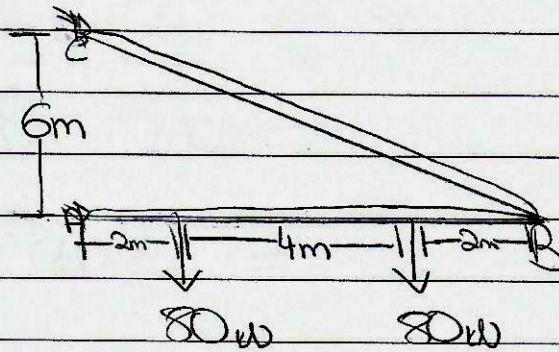


Project 1

AM:2018050043

Kupukin Orosipn

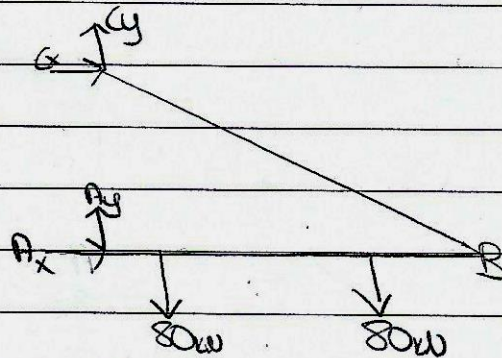


Displacement

$$\sigma_x = 125 \text{ MPa} \quad \epsilon_2 = 5$$

$$\tau_{xy} = 60 \text{ MPa} \quad \epsilon_3 = 15$$

DES°



$$\sum F_x = 0$$

$$A_x + C_x = 0$$

$$A_x = -C_x$$

$$A_x = 106.67 \text{ kN}$$

$$\sum F_y = 0$$

$$A_y + C_y - 80 - 80 = 0$$

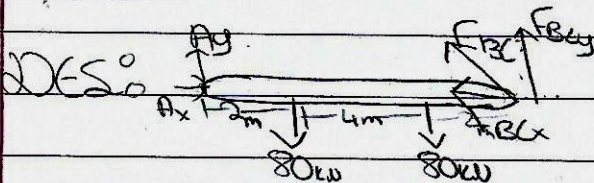
$$A_y + C_y = 160$$

$$\sum M_A = 0$$

$$-C_y \cdot 8 - 80 \cdot 6 - 80 \cdot 2 = 0$$

$$-6C_y = 480 + 160$$

$$C_y = -106.67 \text{ kN}$$



$$\sum F_x = 0$$

$$A_x - F_{BCx} = 0$$

$$A_x = F_{BCx}$$

$$F_{BCx} = 106.67 \text{ kN}$$

$$\sum F_y = 0$$

$$A_y + F_{BCy} - 80 - 80 = 0$$

$$A_y + F_{BCy} = 160$$

$$A_y = 160 - 80$$

$$A_y = 80 \text{ kN}$$

$$\sum M_A = 0$$

$$F_{BCy} \cdot 8 - 6 \cdot 80 - 2 \cdot 80 = 0$$

$$8F_{BCy} = 480 + 160$$

$$F_{BCy} = 80 \text{ kN}$$

$$A_y + C_y = 160$$

$$80 + C_y = 160$$

$$C_y = 80 \text{ kN}$$

α) Για το ελάχιστο απαιτούμενο εμβαδόν

$$I_{\text{εξω}} \leq I_{\text{εξ}} \Rightarrow \frac{F_{BC}}{A_{BC}}$$

$$F_{BC} = \sqrt{F_{BCx}^2 + F_{BCy}^2}$$

$$= \sqrt{(106,67)^2 + (80)^2}$$

$$125 \cdot 10^6 \leq \frac{133,34 \cdot 10^3}{A_{BC}}$$

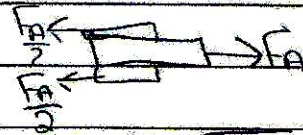
$$= 133,34 \text{ kN}$$

$$125 \cdot 10^6 \text{ A} = 133,34 \cdot 10^3$$

$$A_{BC} = 1,067 \cdot 10^{-3} \text{ m}^2$$

β) Για μισαγωγή της δύναμης A

$$I_{\text{εξω}} \leq I_A$$



$$I_{\text{εξω}} \leq \frac{F_A}{2}$$

$$F_A = \sqrt{A_x^2 + A_y^2}$$

$$= \sqrt{(106,67)^2 + (80)^2}$$

$$= 133,34 \text{ kN}$$

$$60 \cdot 10^6 \leq \frac{133,34 \cdot 10^3}{2}$$

$$\frac{\pi d_n^2}{4}$$

$$60 \cdot 10^6 = \frac{66,67 \cdot 10^3}{\frac{\pi d_n^2}{4}}$$

$$60 \cdot 10^6 = \frac{266,68 \cdot 10^3}{\pi d_n^2}$$

$$60 \cdot 10^6 \pi d_n^2 = 266,68 \cdot 10^3$$

$$d_n^2 = 1,41 \cdot 10^{-3}$$

$$d_n = \sqrt{1,41 \cdot 10^{-3}}$$

$$d_n = 0,038 \text{ m}$$

Γα προαγωγή της αέρας C

$$T_{\text{air}} \leq T_c$$

$$F_c \leftarrow \boxed{} \rightarrow F_c$$

$$T_{\text{air}} \leq \frac{F_c}{A_c}$$

