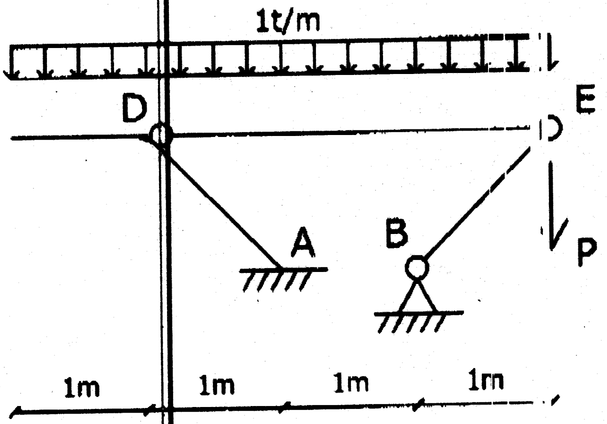
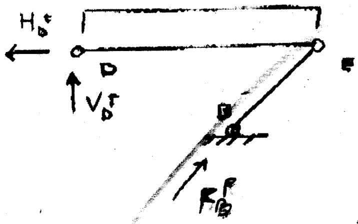
Ejercicio 1





$\sum M_E = 0$

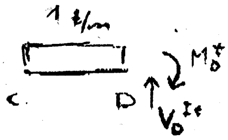
$\Rightarrow 3t \cdot 1{,}5m = V_D^t \cdot 3m$

$\Rightarrow V_D^t = 1{,}5t$

$\sum M_B = 0$

$\Rightarrow 1{,}5t \cdot 2m - H_D^t \cdot 1m - 3t \cdot 0{,}5m = 0$

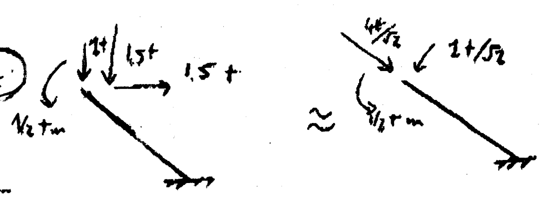
$\Rightarrow H_D^t = 1{,}5t$



$V_D^{It} = 1t/m \cdot 1m = 1t$

$M_D^t = 1t \cdot 0{,}5m = 1/2\ tm$

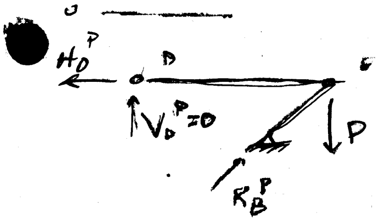
$\Rightarrow$ E_t



$\delta_D^{t\prime} = \frac{1}{\sqrt{2}} \frac{(\sqrt{2})^3}{3} \frac{tm^3}{EI} (\swarrow)$

$\delta_D^{t\prime\prime} = \frac{1}{2} \frac{(\sqrt{2})^2}{2} \frac{tm^2}{EI} (\swarrow)$

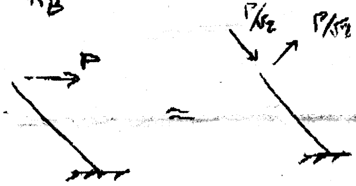
$\delta_D^t = \frac{7}{6} \frac{tm^3}{EI} (\swarrow)$



DE y EB bielas $\Rightarrow V_D^P = 0$

$\sum M_B = 0 \Rightarrow P \cdot 1m = H_D \cdot 1m \Rightarrow H_D = P$

E_P



$\delta_D^P = \frac{P}{\sqrt{2}} \frac{(\sqrt{2})^3}{3} \frac{m^3}{EI} (\nearrow)$

$= \frac{2}{3} P \frac{m^3}{EI} (\nearrow)$

$\Rightarrow \delta_D = \delta_D^t - \delta_D^P = \frac{7}{6} \frac{tm^3}{EI} - \frac{2}{3} P \frac{m^3}{EI} = 0 \Rightarrow \boxed{P = 7/4\ t}$

