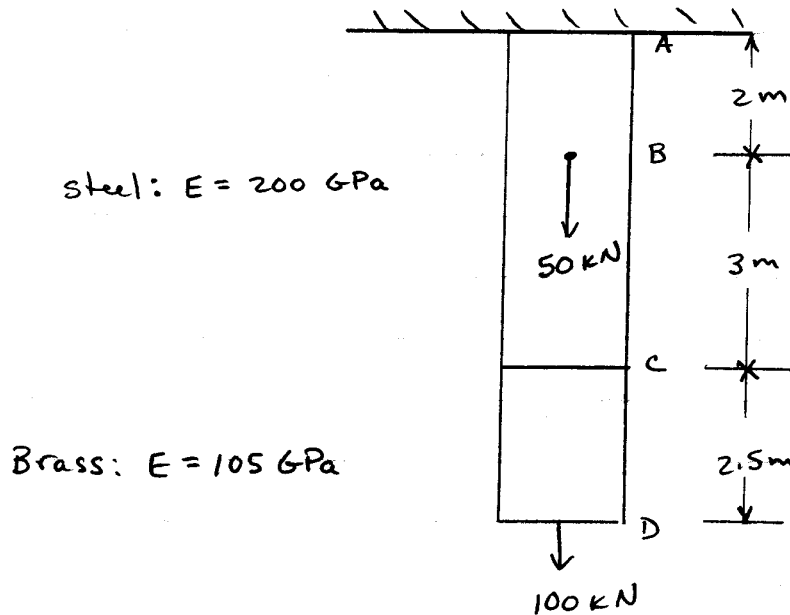


AXIAL DEFORMATION EXAMPLE PROBLEM 1

Given: A steel rod and a brass rod, each with a diameter of 36 mm, are joined together and loaded as shown in the diagram below.

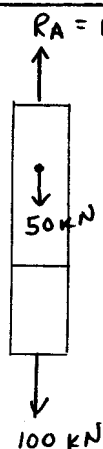


Required: Determine the deflection of (a) Pt. C, and (b) Pt. D.

Assumptions: The weights of the rods are negligible in comparison to the applied loads

Solution: Find the reaction at A. $\sum F_v = 50 + 100 - R_A = 0$
 $R_A = 150 \text{ kN} \uparrow$

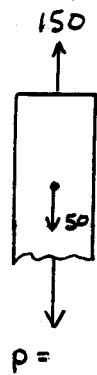
FBD of Entire Rod



FBD of section in A-B



FBD of section in B-C



FBD of section in C-D



$$\delta = \sum_i \frac{P_i L_i}{E_i A_i}$$

); $A = \text{constant throughout} = \frac{\pi}{4} (36 \text{ mm})^2 =$

$$A = 1018 \text{ mm}^2 = 1.018 \times 10^{-3} \text{ m}^2$$

a) Deflection of Pt. C = $\delta_{AB} + \delta_{BC}$

$$\delta_{AB} =$$

$$\delta_{BC} =$$

$$\delta_c =$$

b) Deflection at Pt. D = $\delta_c + \delta_{cd}$

$\delta_{cd} =$

$\delta_D =$

Summary of Answers

$\delta_c = 2.95 \text{ mm } \downarrow$

$\delta_D = 5.29 \text{ mm } \downarrow$

Could set up in tabular form:

Section	P (kN)	L (m)	E (kN/m ²)	A (m ²)	δ (m)
AB	+150	2	200×10^6	1.018×10^{-3}	.001473
BC	+100	3	200×10^6	1.018×10^{-3}	.001473
CD	+100	2.5	105×10^6	1.018×10^{-3}	.002339
					$\delta_D = .00529$

$\delta_c = .00295$
(Elongation)

(Elongation)