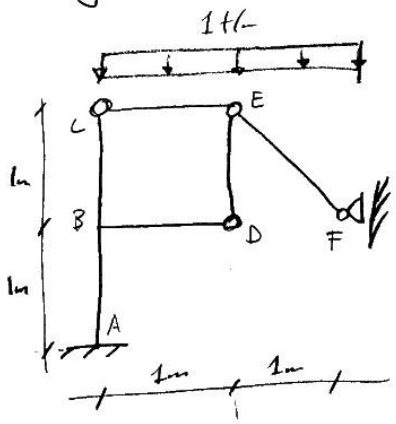
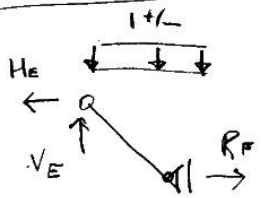
EJ.: 1



Reacciones

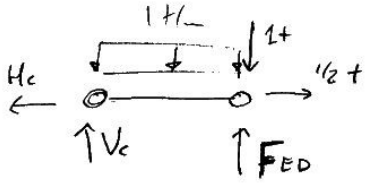


$M_E = 0 \Rightarrow 1\,t/m \cdot 1\,m \cdot \frac{1}{2}\,m = R_F \cdot 1\,m$

$R_F = 1/2\ t$

$H_E = 1/2\ t$

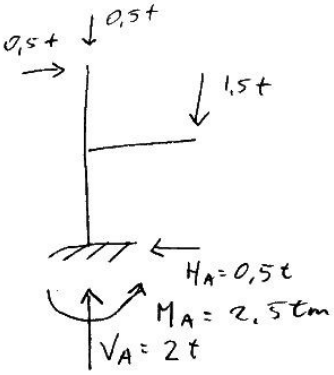
$V_E = 1\,t$



$H_c = 1/2\ t$

$F_{ED} = 1/2\ t + 1\,t = 1{,}5\,t$

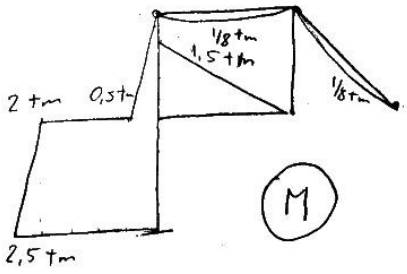
$V_c = 0{,}5\ t$

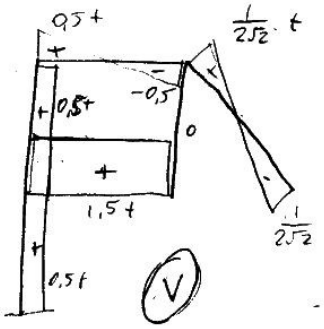


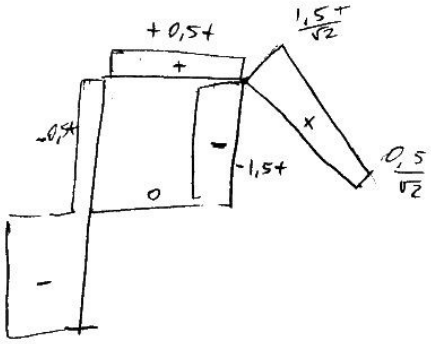
$M_A = 1{,}5\,t \cdot 1\,m + 0{,}5\,t \cdot 2\,m$

$M_A = 2{,}5\,t\,m$

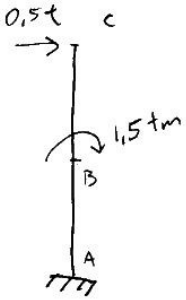
Solicitaciones

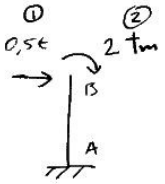






Desplazamiento de C



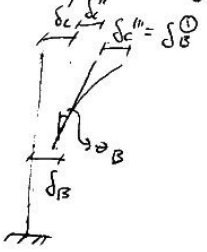


$$\delta_B^1 = \frac{0{,}5\,t \cdot (1\,m)^3}{3\,EI} \qquad \delta_B^2 = \frac{2\,tm\,(1\,m)^2}{2\,EI}$$

