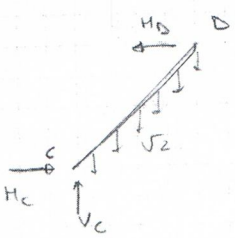
Ejercicio 1 =

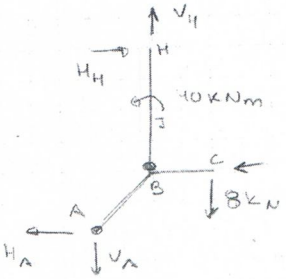
A)



$\Sigma V = V_C = \sqrt{2}\, 4\sqrt{2} = \boxed{8\ kN = V_C}$

$\Sigma M_C = H_D\, 4 = 8 \times 2 \Rightarrow \boxed{H_D = 4\ kN}$

$\Sigma H = \boxed{H_C = H_D = 4\ kN} \leftarrow$



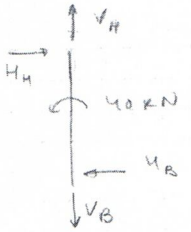
$M_B^{BH} = 40 - H_H\, 4 = 0 \Rightarrow \boxed{H_H = 10\ kN}$

$H_A = 40 - 8 \times 4 + 4 \times 2 - H_H\, 6 + V_H\, 2 = 0$

$-24 + V_H 2 = 0 \Rightarrow \boxed{V_H = 22\ kN}$

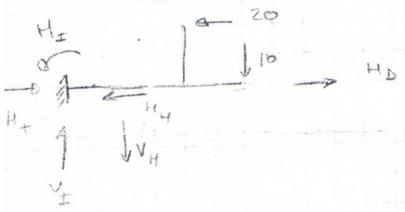
$\Sigma H = H_A = H_H - 4 = \boxed{6\ kN = H_A}$

$\Sigma V = V_A = V_H - 8 = \boxed{14\ kN = V_A}$



$\boxed{H_B = H_H = 10\ kN}$

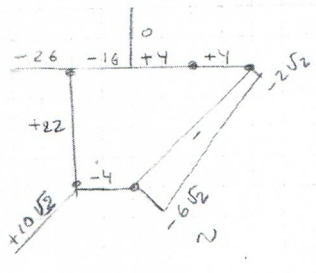
$\boxed{V_B = V_H = 22\ kN}$

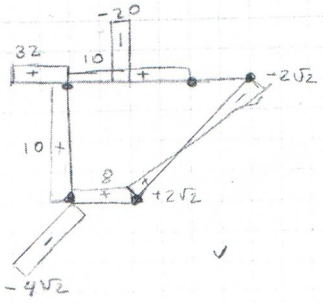


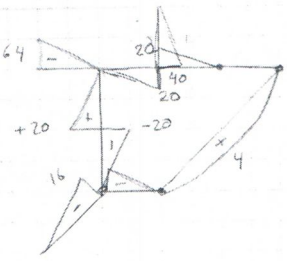
$\Sigma H = H_I = H_H - H_D + 20 = 10 - 4 + 20 = \boxed{26\ kN = H_I}$

$\Sigma V = V_I = V_H + 10 = 22 + 10 = \boxed{32\ kN = V_I}$

$M_I = M_I = V_H \times 2 - 20 \times 2 + 10 \times 6 = \boxed{64\ kN = M_I}$







$N_{AB} = \frac{H_A}{\sqrt{2}} + \frac{V_A}{\sqrt{2}} = 10\sqrt{2}$

$V_{AB} = \frac{H_A}{\sqrt{2}} - \frac{V_A}{\sqrt{2}} = -4\sqrt{2}$

$M_{CD}^{max} = H_D\, 2 - \sqrt{2}\, 2\sqrt{2} \times 1 = 4$

$N_C^{CD} = -\frac{H_C}{\sqrt{2}} - \frac{V_C}{\sqrt{2}} = -6\sqrt{2}$

$V_C^{CD} = \frac{V_C}{\sqrt{2}} - \frac{H_C}{\sqrt{2}} = 2\sqrt{2}$

$N_D^{CD} = -\frac{H_D}{\sqrt{2}} = -2\sqrt{2}$

$V_D^{CD} = -\frac{H_D}{\sqrt{2}} = -2\sqrt{2}$

b) $\sigma_{max} = \frac{26}{\Omega} + \frac{64}{W}$ ⇒ PNI 28 $\quad \Omega = 61\,cm^2 = 61\times10^{-4}\,m^2$

