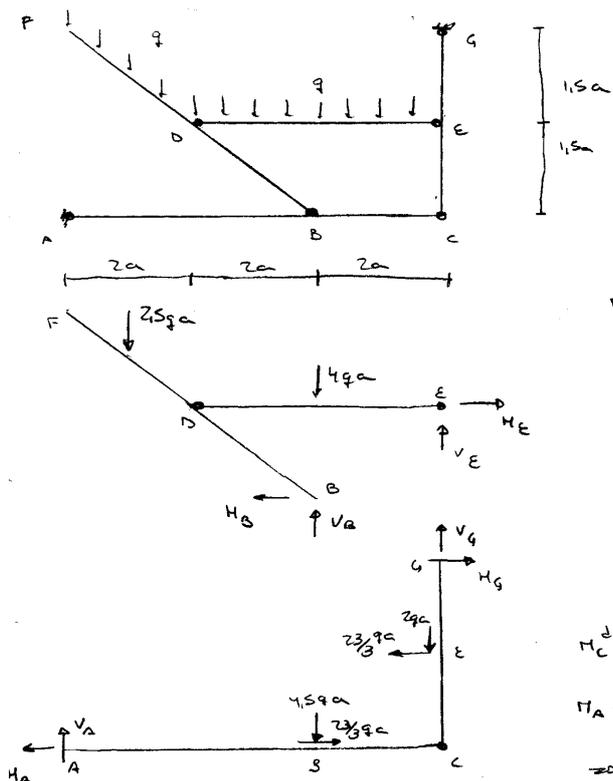


**Solución - Examen Julio 2005 - Resistencia de materiales 1 v 1N**

**EJERCICIO 1**



$$M_D^{der} = \frac{1}{2} q a^2 - V_E \cdot a = 0 \Rightarrow V_E = 2qa$$

$$M_B = 2.5qa \cdot 3a + V_E \cdot 2a - H_E \cdot 1.5a = 0$$

$$H_E = \frac{1}{1.5} (2.5 \times 3 + 2 \times 2) qa = \frac{23}{3} qa = 7.67 qa$$

$$H_B = H_E = \frac{23}{3} qa$$

$$V_B = 2.5qa + 4qa - V_E = 4.5qa = V_B$$

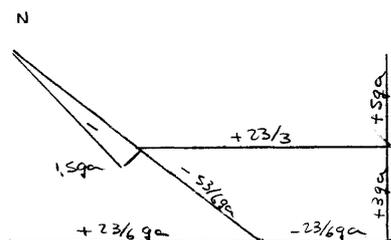
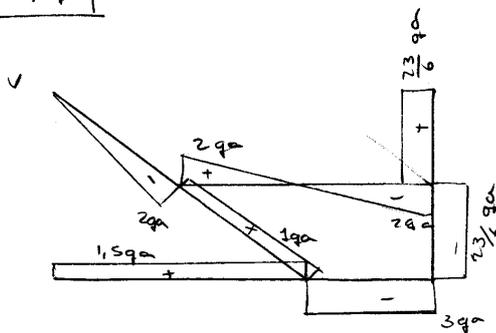
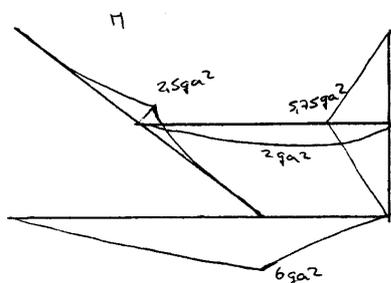
$$M_C^{der} = \frac{23}{3} qa \cdot 1.5a - H_G \cdot 3a = 0 \Rightarrow H_G = \frac{23}{6} qa = 3.83 qa$$

$$M_A = -4.5qa \cdot 4a + \frac{23}{3} qa \cdot 1.5a - 2qa \cdot 6a + V_G \cdot 6a - H_G \cdot 3a = 0$$

