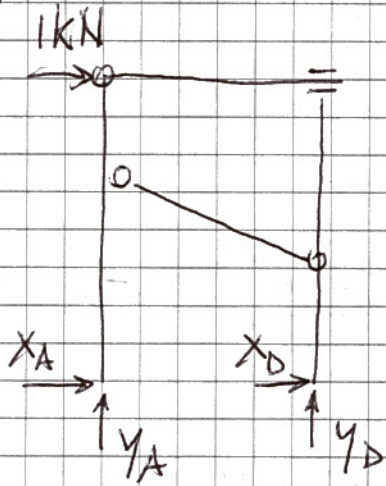


1)



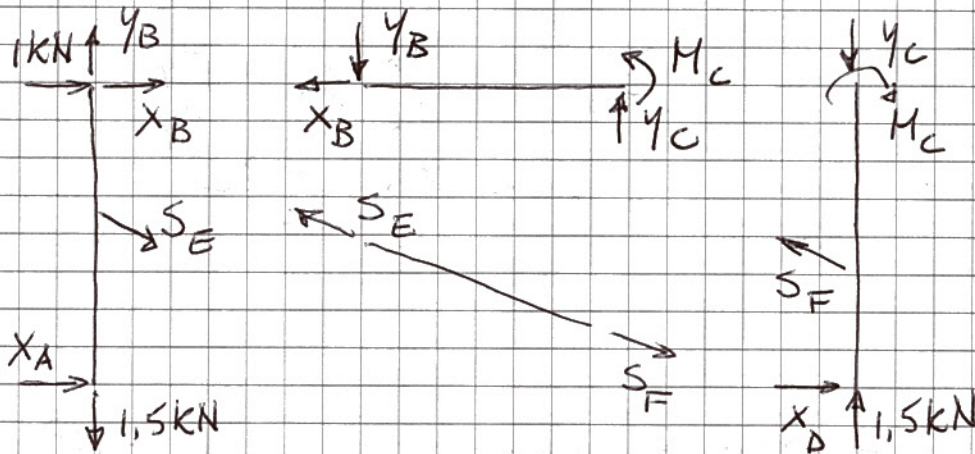
Eq. globale

$$(M_A) \quad Y_D \cdot 1m - 1,5kNm = 0$$

$$\rightarrow Y_D = 1,5kN$$

$$(Y) \quad Y_A + Y_D = 0 \rightarrow Y_A = -1,5kN$$

$$(X) \quad X_A + X_D + 1kN = 0$$



Eq. BC

$$(X) \quad X_B = 0$$

$$(Y) \quad -Y_B + Y_C = 0$$

$$\rightarrow Y_C = 0,75kN$$

$$(M_C) \quad M_C + Y_B \cdot 1m = 0$$

$$\rightarrow M_C = -0,75kNm$$

Eq. AB

$$(M_A) \quad -S_E \frac{1}{\sqrt{1+0,5^2}} \cdot 1m - 1,5kNm = 0$$

$$\rightarrow S_E = -1,677kN$$

$$(X) \quad X_A + S_E \frac{1}{\sqrt{1+0,5^2}} + 1kN = 0$$

$$\rightarrow X_A = 0,5kN \rightarrow X_D = -1,5kN$$

$$(Y) \quad Y_B - S_E \frac{0,5}{\sqrt{1+0,5^2}} - 1,5kN = 0$$

$$\rightarrow Y_B = 0,75kN$$

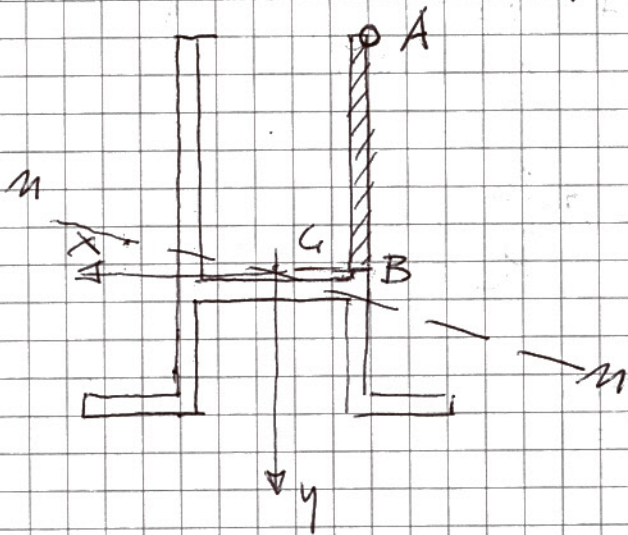
Eq. EF

$$S_F = S_E$$



$$2) J_y = 2 \cdot 5 \cdot \frac{25^3}{12} + 2 \cdot 5 \cdot 25 (25 + 12.5)^2 + 2 \cdot 100 \cdot \frac{5^3}{12} + 2 \cdot 100 \cdot 5 \cdot 22.5^2 + 5 \cdot \frac{40^3}{12} = 8.996 \cdot 10^5 \text{ mm}^4$$