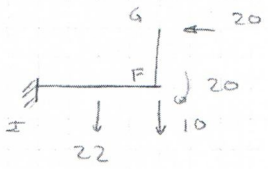
$W = 542\,cm^3 = 542\times10^{-6}\,m^3$

$$\sigma_{max} = \frac{26\,kN}{61\times10^{-4}\,m^2} + \frac{64\,kN\,m}{542\times10^{-6}\,m^3} = 122\,414\,kN/m^2 = 122,4\,MPa$$ SI ⇒ PNI 2

con PNI 26 $\sigma_{max} = \frac{26}{53,4\times10^{-4}} + \frac{64}{442\times10^{-6}} = 156\,MPa$ NO

c) $\tau = \frac{V\,M}{I\,b} = \frac{32\,kN \times 316\times10^{-6}\,m^3}{7590\times10^{-8}\,m^4 \; 1,01\times10^{-2}\,m} = 13\,191\,kN/m^2 = 13,2\,MPa$

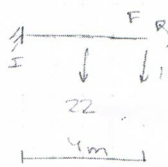
d)



Sup F fijo ⇒

$$\leftarrow f_G^1 = \frac{P\ell^3}{3EI}$$

$$\leftarrow f_G^1 = \frac{20\,kN\;2^3\,m^3}{3\times210\times10^6\,kPa\;7590\times10^{-8}\,m^4} = 0,3$$



$$\sigma\theta_F = \frac{M\ell}{EI} - \frac{P\ell^2}{2EI} - \frac{Pa^2}{2EI} =$$

$$= \frac{20\times4}{15939} - \frac{10\times4^2}{2\times15939} - \frac{22\times2^2}{2\times15939} = -2,76\times10^{-3}$$

Giro Rígido =

$$\leftarrow f_G^2 = \sigma\theta_G\,\ell = -2,76\times10^{-3}\times2m = -5,52\times10^{-3}\,m = -0,5$$

$$\leftarrow f_{G\,TOT} = 0,33 - 0,55 = -0,22\,cm$$

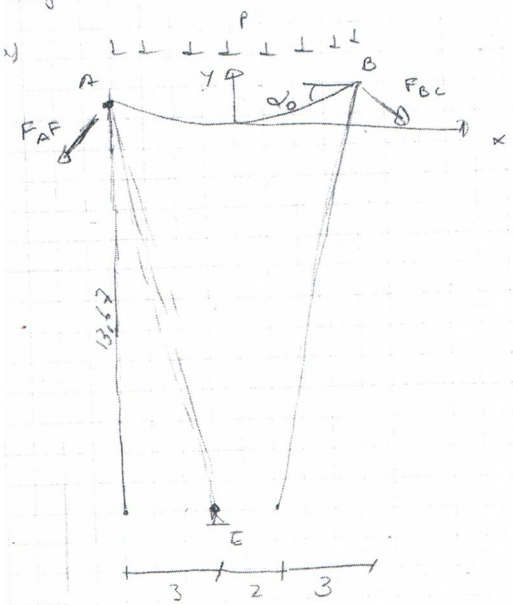
$$\downarrow f_G = \downarrow f_F = -\frac{20\times4^2}{2\times15939} + \frac{10\times4^3}{3\times15939} + \frac{22\times2^3\,(3\times4-2)}{6\times15939} = 0,0125\,m = 1,25\,cm$$

Ejercicio 2 =

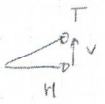
$F_{adm} = 100\ kN$

$\alpha_{adm} = 30°$

a)



$y = \frac{p}{2H} x^2 \qquad \frac{dy}{dx} = \frac{p}{H} x = tg\alpha$



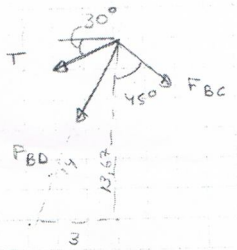
$H = T\cos\alpha$

$\Rightarrow \frac{p}{T\cos\alpha} x = tg\alpha \Rightarrow p\,x = T\cos\alpha\, tg\alpha$