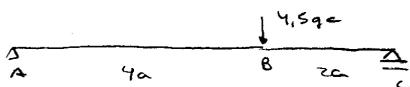
$$\Rightarrow V_G = \frac{1}{6} (4.5 \times 4 - \frac{23}{3} \times 1.5 + 2 \times 6 + \frac{23}{3} \times 3) qa = 5qa = V_G$$

$$H_A = H_G = \frac{23}{6} qa$$

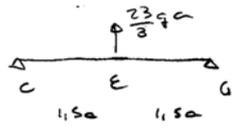
$$V_A = 4.5qa + 2qa - V_G \Rightarrow V_A = 1.5qa$$



b) Si las barras son rígidas a directa  $\Rightarrow$  C es pto fijo  $\Rightarrow$  hallo desplaz de B y E

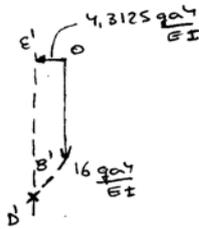


$$\delta_B = \frac{Pa^2 b^2}{3EI} = \frac{4.5qa \cdot 4^2 a^2 \cdot 2^2 a^2}{3EI \cdot 4} = 16 \frac{qa^2}{EI}$$



$$\delta_E = \frac{PL^3}{48EI} = \frac{\frac{23}{3} qa \cdot \frac{3^3 a^3}{48EI}} = 16 \frac{qa^4}{EI} = 4,3125 \frac{qa^4}{EI}$$