$$\delta_B = \frac{7}{6}\,\frac{tm^3}{EI}\ (\rightarrow)$$

$$\theta_B^1 = \frac{0{,}5\,t \cdot (1\,m)^2}{2\,EI} \qquad \theta_B^2 = \frac{2\,tm \cdot 1\,m}{EI}$$

$$\theta_B = \frac{9}{4}\,\frac{tm^2}{EI}\ (\circlearrowleft)$$



$$\delta_C' = \delta_B = \frac{7}{6}\,\frac{tm^3}{EI}$$

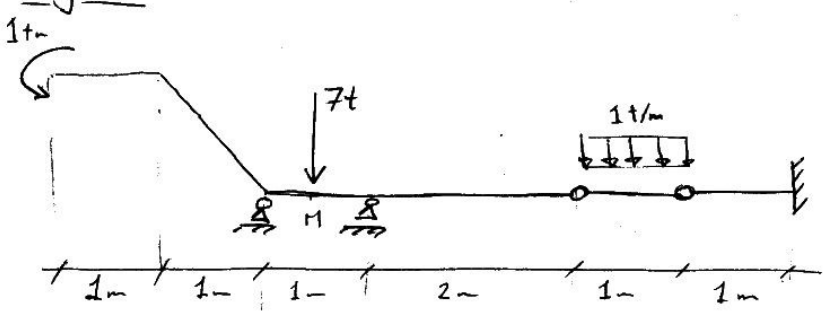
$$\delta_C'' = \theta_B \cdot 1\,m = \frac{9}{4}\,\frac{tm^3}{EI}$$

$$\delta_C''' = \frac{1}{6}\,\frac{tm^3}{EI}$$

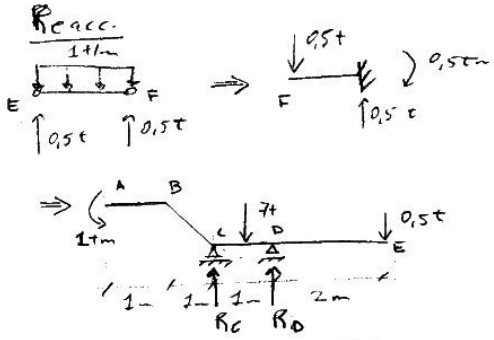
$$\boxed{\delta_C = \frac{43}{12}\,\frac{tm^3}{EI}}$$

$$\delta_C = 3{,}58\,\frac{tm^3}{EI}$$

Ej. 2



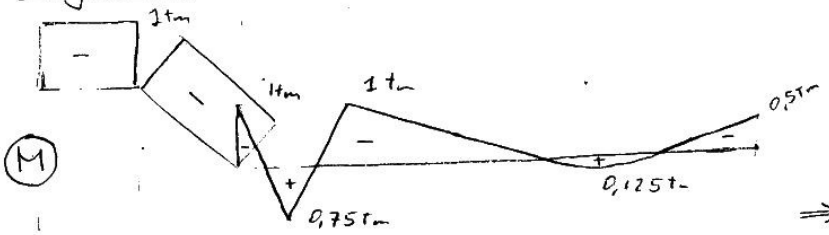
Reacc.



$R_D = \frac{7t \cdot 0{,}5m + 0{,}5t \cdot 3m - 1tm}{1m} = 4t$

$R_C = 7t + 0{,}5t - 4t = 3{,}5t$

Diagramas de momentos



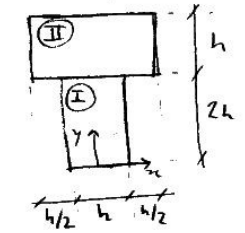
$M_M = 4t \cdot 0{,}5m - 0{,}5t \cdot 2{,}5m = 0{,}75\,tm$

