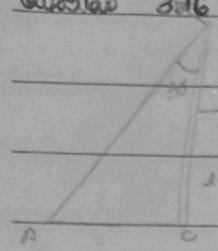
Questão 3.16



$\circlearrowleft \sum M_C = 0$

$-15 \cdot 1,2 + T_{AB} \operatorname{sen} 30° \cdot 2,2 = 0$

$T_{AB} = 16,3636\ KN$

$\cos 30° = \frac{2,2}{AB}$

$AB = 2,5403\ m$

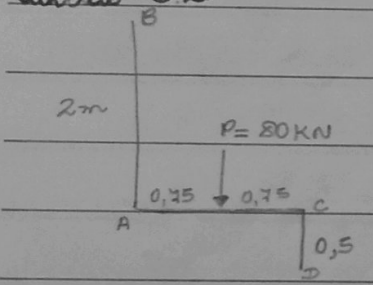
$\sigma_{AB} = \frac{T_{AB}}{A} \rightarrow \frac{16.363,6}{\pi \cdot (0,025)^2} = 833,39\ MPa$

$\sigma_{AB} = E\varepsilon \rightarrow \varepsilon = \frac{\sigma_{AB}}{E} = \frac{833,39 \cdot 10^6}{200 \cdot 10^9} = 4,167 \cdot 10^{-3}\ mm/mm$

$\varepsilon = \frac{\delta}{L_0} \Rightarrow \delta = 4,167 \cdot 10^{-3} \cdot 2,5403$ (δ → deformação nominal)

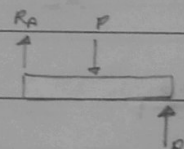
$\delta = 0,010585\ m$

Questão 3.21



$d_{AB} = 0,02\ m$

$d_{CD} = 0,04\ m$



$R_A + R_C - P = 0$ (força no corpo)

$R_A = R_C = 40\ KN$

AB → tração

CD → compressão

$\sigma_{AB} = \frac{R_A}{A} \rightarrow \sigma = \frac{40 \cdot 10^3}{\pi \cdot 0,02^2} = 31,831\ MPa$

$\sigma_{CD} = \frac{R_C}{A} \rightarrow \sigma = \frac{40 \cdot 10^3}{\pi \cdot 0,04^2} = 7,958\ MPa$

$E = \frac{32,2 \cdot 10^6}{0,01} = 3,22\ GPa$

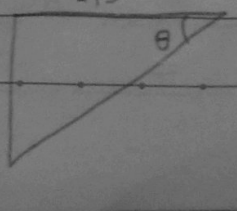
$\sigma = E\varepsilon$ → Para AB → $31,831 \cdot 10^6 = 3,22 \cdot 10^9 \cdot \varepsilon \Rightarrow \varepsilon = 0,009885\ mm/mm$

Para CD → $7,958 \cdot 10^6 = 3,22 \cdot 10^9 \varepsilon \rightarrow \varepsilon = 0,00247142\ mm/mm$

$\varepsilon = \frac{\delta}{L_0} \rightarrow \delta_{AB} = 0,009885 \cdot 2000 = 19,77\ mm$

$\delta_{CD} = 0,00247142 \cdot 500 = 1,23571\ mm$

$\delta_{AB} - \delta_{CD} = 19,77 - 1,23571 = 18,53429$

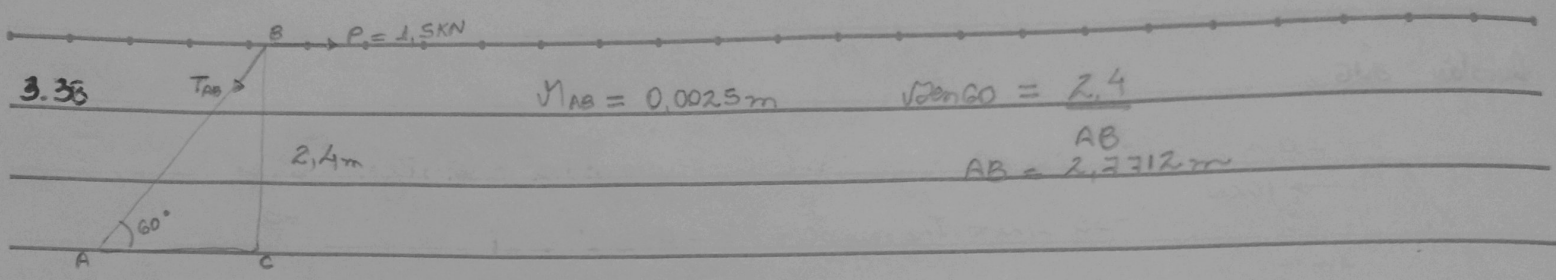


$\theta = \tan^{-1} \frac{18,53429 \cdot 10^{-3}}{1,5}$

$\theta = 0,7079°$

FORONI

3.38



$\nu_{AB} = 0,0025\,m$ $\quad \sin 60 = \frac{2,4}{AB}$

$AB = 2,7712\,m$

$\curvearrowleft^{+} \sum M_C = 0 \rightarrow 2,4\, T_{AB} \cdot \cos 60 - 2,4 \cdot 1,5 = 0$

$T_{AB} = 3\,KN$

$\sigma = \frac{F}{A} = \frac{3000}{\pi \cdot 0,0025^2} = 152,79\,MPa$

$\sigma = E\varepsilon \rightarrow 152,79 \cdot 10^6 = 200 \cdot 10^9 \varepsilon \rightarrow \varepsilon = 0,00076395\ mm/mm$

$\varepsilon = \frac{\delta}{L_{AB}} \rightarrow \delta = 0,00076395 \cdot 2,7712 = 2,117058\,m$