$M_{DE}^+ = \frac{1t/m \cdot (3m)^2}{8} = 1{,}125\ tm$

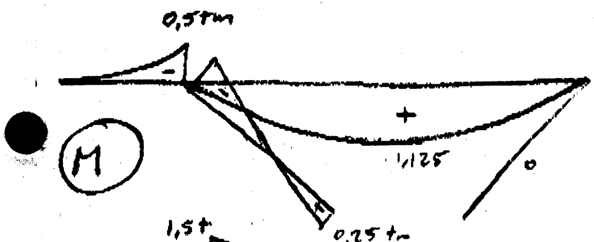
$M_A = (1{,}5 - \cancel{1{,}5} - 1 + 7/4)\ 1m - 0{,}5\ tm = 0{,}25\ tm$

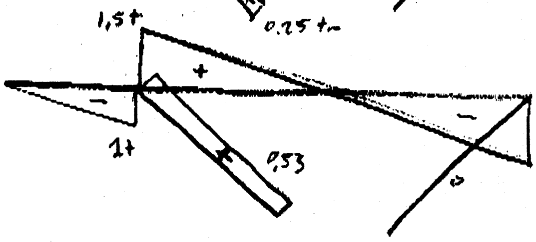
$V_{DA} = \left(\frac{7/4 - 1}{\sqrt{2}}\right) = 0{,}53t$

$R_B^t = V_D^t \cdot \sqrt{2} = 2{,}12t$

$R_B^P = P \cdot \sqrt{2} = 2{,}47$

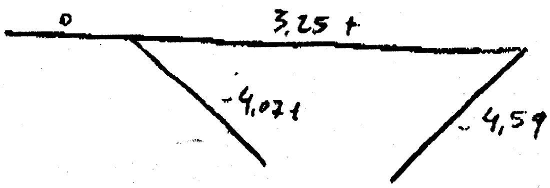
$R_B = 4{,}59\ t$

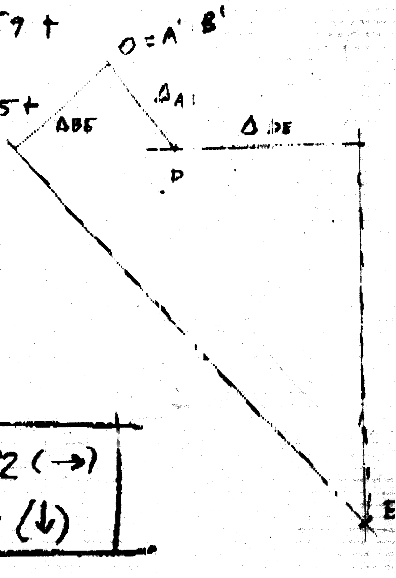




$N_{DE} = H_D^t + H_D^P = (1{,}5 + 7/4) = 3{,}25t$

$N_{DA} = -\frac{(4t + 7/4)}{\sqrt{2}} t = 4{,}07\ t$





$\delta_{EH} = 13{,}82\ (\rightarrow)$

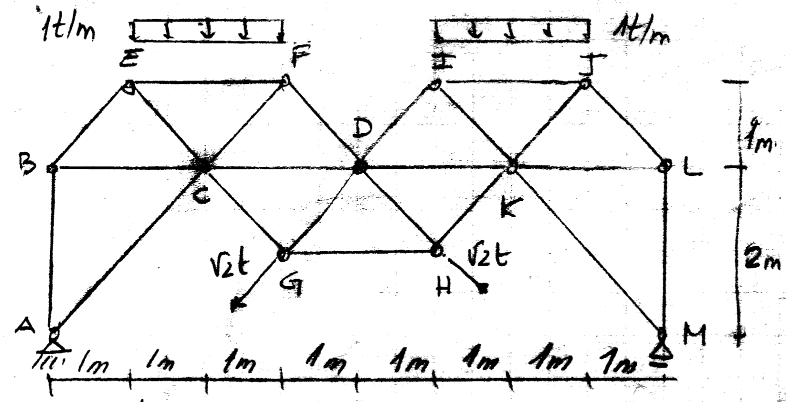
$\delta_{EV} = 23{,}0\ (\downarrow)$

$\Delta \ell_{AD} = -\frac{4{,}07\ t \cdot \sqrt{2}\ m}{AE} = -5{,}76\ \frac{tm}{AE}$