↳ M, pto ½ $\overline{BC}$

$\Rightarrow M^+ = 0{,}75\,tm$

$M^- = 1\,tm$

Sección



Inercia

	Ω	y_G'	$\Omega y_G'$	I'	$(y_G'-y_G)$	$(y_G'-y_G)^2\Omega$
I	2	1	2	2/3	-0,75	1,125
II	2	2,5	5	1/6	+0,75	1,125
Σ	4		7	5/6		2,25

$\Rightarrow y_G = 1{,}75h \left(\frac{7}{4h}\right)$ $I = 3{,}083\,h^4$ $\left(\frac{37}{12}h^4\right)$

$y_{sup} = 1{,}25h \Rightarrow W_s = 2{,}466\,h^3$

$y_{inf} = 1{,}75h \Rightarrow W_i = 1{,}762\,h^3$

Tensión admisible

tensión máxima (compresión): $\sigma = \frac{1\,tm}{1{,}762\,h^3} = 56{,}75\ tcm/h^3 \leq 0{,}2\ t/cm^2$

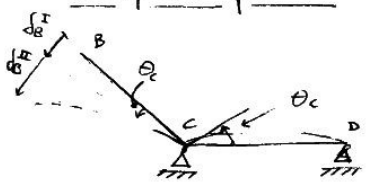
$\Rightarrow h \geq \sqrt[3]{\frac{56{,}75\ tcm}{0{,}2\ t/cm^2}} = 6{,}57\,cm$

máxima tensión de tracción: $\sigma^I = \frac{1\,tm}{2{,}466h^3} = 40{,}55\ tcm/h^3$ ✗

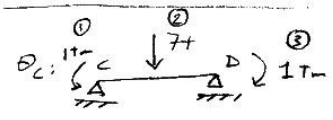
$\sigma^{II} = \frac{0{,}75\,tm}{1{,}762\,h^3} = 42{,}57\ tcm/h^3 \leq 0{,}14\ t/cm^2$

$\Rightarrow h \geq \sqrt[3]{\frac{42{,}57\ tcm}{0{,}14\ t/cm^2}} = 6{,}72\,cm$

Desplaz. pto B



θ_C:

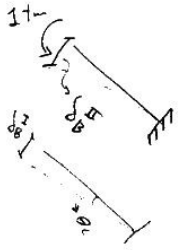


$\theta_C^1 = \frac{1tm \cdot 1m}{6} = \frac{1}{6}\,tm^2\ (\circlearrowleft)$

$\theta_C^2 = \frac{7t \cdot 1m^2}{16} = \frac{7}{16}\,tm^2\ (\circlearrowright)$

$\theta_C^3 = \frac{1tm \cdot 1m}{6} = \frac{1}{3}\,tm^2\ (\circlearrowleft)$

$\Rightarrow \theta_C = 0{,}062\,tm^2\ (\circlearrowleft)$ (todo sobre EI)



$\delta_B^{II} = \frac{1\,tm \cdot (\sqrt{2}m)^2}{2\,EI} = 1\ \frac{tm^3}{EI}\ (\swarrow)$

$\delta_B^I = \frac{0{,}062\,tm^2 \cdot \sqrt{2}\,m}{EI} = 0{,}088\ \frac{tm^3}{EI}\ (\swarrow)$