d.h.  $y = \frac{M_y}{M_x} \frac{J_x}{J_y} x = - \frac{5 \cdot 10^5}{3 \cdot 10^6} \frac{1.297 \cdot 10^6}{8.996 \cdot 10^5} x = -0.24 x$



$$A \equiv (-25, -60.6)$$

$$\sigma_{z \max} = \frac{M_x}{J_x} y_A - \frac{M_y}{J_y} x_A = 153.9 \text{ MPa}$$

$$\sigma_{z0} = \frac{3M_z}{\sum a_i b_i^2} = \frac{3 \cdot 4 \cdot 10^4}{(2 \cdot 25 + 2 \cdot 100 + 40) \cdot 5^2} = 16.6 \text{ MPa}$$

$$\sigma_{zy \max} = \frac{T_y S_x^*}{J_x b} = \frac{6 \cdot 10^3 \cdot 5 \cdot 60.6 \cdot 30.3}{1.297 \cdot 10^6 \cdot 5} = \frac{6 \cdot 10^3 \cdot 9180.9}{1.297 \cdot 10^6 \cdot 5} = 8.5 \text{ MPa}$$

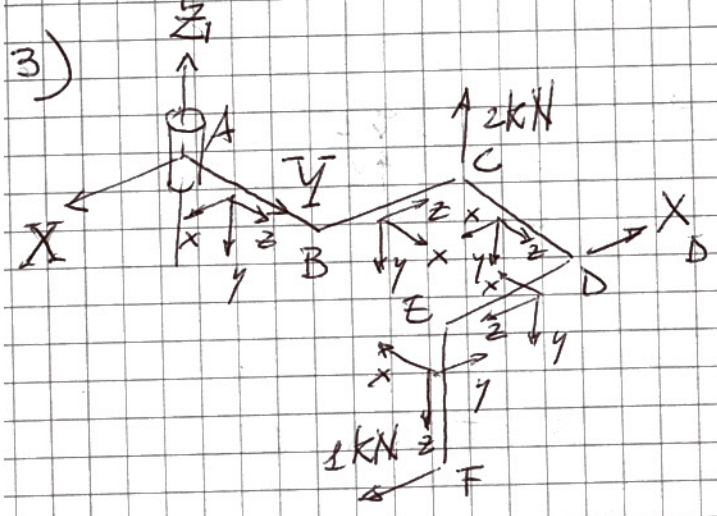
$$\sigma_{\max} = (16.6 + 8.5) \text{ MPa} = 25 \text{ MPa}$$

$\sigma_{\text{eqmax}}$  in prox di A  $\rightarrow \sigma_{z \max}, \sigma_{z0}$

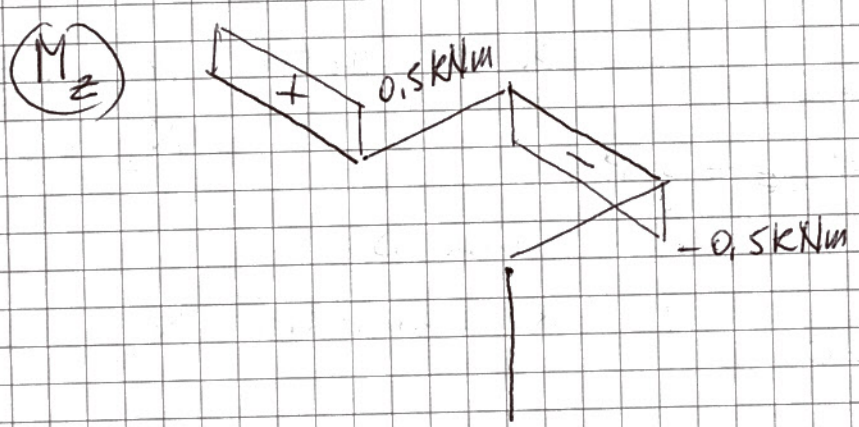
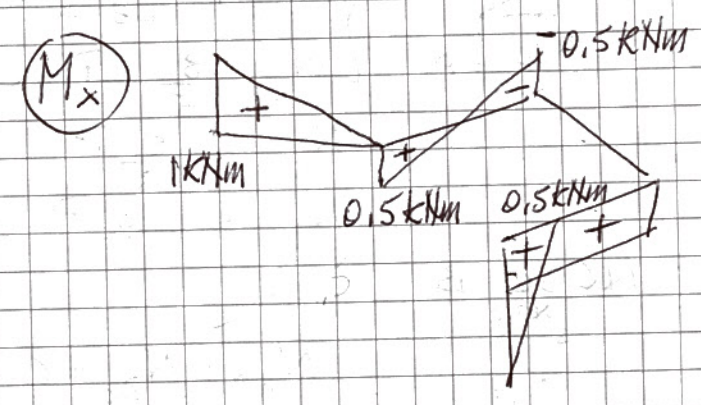
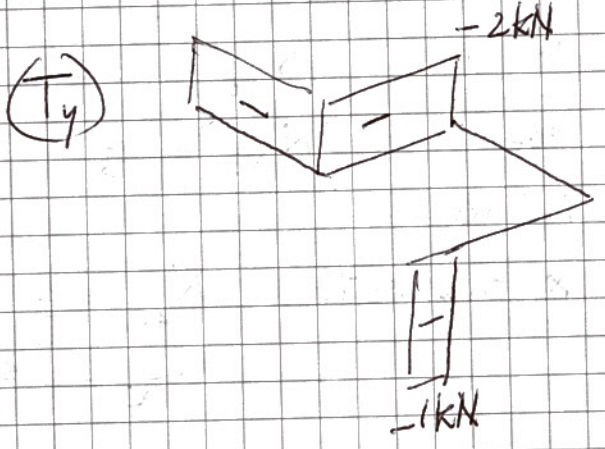
$$\sigma_{\text{eqmax}} = \sqrt{153.9^2 + 4 \cdot 16.6^2} = 157 \text{ MPa}$$

