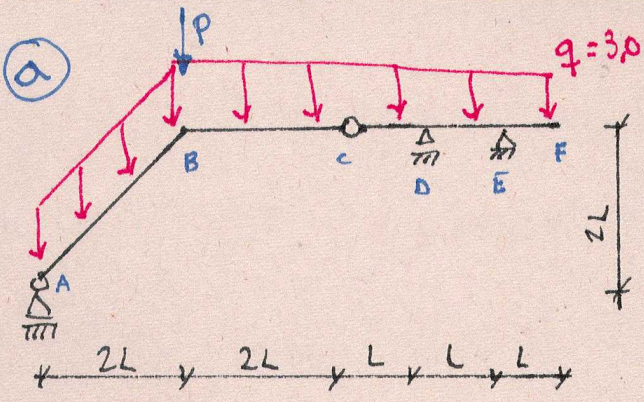
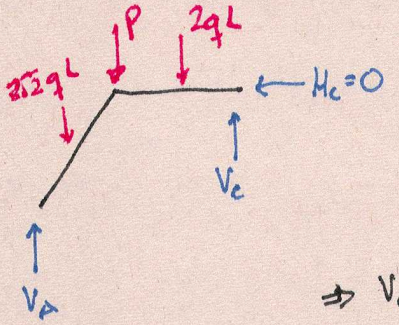
Examen Resistencia de Materiales 1 - Diciembre 2015

(a)



$L = 2{,}0\,m \quad E = 210\,GPa \quad I = 1500\,cm^4$

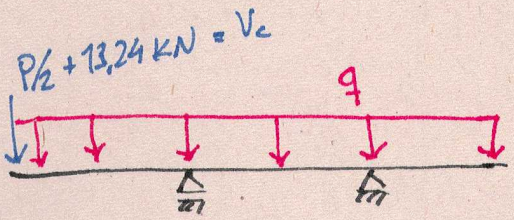
$\sum M_A = 0$



$$= 2\sqrt{2}qL \cdot \frac{2L}{2} + P \cdot 2L + 2qL \cdot 3L - V_c \cdot 4L$$

$$\Rightarrow V_c = \frac{P}{2} + \frac{qL}{2}\left(3+\sqrt{2}\right)$$

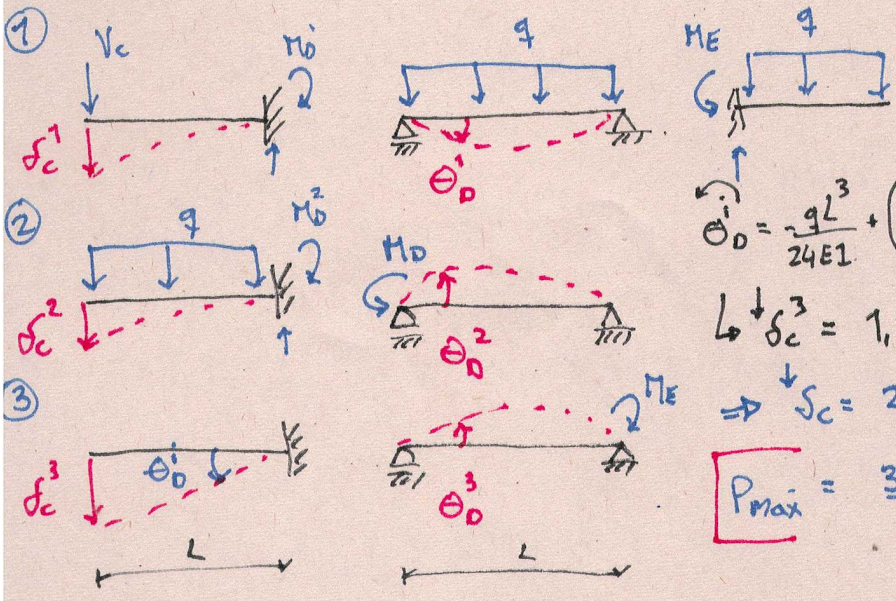
$$V_c = \frac{P}{2} + 13{,}24\,kN$$



$$\downarrow \delta_c^1 = \left(\frac{P}{2} + 13{,}24\right)\cdot\frac{L^3}{3EI} = 0{,}0423P + 1{,}12\,cm$$

$$\downarrow \delta_c^2 = \frac{qL^4}{8EI} = 0{,}19\,cm$$

$$\downarrow \delta_c^3 = \theta_D^i \cdot L + \theta_D^d \cdot L$$



$$\theta_D^i = -\frac{qL^3}{24EI} + \left(\frac{qL^2}{2} + V_c \cdot L\right)\frac{L}{3EI} + \frac{qL^2}{2}\cdot\frac{L}{6EI}$$

