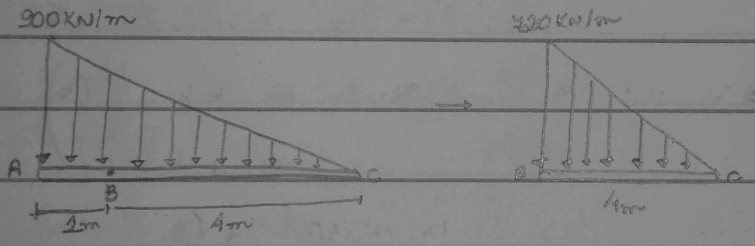
Resistência dos materiais - PROBLEMAS!

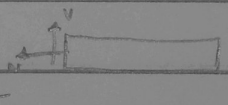
1.17



$900 - 5 \rightarrow X = 720\,KN/m$

$X - 4$

$F_R = \frac{720 \cdot 4}{2} = 1440KN$



$\sum F_x = 0 \qquad \sum F_y = 0$

$N = 0 \qquad V - 1440 = 0 \rightarrow V = 1440KN$

$\sum M = 0 \rightarrow -M - 1440 \cdot \frac{4}{3} = 0$

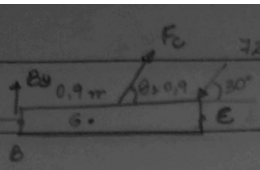
$M = -1920\,KN \cdot m$

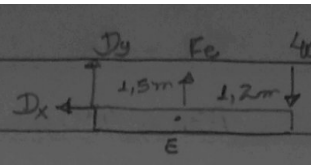
1.37 $\sigma_B = \frac{500}{\pi \cdot 0{,}0325^2} = 150{,}67\ KPa$

$\sigma_C = \frac{500 \cdot 300}{\pi \cdot 0{,}07^2} =$

$\sigma_D = \frac{200}{\pi \cdot 0{,}05^2} = 25{,}46\ KPa$

1.28

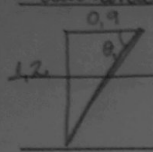




$\curvearrowleft \sum M_D = 0$

$1,5Fe - 400 \cdot 2,7 \rightarrow Fe = 720N$

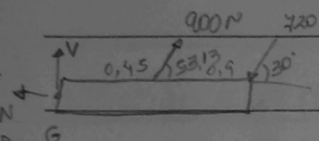
Calculando θ_1 :



$tg^{-1} = \frac{1,2}{0,9} \rightarrow \theta_1 = 53,13°$

$\curvearrowleft \sum M_B = 0$

$0,9F_c \cdot \text{sen}\,53,13 - 720 \cdot \text{sen}\,30 \cdot 1,8 = 0 \rightarrow F_c = 900N$



Calculando as forças internas do ponto G:

$\stackrel{+}{\rightarrow} \sum F_x = 0$

$-N + 900 \cos 53,13 - 720 \cos 30° \rightarrow N = -85,53N$

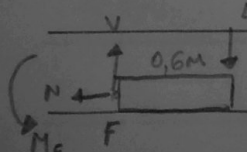
$+\uparrow \sum F_y = 0$

$V + 900 \,\text{sen}\, 53,13 - 720 \,\text{sen}\, 30° \rightarrow V = -360N$

$\sum M_G = 0$

$M_G + 900 \,\text{sen}\, 53,13 \cdot 0,45 - 720 \,\text{sen}\, 30 \cdot 1,35 = 0 \rightarrow M_G = 162 N \cdot m$

Calculando as forças internas do ponto F

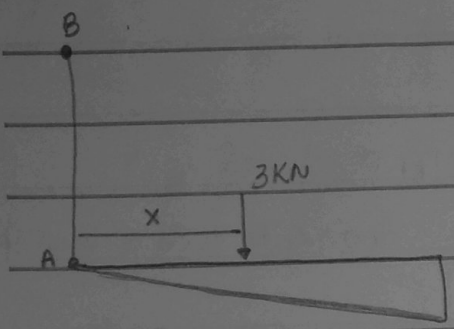


$\stackrel{+}{\rightarrow} \sum F_x = 0$ $\quad +\uparrow \sum F_y = 0$ $\quad \sum M_F = 0$

