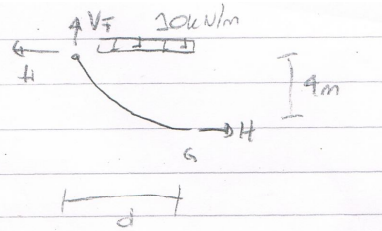
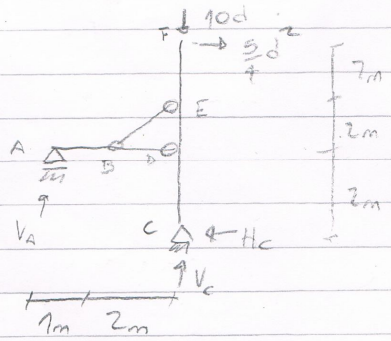
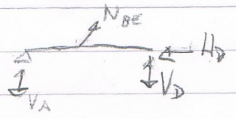
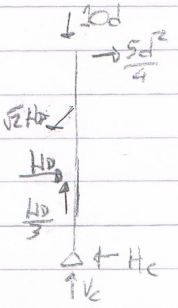



$$\Sigma M_F = 0 = H \cdot 4m - \frac{10kN/m \cdot d^2}{2}$$

$$H = \frac{5}{4} d^2 \left(\frac{kN}{m^2}\right) \qquad V_F = 10kN/m \cdot d$$




$$H_D = \frac{N_B \sqrt{2}}{2}$$

$$V_A \cdot 3m - \frac{N_B \sqrt{2}}{2} \cdot 2m = 0$$

$$V_A = \frac{2}{3} H_D \qquad V_D = \frac{H_D}{3}$$

$$10d + H_D = \frac{H_D}{3} + V_C \rightarrow V_C = 10d + \frac{2}{3} H_D$$

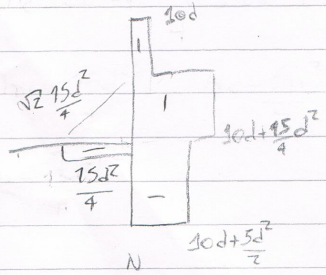
$$\frac{5d^2}{4} \cdot 6m - H_D \cdot 4m + H_D \cdot 2m = 0$$

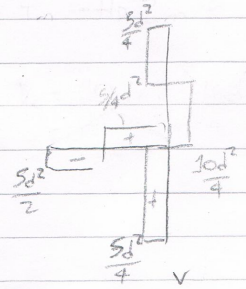
$$\boxed{H_D = \frac{15d^2}{4}} \qquad \boxed{V_C = 10d + \frac{5d^2}{2}}$$

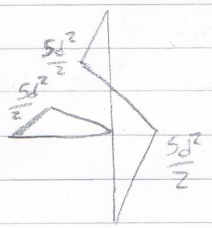
$$\frac{5d^2}{4} + H_D = H_D + H_C \rightarrow \boxed{H_C = \frac{5d^2}{4}}$$

$$V_A = \frac{5d^2}{2} \qquad V_D = \frac{5}{4} d^2$$

$$V_C + \frac{H_D}{3} = 10d + \frac{5d^2}{2} + \frac{5}{4} d^2 = 10d + \frac{15d^2}{4}$$



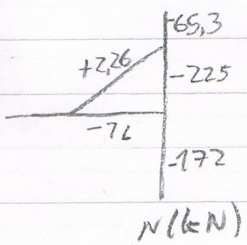



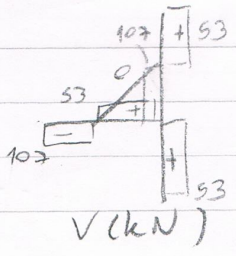

$$\sigma_{max} = \frac{5d^2}{2} \cdot \frac{1}{W} + \left(10d + \frac{15d^2}{4}\right) \frac{1}{A}$$

