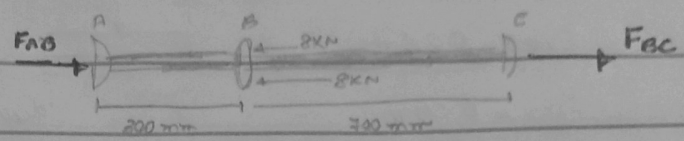
$\delta = \frac{PL}{AE}$ $\quad \delta_T = \alpha L \Delta T$

Cap 4 - Carga axial

ex 8 $\quad d_e = 20\,mm$

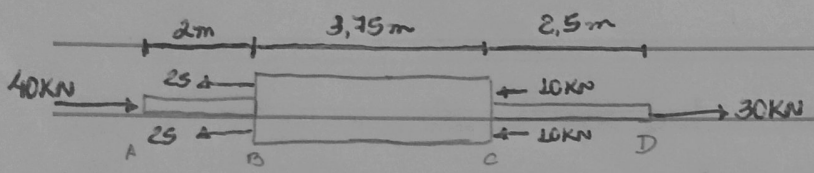
$d_i = 15\,mm$



$$F_A = P\left(\frac{L_{CB}}{L}\right) \rightarrow 16\left(\frac{0,7}{1}\right) = 11,2\ KN$$

$$F_C = P\left(\frac{L_{BA}}{L}\right) \rightarrow 16\left(\frac{0,3}{1}\right) = 4,8\ KN$$

Problema 4.4



$d_{AB} = 20\,mm$ $\quad E_{COBRE} = 126\,GPa$

$d_{BC} = 25\,mm$

$d_{CD} = 12\,mm$

$$\delta_{AB} = \frac{-40 \cdot 10^3 \cdot 2}{\pi \cdot 0,01^2 \cdot 126 \cdot 10^9} = -2,021 \cdot 10^{-3}$$

$+$

$$\delta_{BC} = \frac{10 \cdot 10^3 \cdot 3,75}{\pi \cdot 0,0125^2 \cdot 126 \cdot 10^9} = 6,0630 \cdot 10^{-4}$$

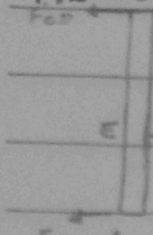
$+$

$$\delta_{CD} = \frac{-30 \cdot 10^3 \cdot 2,5}{\pi \cdot 0,006^2 \cdot 126 \cdot 10^9} = -5,2630 \cdot 10^{-3}$$

$=$

$\varepsilon = \frac{\delta}{L}$ $\quad \delta^4$ $\quad \delta_T = \alpha \Delta T L$ $\quad \delta = \frac{PL}{AE}$

4.12



$\pm \sum F_x = 0$

$-F_{AB} - F_{CD} + 30 = 0$

$-F_{AB} - F_{CD} = -30$

$F_{AB} + F_{CD} = 30$

$2F_{CD} + F_{CD} = 30$

$F_{CD} = 10KN$

$\circlearrowleft \sum M_C = 0$

$0,6F_{CD} - 0,3F_{AB} = 0$

$0,6F_{CD} = 0,3F_{AB}$

SUBSTITUINDO ←

$F_{AB} = 2F_{CD}$

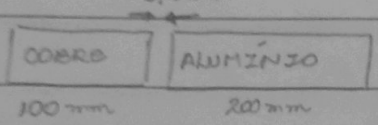
$= 2 \cdot 10$

$F_{AB} = 20KN$

$E = 120GPa$

$\delta_{AB} = \frac{P \cdot L}{AE} =$

4.78



$\Delta L_{cobre} + \Delta L_{alumínio} \geq 0,2 \cdot 10^{-3}$

$17 \cdot 10^{-6} \cdot 135 \cdot 0,1 + 24 \cdot 10^{-6} \cdot 135 \cdot 0,2 \geq 0,2 \cdot 10^{-3}$

$2,295 \cdot 10^{-4} + 6,48 \cdot 10^{-4} \geq 0,2 \cdot 10^{-3}$

$8,775 \cdot 10^{-4} \geq 0,2 \cdot 10^{-3}$

$\Delta L_{cobre} + \Delta L_{alumínio} - \delta_{cobre} - \delta_{alumínio} = 0,2 \cdot 10^{-3}$

$8,775 \cdot 10^{-4} - \frac{\sigma L_C}{E_C} - \frac{F \cdot L_A}{A \cdot E_A} = 0,2 \cdot 10^{-3}$

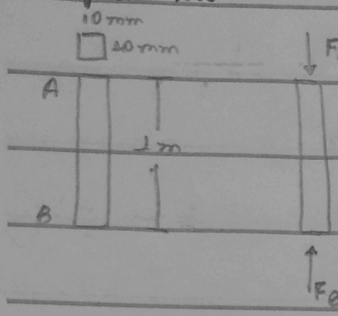
$\frac{\sigma L_C}{E_C} + \frac{\sigma L_A}{E_A} = 6,775 \cdot 10^{-4}$

$\frac{\sigma \cdot 0,1}{126 \cdot 10^9} + \frac{\sigma \cdot 0,2}{70 \cdot 10^9} = 6,775 \cdot 10^{-4}$

$7,9365 \cdot 10^{-13} \sigma + 2,8571 \cdot 10^{-12} \sigma = 6,775 \cdot 10^{-4}$

$\sigma = 185,578 MPa$

Exemplo 4.10



$+\uparrow \sum F_y = 0$

$F_B - F_A = 0$

$F_B = F_A = F$

$\delta_{A/B} = 0 = \delta_T - \delta_F$

$0 = \alpha \Delta T L - \frac{FL}{AE} \rightarrow FL = \alpha \Delta T L AE$

$F = \alpha \Delta T AE$

$= 12 \cdot 10^{-6} \cdot 30 \cdot 1 \cdot 10^{-4} \cdot 200 \cdot 10^{6} \Rightarrow 7{,}2\ KN$

$\sigma = \frac{F}{A} = \frac{7{,}2 \cdot 10^{3}}{10^{-4}} = 75\ MPa$