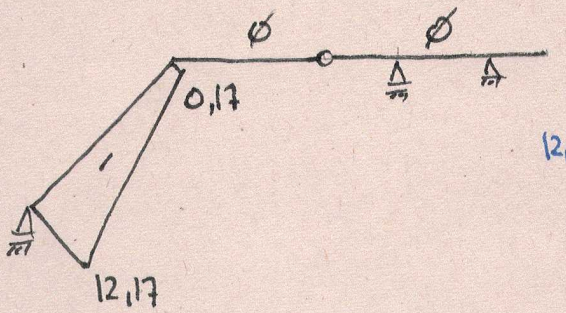
$$\downarrow \delta_c^3 = 1{,}44\,cm + 0{,}0423\,P$$

$$\Rightarrow \downarrow \delta_c = 2{,}75\,cm + 0{,}0846 \cdot P \leq \downarrow \delta_c^{adm} = 3\,cm$$

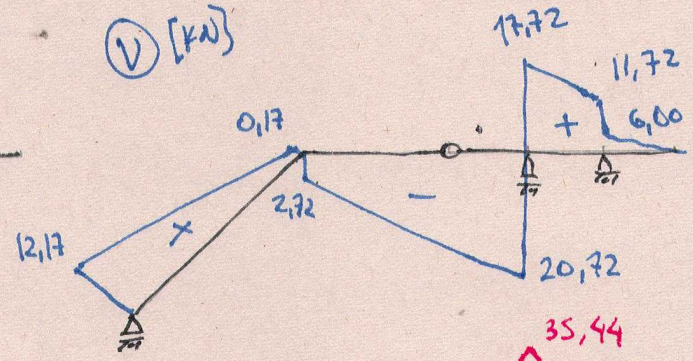
$$\boxed{P_{max} = \frac{3 - 2{,}75}{0{,}0846}\,kN = 2{,}96\,kN}$$

(b)

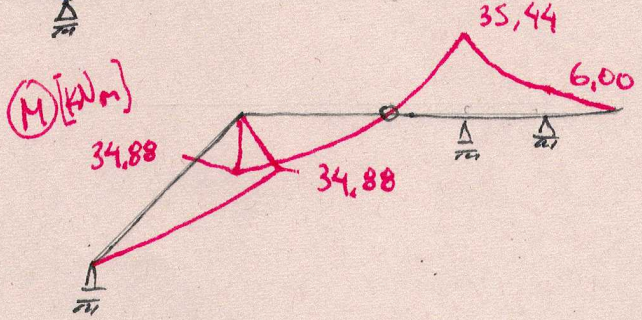
N [kN]



V [kN]

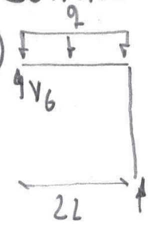


M [kNm]



Solución Examen lunes 21 de diciembre de 2015

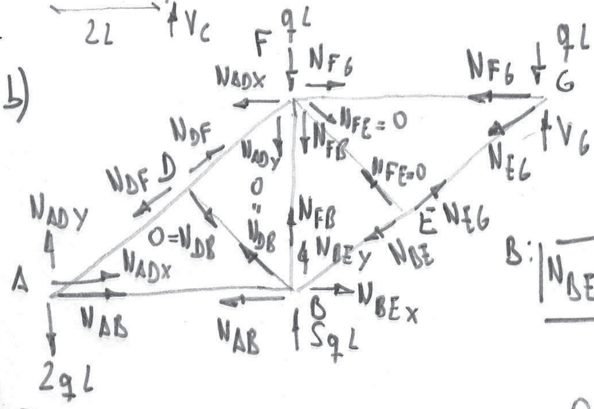
a)



$\Sigma M_G = 0 \rightarrow 2L \cdot V_C = q \frac{2L^2}{2} \rightarrow \boxed{V_C = qL}$; Eq Global $\Sigma M_A = 0 \rightarrow 2L V_B - 4qL \cdot \frac{4L}{2} + \frac{6L}{3} qL = 0$ $\boxed{V_B = 5qL}$

Eq. Vert $\rightarrow \boxed{V_A = 2qL \downarrow}$; $\boxed{H_A = 0}$

b)

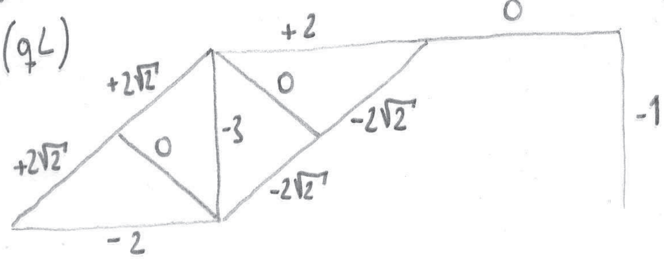


Nudo A: $\boxed{N_{ADY} = 2qL} \rightarrow \boxed{N_{ADX} = 2qL} \rightarrow \boxed{N_{AB} = -2qL}$