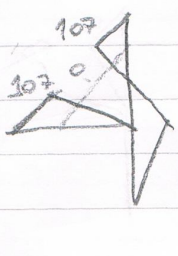
2PNC 28 $A = 106{,}6 cm^2$

$W = 897 cm^3$

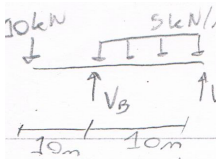
$$140 \times 10^3 \frac{kN}{m^2} \geq \frac{5d^2}{2} \frac{1}{897 \times 10^{-6} m^3} + \left(10d + \frac{15d^2}{4}\right) \frac{1}{106{,}6 \times 10^{-4} m^2} \rightarrow \boxed{6{,}53m = d}$$



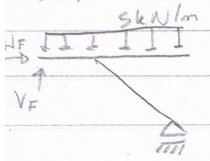



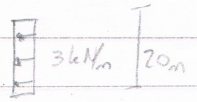
# EJERCICIO 2




$(\Sigma M_B=0)\ 5\,kN/m \cdot 10m \cdot 5m = 10kN \cdot 10m + V_C \cdot 10m \rightarrow V_C = 15kN$

$V_B = 50kN - 15kN - 10kN = 45kN$

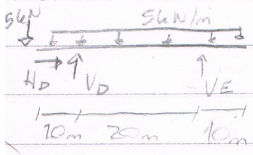



$\Sigma F_H=0 \rightarrow H_F = 60kN$

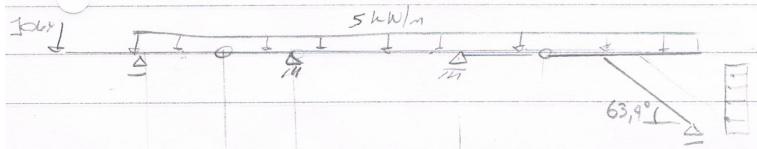
$\Sigma M_F = 0 = 5kN/m \cdot 20m \cdot 10m + 3kN/m \cdot 20m \cdot 10m - V_I \cdot 20m \rightarrow V_I = 80kN$

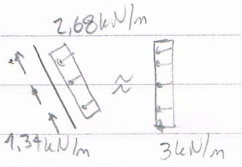
$\rightarrow V_F = 20kN$

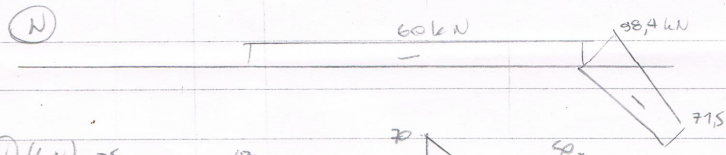


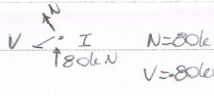

$H_D = 60kN \quad \Sigma M_D = 0 \rightarrow 20kN \cdot 10m + V_D \cdot 20m = 15kN \cdot 30m + 5kN/m \cdot 40m \cdot 10m$

$V_D = 112,5kN \qquad V_E = -112,5kN + 35kN + 200kN = 122,5kN$

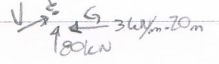


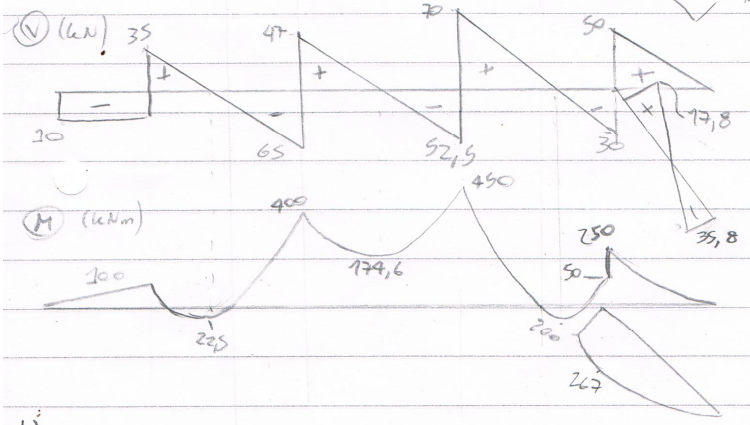




$N = 80kN \cdot \sin 63,4° \qquad V = -80kN \cos 63,4°$

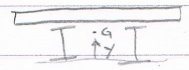



$N = -80\sin 63,4 - 60\cos 63,4$

$V = 80\cos 63,4 - 60\sin 63,4$




b)