$\Rightarrow p_{adm} \times 4m = 100\ kN \times \cos 30 \times tg 30 \Rightarrow$

$\Rightarrow p_{adm} = 12,5\ kN/m$

b)



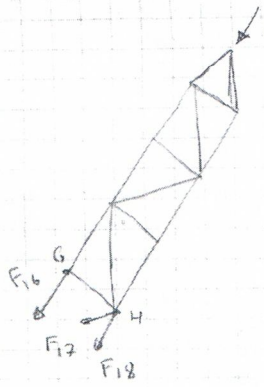
$\Sigma H)\ T\cos 30° + F_{BD}\frac{3}{14} = \frac{F_{BC}}{\sqrt{2}}$

$\Sigma V)\ T\,sen30 + F_{BD}\frac{13,67}{14} = -\frac{F_{BC}}{\sqrt{2}}$ } $\Rightarrow$ sumo

$\Rightarrow T(\cos 30 + sen30) + F_{BD}\left(\frac{3 + 13,67}{14}\right) = 0$

$F_{BD} = -\frac{100\ kN\,(\cos 30 + sen30)\,14}{3 + 13,67} = -114,72\ kN$

$F_{BC} = \sqrt{2}\left(T\cos 30 + F_{BD}\frac{3}{14}\right) = \sqrt{2}\left(100\cos 30 - 114,72 \times \frac{3}{14}\right) = 87,71\ kN$



$\Sigma \perp BD = F_{17}\,sen\alpha = 0 \Rightarrow F_{17} = 0$

Eq Nudo G $\perp$ BD $F_{15} = 0$

$M^H = F_{16} \times 1m + F_{BD}\,0,5m = 0 \Rightarrow F_{16} = -\frac{114,72}{2}$

$F_{16} = -57,36\ kN$

$\Sigma /\!/ BD = F_{18} = -F_{BD} - F_{16} = -114,72 + 57,36$

$F_{18} = -57,36\ kN$

c) Las barras 15 y 17 $\boxed{\phi = 10mm}$

Las barras 16 y 18 $\Omega = \frac{F}{\sigma} = \frac{57,36\ kN}{} = 4,1 \times 10^{-4} m^2 = 4,1\ cm$

$F_{18} = -57{,}36\ KN$

c) Las barras 15 y 17 $\boxed{\phi = 10\,mm}$

Las barras 16 y 18 $\Omega = \frac{F}{\sigma} = \frac{57{,}36\ KN}{140 \times 10^3\ kPa} = 4{,}1 \times 10^{-4}\ m^2 = 4{,}1\ cm^2$

$\Rightarrow \phi = \sqrt{\frac{4\Omega}{\pi}} = 2{,}3\ cm = \boxed{23\ mm = \phi}$

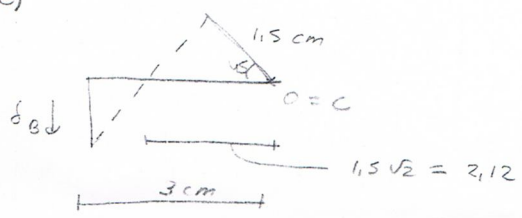
d) $F_{BC} = 87{,}71\ KN \Rightarrow \Omega = \frac{F}{\sigma} = \frac{87{,}71}{200 \times 10^3} = 4{,}4 \times 10^{-4}\ m^2 = 4{,}4\ cm^2$

$\phi = \sqrt{\frac{4\Omega}{\pi}} = 2{,}4\ cm$

$\Delta l = \frac{F l}{E \Omega} \Rightarrow \Omega = \frac{F l}{E \Delta l} = \frac{87{,}71 \times \sqrt{2} \times 13{,}67}{210 \times 10^6 \times 1{,}5 \times 10^{-2}} = 5{,}38 \times 10^{-4}\ m^2 = 5{,}38\ cm^2$

$\phi = \sqrt{\frac{4\Omega}{\pi}} = 2{,}6\ cm = \boxed{26\ mm = \phi}$

e) $\leftarrow \delta_B = 3\ cm$



$\delta_B\downarrow = 3\ cm - \sqrt{2} \times 1{,}5 = 0{,}88\ cm$