F: $\boxed{N_{FB} = -3qL}$; $\boxed{N_{FG} = +2qL}$

B: $\boxed{N_{BEY} = -2qL} \rightarrow \boxed{N_{BEX} = -2qL}$ G: $\boxed{V_G = -qL}$

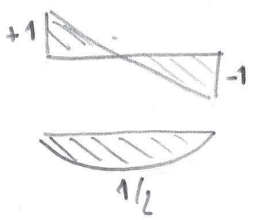
Ⓝ (qL)



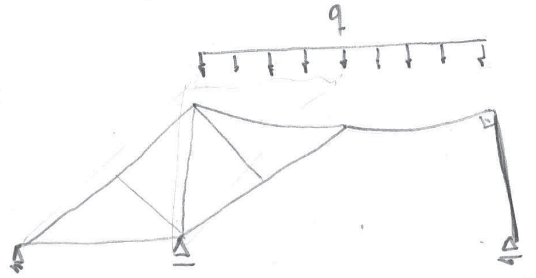
Cortante y momento en todas las barras son nulos excepto en FG y GH, que los diagramas de Ⓥ y Ⓜ son iguales:

Ⓥ (qL)

Ⓜ (qL^2)



c)



$1\text{cm} \sim 4 \frac{qL^2}{EA}$

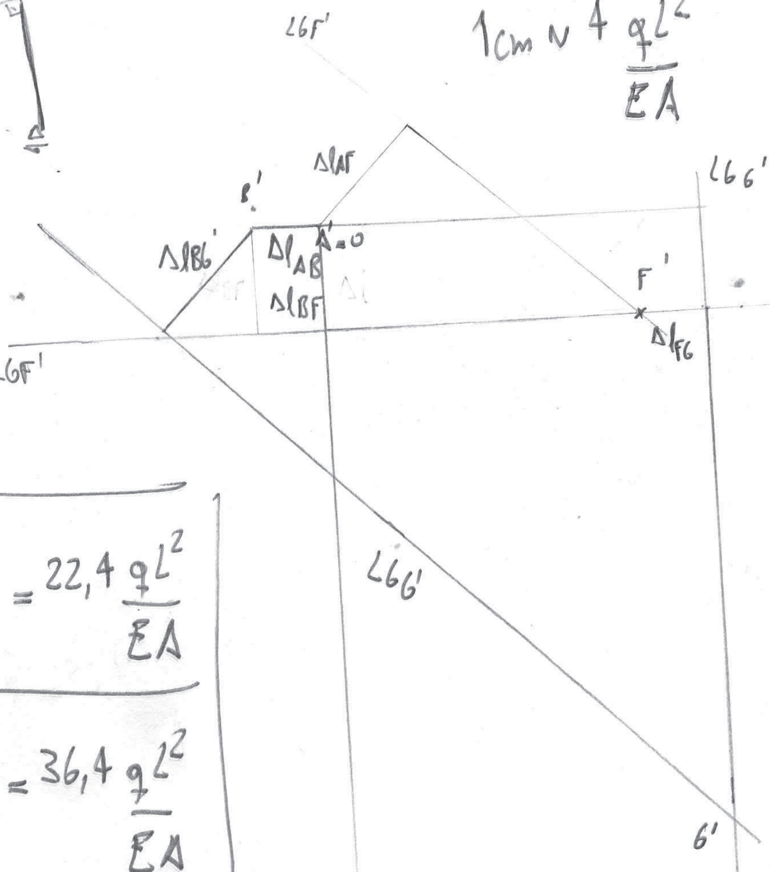
d) $\Delta l_{AB} = \frac{-qL^2}{EA} \cdot 4$

$\boxed{\Delta l_{AF} = \Delta l_{AD} + \Delta l_{DF} = \frac{+qL^2}{EA} \cdot 8}$

$\boxed{\Delta l_{BF} = -\frac{qL^2}{EA} \cdot 6}$

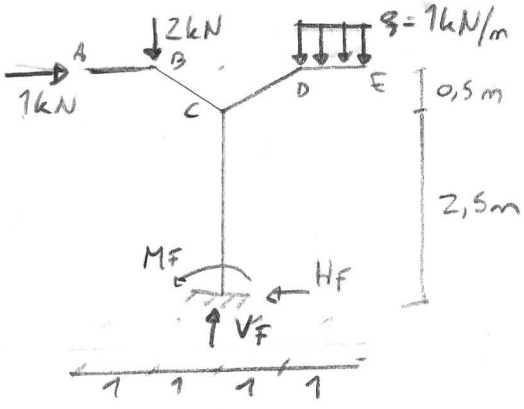
$\boxed{\Delta l_{FG} = +\frac{qL^2}{EA} \cdot 4}$