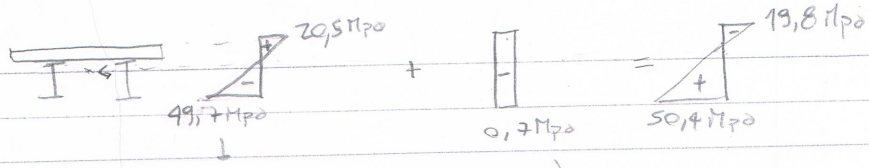



$$y_G = \frac{2 \times 213cm^2 \times 27,5cm + 100cm \times 4cm \times 57cm}{2 \times 213cm^2 + 400cm^2} = 41,8cm$$

$$I_x = 2 \times 99180cm^4 + 2 \times 213cm^2 (41,8cm - 27,5cm)^2 + \frac{100cm(4cm)^3}{12} + 100cm \cdot 4cm (57cm - 41,8cm)^2 = 378422cm^4$$

$$Q_{\square} = 100cm \cdot 4cm \times (57cm - 41,8cm) = 6080cm^3 \rightarrow \tau = \frac{70kN \cdot 6080cm^3}{378422cm^4 \cdot 2 \times 2cm} = 0,28\ MPa.$$

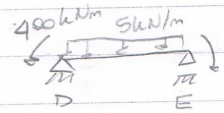
c)



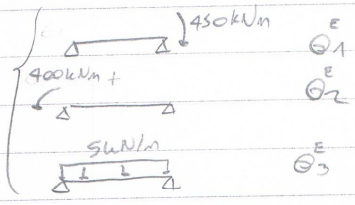

$\sigma = \frac{45000\ kNcm}{378422\ cm^4} \times 41,8cm$ $\qquad \sigma = \frac{60kN}{826cm^2}$

$\sigma = \frac{45000\ kNcm}{378422\ cm^4} \times 17,2cm$

d) Flecha en F

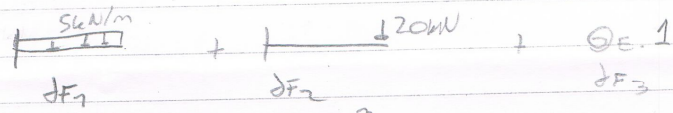



$\rightarrow \theta_E =$

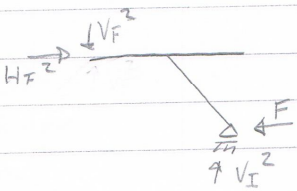



$\theta_E = \frac{450kNm \cdot 20m}{3EI} + \frac{400kN \cdot 20m}{6EI} - \frac{5kN/m\,(20m)^3}{24EI} = 0,0034 rad$

$f_F =$

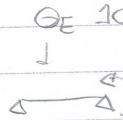



$f_F = \frac{5kN/m\,(10m)^4}{8EI} + \frac{20kN\,(10m)^3}{3EI} - 0,0034 rad \cdot 10m = 4,98cm \downarrow$




$H_F^2 = F \qquad \Sigma M_I = 0 \Rightarrow \boxed{V_F^2 = F}$

Flecha por $\vec{F}$ $\qquad f_F^2 =$




$+ \theta_E\ 10m = \frac{F(10m)^3}{3EI} + \frac{10m\,F \cdot 20m}{3EI} \times 10m$




$f_F^2 = 0,1258\,F \qquad f_F^1 + f_F^2 = 0 \rightarrow f_F^2 = 4,98cm \uparrow \qquad \boxed{F = 39,6kN}$