$N = 0$ $\quad V - 400 = 0$ $\quad M_F - 400 \cdot 0,6 = 0$

$V = 400N$ $\quad M_F = 240N \cdot m$

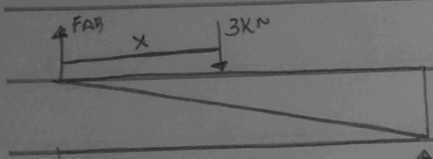
EX 1.9 - tensão normal



$X = ?$

$F_{AB} = F_C$

$A_{AB} = 400\,mm^2 \quad A_C = 650\,mm^2$



Calculando as cargas internas

$\uparrow + \sum F_y = 0 \rightarrow F_{AB} - 3000 + F_C = 0 \quad (1)$

$\circlearrowleft + \sum M_A = 0 \rightarrow -3000 \cdot X + F_C \cdot 200 = 0 \quad (2)$

$$\sigma = \frac{F_{AB}}{A_{AB}} = \frac{F_C}{A_C}$$

$$\frac{F_{AB}}{400} = \frac{F_C}{650} \rightarrow 650 F_{AB} = 400 F_C$$

$F_C = 1,625 F_{AB} \quad (3)$

Substituindo (3) em (1):

$F_C = 1857,13\,N$

$F_{AB} - 3000 + 1,625 F_{AB} = 0$

$2,625 F_{AB} = 3000$

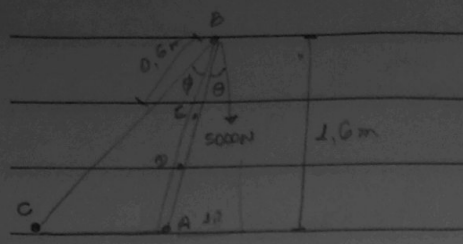
$F_{AB} = 1.142,85\,N$

Encontrando o valor de X na equação 2:

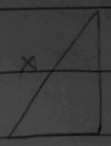
$-3000X + 1857,13 \cdot 200 = 0$

$X = 123,08\,mm$

Problema 1.7

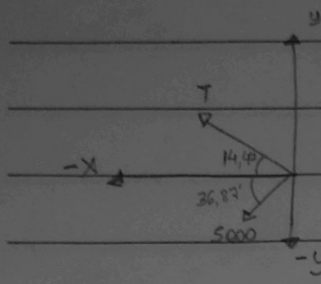


$\theta = tg^{-1} = \frac{1,2}{1,6} = 36,87°$



$X = 2$

$\gamma = tg^{-1} = \frac{2}{1,6} = 51,34°$



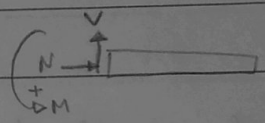
$\phi = 51,34 - 36,87 = 14,47°$

Calculando as forças externas a

$\circlearrowleft \sum M_A = 0 \rightarrow T_a \cdot \text{sen}\,14,47 \cdot 2 - 5000 \cdot \text{sen}\,36,87 \cdot 2 = 12006\ N$

Calculando as forças internas a EB

$\sum F_x = 0 \rightarrow N_E - 12006 \cos 14,47° - 5000 \cos 36,87°$



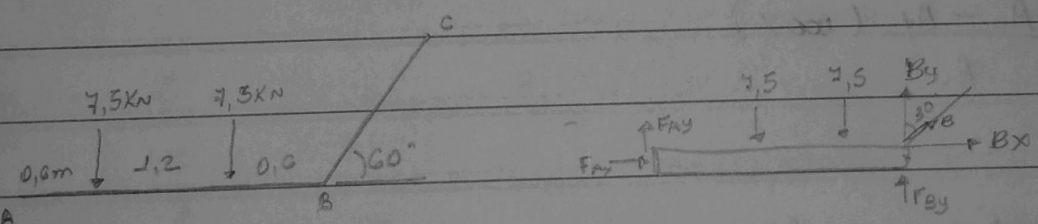
$N_E = 15625\ N$

$\sum F_y = 0 \rightarrow V_E + 12006 \cdot \text{sen}\,14,47 - 5000 \cdot \text{sen}\,36,87 = 0$

$V_E = 0\ N$

$\sum M_E = 0 \rightarrow 12006 \cdot \text{sen}\,14,47 \cdot 0,6 - 5000\ \text{sen}\,36,87 \cdot 0,6 = 0\ N.m$

1.96



$\circlearrowleft \sum M_A = 0 \rightarrow -7,5 \cdot 0,6 - 7,5 \cdot 1,8 + B \cdot \cos 30° \cdot 2,4 = 0$

$B = 8,66KN$

$\rightarrow \sum F_x = 0 \rightarrow Ax + 8,86 \cos 60° = 0 \rightarrow Ax = -4,43KN$

$\uparrow \sum F_y = 0 \rightarrow Ay - 7,5 - 7,5 + 8,66 \cdot \text{sen}\,60° = 0 \rightarrow Ay = 7,5\ KN$

Calculando a área da barra BC

$\sigma = \frac{F}{A} \rightarrow 21 = \frac{8660}{A} \rightarrow A = 412,38\ mm^2$

Fo