$$C.S.I.C. = \frac{\sigma_{\text{amm}}}{\sigma_{\text{eqmax}}} = \frac{300}{157} = 1.9$$

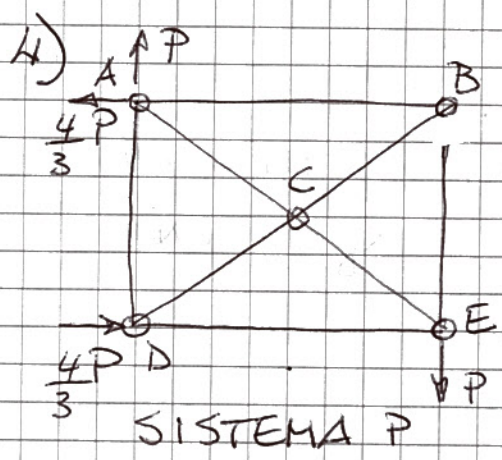




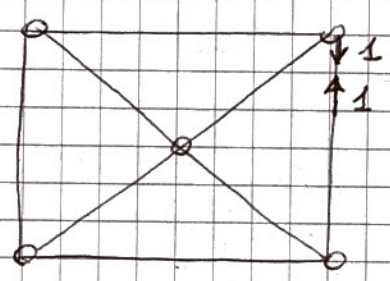
$(M_{zA}) \quad X_D \cdot 1m - 1kNm = 0$   
 $X_D = 1kN$







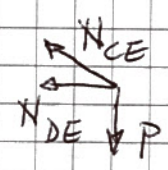
+ X<sub>I</sub>



SISTEMA P

SISTEMA I

NODO E

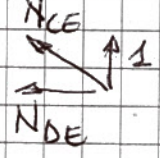


$$\begin{cases} N_{DE} + N_{CE} \frac{4}{5} = 0 \\ N_{CE} \frac{3}{5} - P = 0 \end{cases}$$

$$N_{CE} = \frac{5}{3} P$$

$$N_{DE} = -\frac{4}{3} P$$

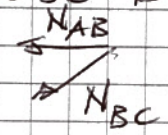
NODO E



$$N_{CE} = -\frac{5}{3}$$

$$N_{DE} = \frac{4}{3}$$

NODO B



$$N_{AB} = N_{BC} = 0$$

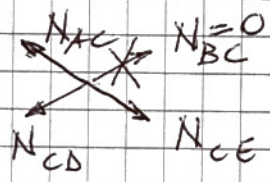
NODO B

x simmetria

$$N_{AB} = \frac{4}{3}$$

$$N_{BC} = -\frac{5}{3}$$

NODO C



$$N_{BC} = 0$$

$$N_{CD} = 0$$

$$N_{AC} = N_{CE} = \frac{5}{3} P$$

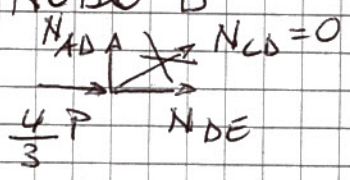
NODO C

x simmetria

$$N_{CD} = -\frac{5}{3}$$

$$N_{AC} = -\frac{5}{3}$$

NODO D



$$N_{AD} = 0$$

NODO D

x simmetria

$$N_{AD} = 1$$

$$\delta_{IP} + X_I \delta_{II} = \Delta$$

$$X_I = 400 A_{BE}$$

$$\delta_{IP} = \sum_1^7 \frac{N_{Pi} N_{Ii} l_i}{EA} = -2 \left(\frac{5}{3}\right) \left(\frac{5}{3}\right) P \frac{5}{8} L / EA$$

$$- \left(\frac{4}{3}\right) \left(\frac{4}{3}\right) P \frac{L}{EA} = -1.4 \text{ mm}$$

$$\delta_{II} = \sum_1^7 \frac{N_{Ii}^2 l_i}{EA} + \frac{N_{I, BE}^2}{EA_{BE}} l_{BE} = 4 \frac{25}{9} \frac{5}{8} L / EA$$

$$+ 2 \frac{16}{9} \frac{L}{EA} + 1 \frac{3}{4} \frac{L}{EA}$$

$$+ 1 \frac{3}{4} \frac{L}{EA}$$