

Project 4 - Tearing Apple, 2018050055

1)

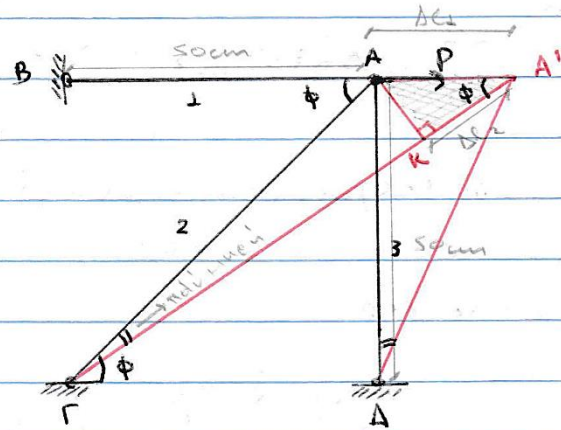
$$\epsilon_2 = 1, \epsilon_3 = 13$$

$$\sigma_{cr} = 130 + 13 = 143 \text{ MPa (ad. m.)}$$

$$\sigma_{cr} = 61 \text{ MPa (ol. m.)}$$

$$E = 210 \text{ GPa}, A = 3 \text{ cm}^2$$

Elejos para avaria em $P = 513 \text{ kN}$



$$\tan \phi = 1 \Rightarrow \phi = 45^\circ$$

$$\cos \phi = \frac{\sqrt{2}}{2} = \frac{0.5}{l_2} \Rightarrow l_2 = 0.71 \text{ m}$$

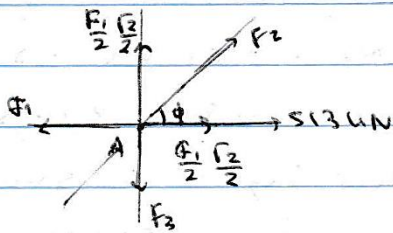
$$\sum \tau_o A \Delta A': \cos \phi = \frac{\Delta l_2}{\Delta l_1} \Rightarrow \frac{F_2 \Delta l_1}{2} = \Delta l_2 \Rightarrow \frac{F_2 F_1 l_1}{2 \cdot A_1} = \frac{F_2 l_2}{2 \cdot A_2} \Rightarrow F_1 \cdot 0.25 = F_2 \cdot 0.5 \Rightarrow F_1 = 2F_2$$

$$\sum F_x = 0 \Rightarrow F_1 - \frac{F_1 \sqrt{2}}{4} = 513 \Rightarrow F_1 = 794 \text{ kN}$$

$$\Rightarrow F_2 = 397 \text{ kN}$$

$$\text{then } F_3 = 281 \text{ kN}$$

$$(\sum F_y = 0)$$



$$F_1 \rightarrow \text{steel}, \sigma_1 = \frac{794 \cdot 10^3 \text{ N}}{3 \cdot 10^{-4} \text{ m}^2} = 264 \cdot 10^7 \text{ Pa} > 143 \text{ MPa} \rightarrow \text{Ser avaria}$$

$$F_2 \rightarrow \text{steel}$$

$$F_3 \rightarrow \text{ol. m.}, \sigma_2 = \frac{397 \cdot 10^3 \text{ N}}{3 \cdot 10^{-4} \text{ m}^2} = 132 \cdot 10^7 \text{ Pa} > 143 \text{ MPa} \rightarrow \text{Ser avaria}$$

$$\sigma_3 = \frac{281 \cdot 10^3 \text{ N}}{3 \cdot 10^{-4} \text{ m}^2} = 93.6 \cdot 10^7 \text{ Pa} > 61 \text{ MPa} \rightarrow \text{Ser avaria}$$