$$F_c = \sqrt{F_{cx}^2 + F_{cy}^2}$$

$$60 \cdot 10^6 = \frac{133,34 \cdot 10^3}{\frac{\pi d_c^2}{4}}$$

$$= \sqrt{(-106,67)^2 + (80)^2}$$
$$= 133,34 \text{ kN}$$

$$60 \cdot 10^6 = \frac{533,36 \cdot 10^3}{\pi d_c^2}$$

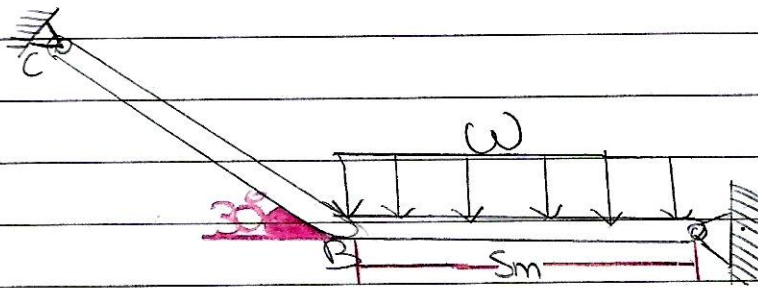
$$60 \cdot 10^6 \pi d_c^2 = 533,36 \cdot 10^3$$

$$d_c^2 = 2,83 \cdot 10^{-3}$$

$$d_c = \sqrt{2,83 \cdot 10^{-3}}$$

$$= 0,053 \text{ m}$$

Assun2



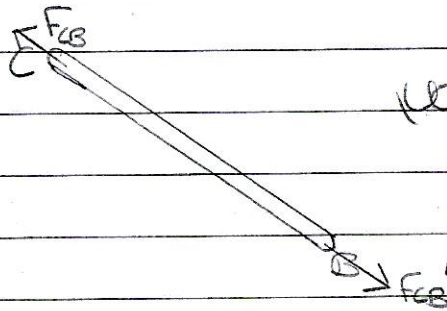
DeSquenze

$$\tau_{\text{ad}} = 50 \text{ MPa} + (\epsilon_2) \text{ m}$$

$$\epsilon_2 = 5$$

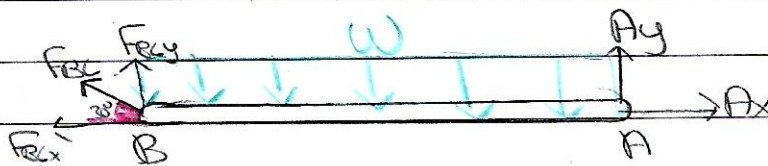
$$d_A = d_B = d_C = 18 \text{ mm}$$

DeSquenze CB



$$F_{CB} = F'_{CB}$$

DeSquenze AB



$$\sum F_x = 0$$

$$\sum F_y = 0$$

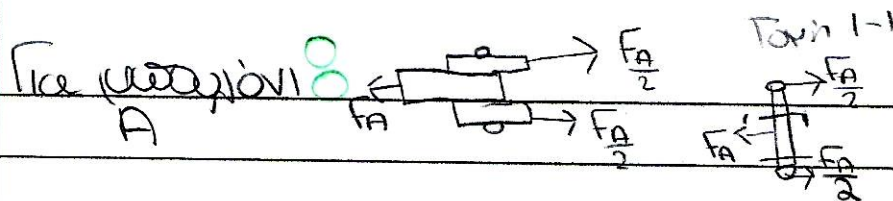
$$F_{CBx} - A_x = 0$$

$$F_{CBx} \cdot 1 + A_y - 5w = 0$$

$$\sum M_A = 0$$

$$S \cdot 2,5w - F_{CBx} \cdot S = 0$$

$$12,5w = F_{CBx} S$$



$$T_{bolt} \leq T_n$$

$$T_{bolt} \leq \frac{F_A}{2}$$

$$\frac{F_A}{2}$$

$$A_n$$

$$SS \cdot 10^6 = \frac{F_A}{2}$$

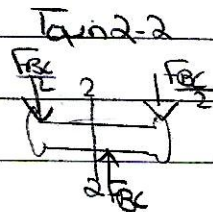
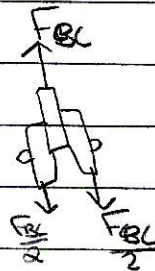
$$\frac{(0.018)^2 \pi}{4}$$

$$SS \cdot 10^6 = \frac{4F_A}{2,04 \times 10^{-3}}$$

$$F_A = 28050 \text{ N}$$

$$F_A = 28,05 \text{ kN}$$

Free body diagram of a bolt (green circle) and a nut (green circle).



$$T_{bolt} \leq T_c$$

$$T_{bolt} \leq \frac{F_{BC}}{2}$$

$$A_{BC}$$

$$SS \cdot 10^6 = \frac{F_{BC}}{2}$$

$$\frac{(0.018)^2 \pi}{4}$$

$$SS \cdot 10^6 = \frac{4F_{BC}}{2,04 \times 10^{-3}}$$

$$F_{BC} = 28050 \text{ N}$$

$$F_{BC} = 28,05 \text{ kN}$$

$$\begin{aligned}
 F_{By} &= F_B \cdot \sin 30 \\
 &= 28,05 \cdot \sin 30 \\
 &= 14,03 \text{ kN}
 \end{aligned}$$

$$\begin{aligned}
 F_{Bx} &= F_B \cdot \cos 30 \\
 &= 28,05 \cdot \cos 30 \\
 &= 24,29 \text{ kN}
 \end{aligned}$$

$$\sum F_x = 0$$

$$F_{Bx} = A_x$$

$$A_x = 24,29 \text{ kN}$$

$$\sum M_A = 0$$

$$12,5 \text{ m} = S F_{By}$$

$$12,5 \text{ m} = S \cdot 14,03$$

$$W = 5,61 \text{ kN}$$

$$\sum F_y = 0$$

$$14,03 + A_y - S \cdot 5,61 = 0$$

$$A_y = 14,03 \text{ kN}$$