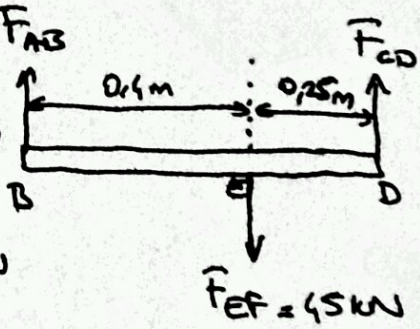
MAK 206 - Strength of Materials - Quiz 2 - Quiz 3

SOLUTION

Problem 1: Referring to the FBD (SCD) shown in (a),



(a)

$\overset{+}{\circlearrowleft} \sum M_B = 0$; $\Rightarrow F_{CD} \times 0,65 - 45 \times 0,4 = 0 \Rightarrow \underline{\underline{F_{CD} = 27,7 \text{ kN}}}$

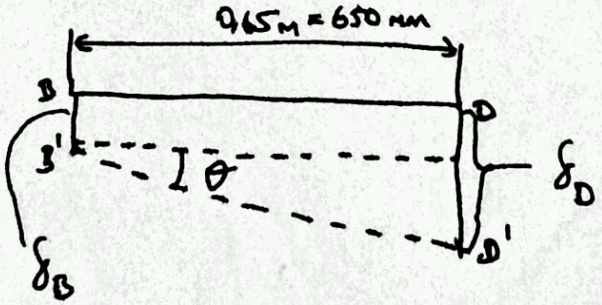
$\overset{+}{\circlearrowleft} M_D = 0$; $\Rightarrow 45 \times 0,25 - F_{AB} \times 0,65 = 0 \Rightarrow \underline{\underline{F_{AB} = 17,3 \text{ kN}}}$

$\Rightarrow$ The cross-sectional area of the rods: $A = \frac{\pi}{4}(20)^2 = 314,15 \text{ mm}^2$

$\Rightarrow$ Since points A and C are fixed then:

$$\delta_B = \frac{F_{AB} \cdot L_{AB}}{A \cdot E_{A-36}} = \frac{17300 \times 600}{314,15 \times 200000} = 0,165 \text{ mm}$$

$$\delta_D = \frac{F_{CD} \cdot L_{CD}}{A \cdot E_{Ti}} = \frac{27700 \times 1000}{314.15 \times 350000} = 0,252 \text{ mm}$$



$$\Rightarrow \theta = \arctan\left(\frac{0,252 - 0,165}{650}\right)$$

$$\boxed{\theta = 7,668 \times 10^{-3}\ ^\circ}$$