$\Rightarrow \delta_B = 1{,}088\ \frac{tm^3}{EI}\ (\swarrow)$

con: $I = 3{,}083\,h^4 = 6287{,}1\,cm^4$

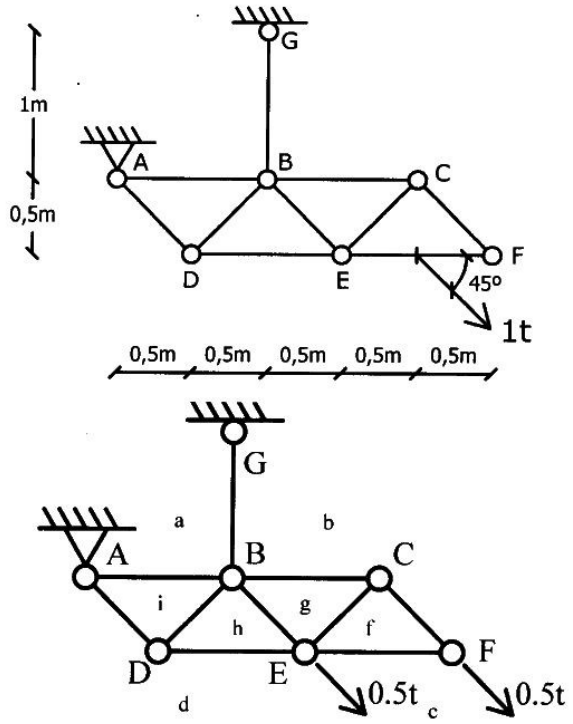
y: $E = 1{,}5 \times 10^5\ kg/cm^2$

$\Rightarrow \delta_B = 1{,}15\,cm$ ($\swarrow$: perpendicular a la barra)

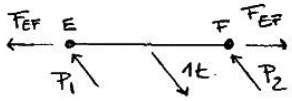
SEGUNDO PARCIAL – 21/11/08

Ejercicio 3

Dado el reticulado de la figura, trazar diagramas de solicitaciones en todas las barras y hallar el desplazamiento del punto **E**. Todas las barras tienen área $\sqrt{2}.\Omega$ y están constituidas por un material de módulo de elasticidad **E**.

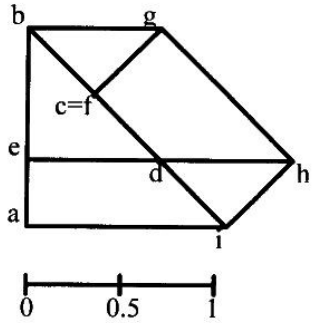


Barra EF

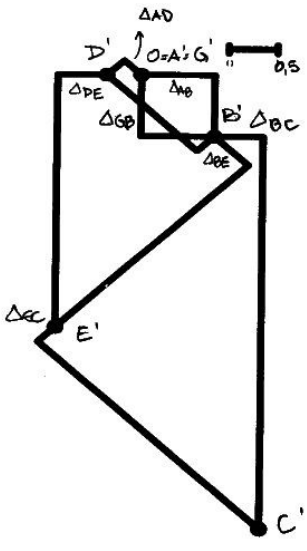


$M_E = 0 \rightarrow P_2 = 0{,}5t$

$P_1 = 0{,}5t$



Barra	signo	Fuerza (t)	largo (m)	dl (tm/ΩE)
CF	+	0,5	0,71	0,25
CE	-	0,5	0,71	0,25
CB	+	0,71	1	0,5
EB	+	1	0,71	0,5
ED	-	0,71	1	0,5
DB	+	0,5	0,71	0,25
DA	-	0,5	0,71	0,25
BG	+	1,06	1	0,75
BA	+	1,06	1	0,75



$\delta_E^H = 8{,}5 \frac{tm}{EI} \leftarrow$

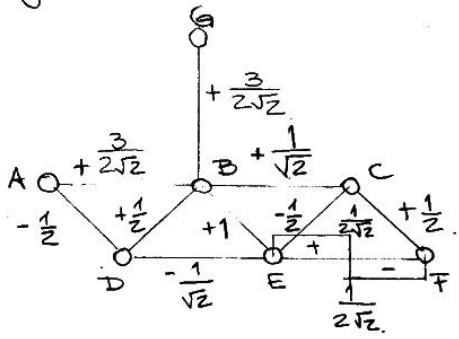
$\delta_E^V = 3{,}1 \frac{tm}{EI} \downarrow$

$\delta_C^H = 1{,}3 \frac{tm}{EI} \rightarrow$

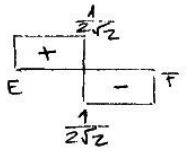
$\delta_C^V = 5{,}5 \frac{tm}{EI} \downarrow$

Diagramas de solicitaciones:

(N)



(V)



Todos los restantes barras tienen cortante y momento nulo.

(M)