$\Delta \ell_{DE} = \frac{3{,}25\ t \cdot 3m}{AE} = 9{,}75\ \frac{tm}{AE}$

$\Delta \ell_{EB} = -\frac{4{,}59\ t \cdot \sqrt{2}\ m}{AE} = -6{,}49\ \frac{tm}{AE}$

EXAMEN RESISTENCIA DE MATERIALES 1 19/12/07

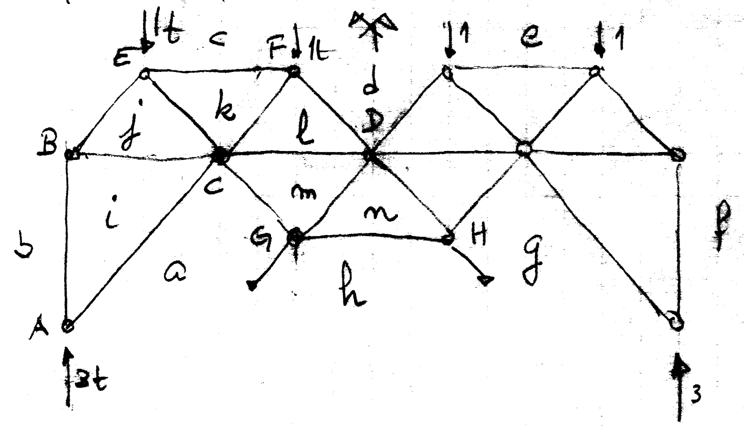


Hallar solicitaciones en todas las barras y desplazamiento relativo de los nudos H y F respecto al nudo C, en función de EΩ

Barras horizontales y verticales área 2Ω

Barras inclinadas área √2Ω

E = cte



	N ; EΩΔl
AB	-3
AC	0
BC	3
BE	$-3\sqrt{2}$
EC	$2\sqrt{2}$
EF	-5
FD	$-3\sqrt{2}$
FC	$2\sqrt{2}$
CD	-1
CG	$4\sqrt{2}$
GD	$-3\sqrt{2}$
GH	8

↑ simétricas

Barras inclinadas (except AC, KM)

$l = \sqrt{2}$ m Area $= \sqrt{2}\Omega$

$$\Delta l = \frac{F\,l}{EA} = \frac{F\sqrt{2}}{E\Omega\sqrt{2}} = \frac{F}{E\Omega}$$