$\boxed{\Delta l_{BG} = -\frac{qL^2}{EA} \cdot 8}$



$\delta_G \text{ hor} \rightarrow = 22{,}4 \frac{qL^2}{EA}$

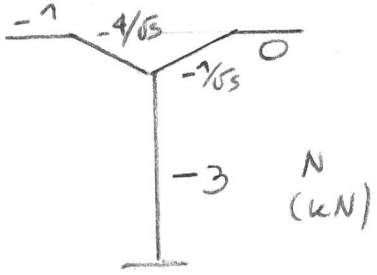
$\delta_G \text{ vert} \downarrow = 36{,}4 \frac{qL^2}{EA}$

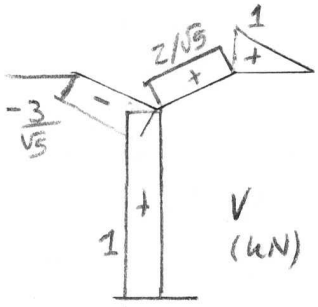


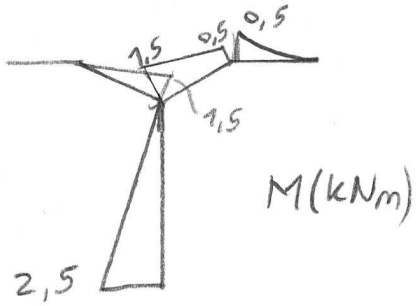
Reacciones $H_F = 1kN$ $V_F = 3kN$

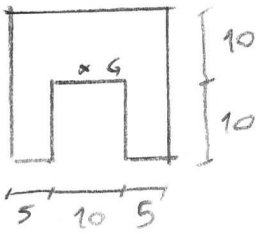
$M_F = 1kN/m \cdot 1m \cdot 0,5m + 1kN \cdot 3m - 2kN \cdot 1m = 2,5kNm$

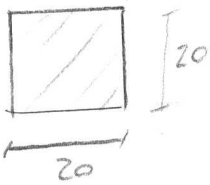
$\cos\alpha = 2/\sqrt{5} = 0,89$ $\operatorname{sen}\alpha = 1/\sqrt{5}$

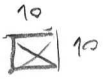






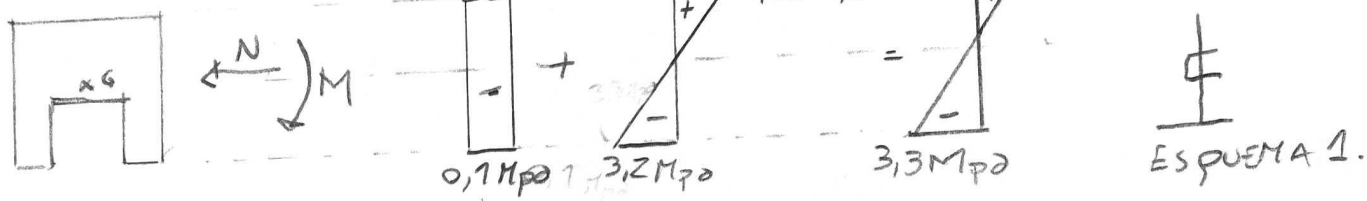






	A	Y_G	I_x	$A(Y_{Gi}-Y_G)^2$
1	400	10	13333	1111
2	-100	5	-833	-4444
	Y_G	11,7	I_{TG}	$9166cm^4$

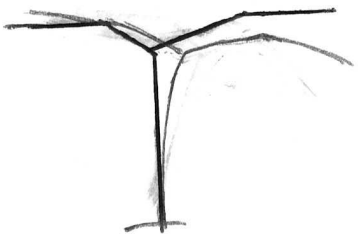
$W_{sup} = \frac{9166cm^4}{8,3cm} = 1104cm^3$ $W_{inf} = \frac{9166cm^4}{11,7cm} = 783cm^3$



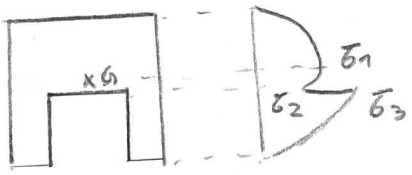
ESQUEMA 1.

σ por directa

σ por $M = -2,5kNm$



$\vec{f_c} = \frac{1kN(250cm)^4}{3.2000 \cdot 9166} = 0,28cm \rightarrow$



$M_{G_1} = \frac{(8,3cm)^2}{2} \cdot 20 = 689cm^3$

$M_2 = 10(15-11,7) \times 20 = 660cm^3$

$\sigma_1 = \frac{1,34kN \cdot 689cm^3}{20cm \cdot 9166cm^4} = 4,9 N/cm^2$

$\sigma_2 = 4,8 N/cm^2$ $\sigma_3 = 9,6 N/cm^2$.