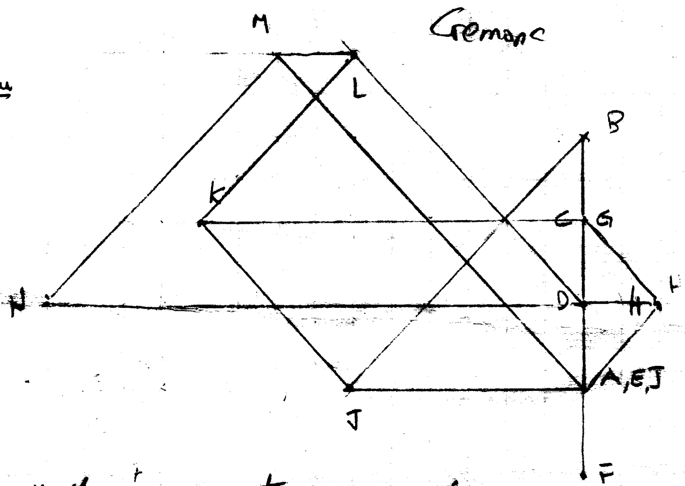
Barras horiz/verticales

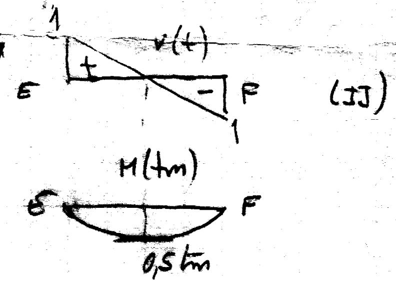
$l = 2$m Área $= 2\Omega$

$$\Delta l = \frac{Fl}{EA} = \frac{F\cdot 2}{E2\Omega} = \frac{F}{E\Omega}$$

Cremona

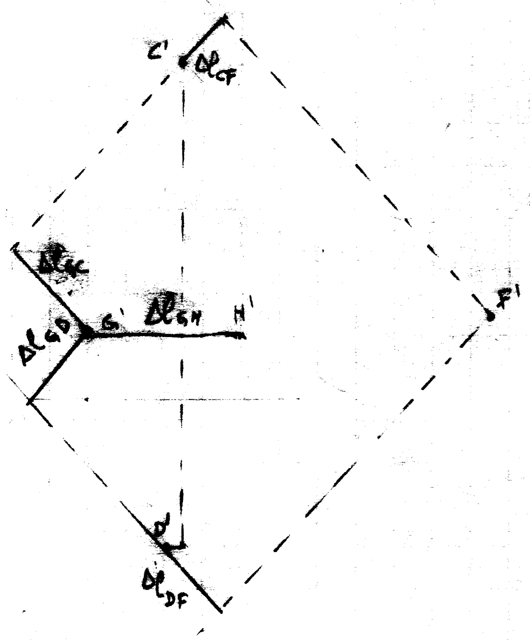
$e = \frac{1cm}{1t}$





Williot, Por simetría G y H en la misma horizontal

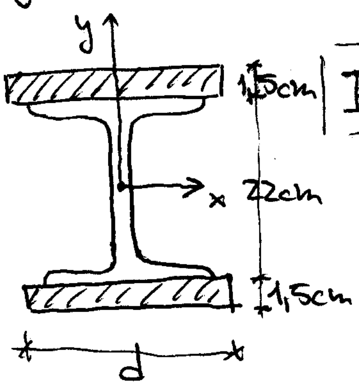
$e = \frac{1cm}{2E\Omega\Delta l}$



$E\Omega\,\Delta_{HC}\rightarrow = 3$; $E\Omega\,\Delta_{HC}\downarrow = 13$

$E\Omega\,\Delta_{FC} = 16$; $E\Omega\,\Delta_{FC}\downarrow = 12$

Ejercicio 3

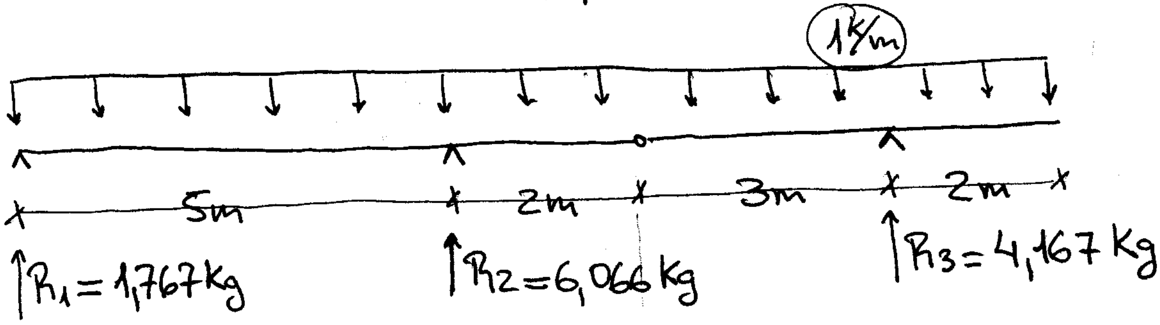


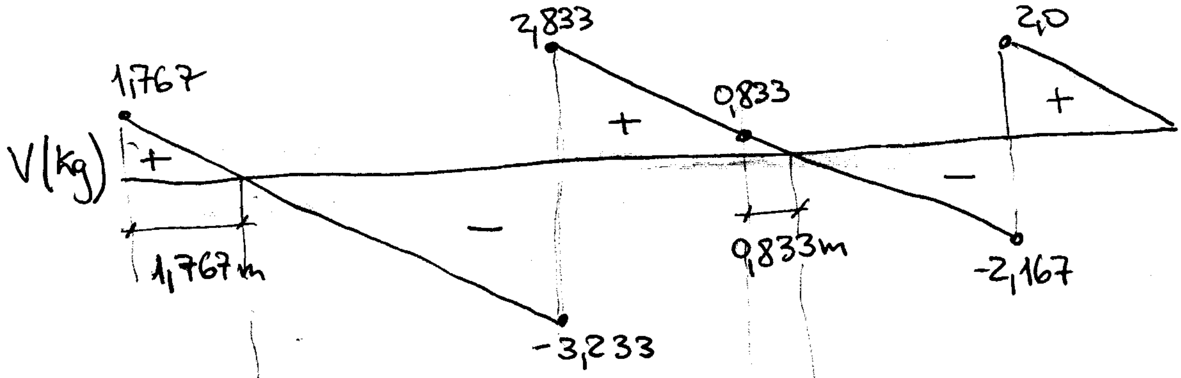
$$\boxed{I_{PNI22} = 3060\,cm^4 \qquad W_{PNI22} = 278\,cm^3}$$

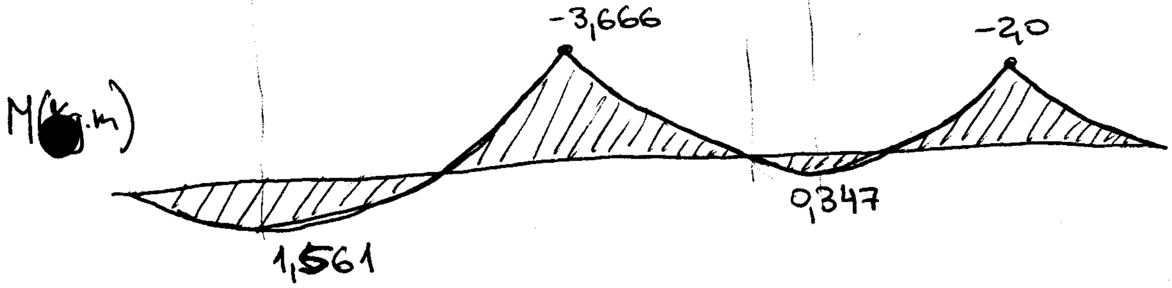
$$I_x = 3060\,cm^4 + 2\times\left(\frac{d\times(1{,}5cm)^3}{12} + d\times(1{,}5cm)\times(11{,}75cm)^2\right)$$

$$I_x = 3060\,cm^4 + d\times 207{,}375\,cm^3 \times 2$$

$$W_x = \frac{I_x}{12{,}5cm} = 244{,}8\,cm^3 + d\times 16{,}59\,cm^2\times 2$$







$$M_{max} = (3{,}666\,kg.m)\,q \Rightarrow \sigma_{max} = \frac{M_{max}}{W_{PNI22}} = \frac{(366{,}6\,kg.cm)\,q}{278\,cm^3} \leq \sigma_{adm} = 1400\,kg/cm^2$$

$$\boxed{q_{adm} = 1062\,kg/m}$$

$$M_{max} = 3{,}666\times 1800\,kg/m = 6598{,}8\,kg.m = 659880\,kg.cm$$

$$\sigma_{max} = \frac{M_{max}}{W_x} = \frac{659880\,kg.cm}{244{,}8cm^3 + 2d\times 16{,}59\,cm^2} \leq \sigma_{adm} = 1400\,kg/cm^2 \Rightarrow \boxed{d = 6{,}83\,cm}$$

cont. Ej. 3

$V_{max} = 3{,}233 \times 1800 \text{ kg} = 5819{,}4 \text{ Kg}$

$I_x = 5922 \text{ cm}^4$ $\mu_x = 121{,}6 \text{ cm}^3$

$\tau_{max} = \dfrac{V_{max} \cdot \mu_x}{I_x \cdot d} = 17{,}3 \text{ Kg/cm}^2$

• Se da en el segundo apoyo de la viga y en las fibras de contacto entre el PNI 22 y las placas