Como las barras son rígidas a directa es D lo hallo por diag. de desplaz

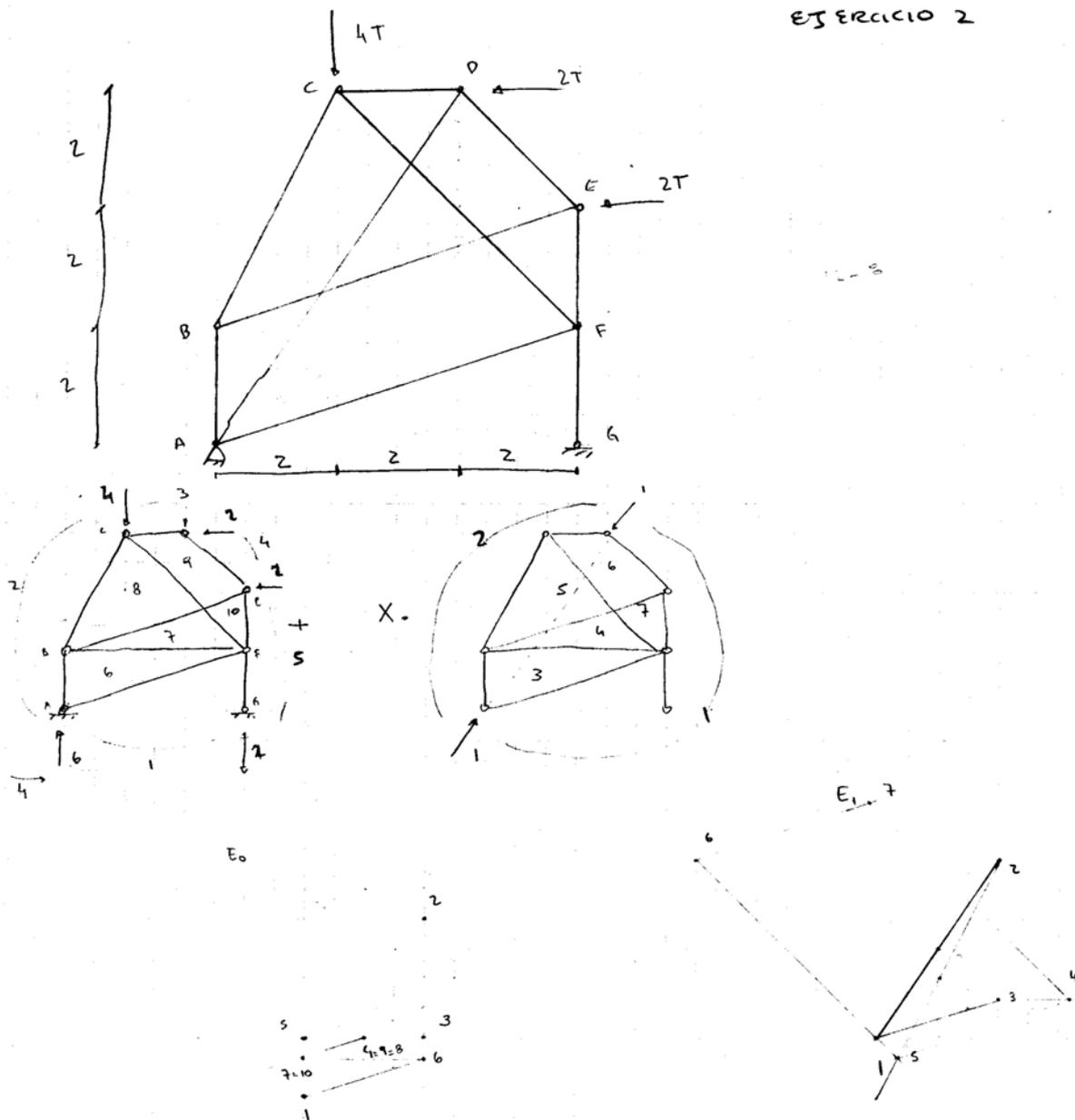


$$\delta_D = 4,3125 \frac{qa^4}{EI}$$

$$\downarrow \delta_D = \left( 16 + \frac{4,3125 \times 1,5}{2} \right) \frac{qa^4}{EI} = 19,734 \frac{qa^4}{EI}$$

**Solución - Examen Julio 2005 – Resistencia de materiales 1 y 1N**

**EJERCICIO 2**



Barra	$E_0$	$E_1$	Total	$A_{min} (cm^2)$
AB	-4,7	-0,65	-11,75	
BC	$-2\sqrt{3}$	-1,03	-15,64	
CD	-2	-1,39	-17,07	
DE	0	-1,18	-12,79	
EF	+0,67	-1,096	-11,21	
AF	-4,7	-0,58	-10,5	
BE	-2,1	+0,877	7,41	
FC	0	+1,31	14,2	
FG	+2	0	2	
BF	+4	-0,369		

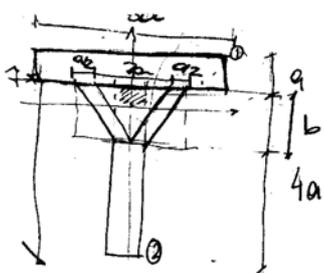
$\sigma_{adm} = 1,4 \frac{t}{cm^2} \rightarrow A \gg \frac{F}{1400}$

$\rightarrow A \gg \frac{17}{14} = 12,14 cm^2$

$\hookrightarrow$  PNE 12

$4 - 0,369 x = 0 \rightarrow x = 10,84$

Solución - Examen Julio 2005 - Resistencia de materiales 1 y 1N

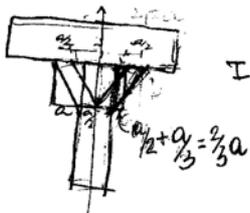


- Determinar b
- Encontrar b para que  $I_x = 1,7 I_y$

$$1) \bar{y}_b = \frac{5a \cdot \frac{a}{2} - 4a \cdot a \cdot 2a}{5a \cdot a + 4a \cdot a} = \frac{-11/2 a^3}{9a^2} = -\frac{11}{18} a$$

$$2) I_x' = \frac{5a \cdot a^3}{12} + 5a \cdot a \left( \frac{a}{2} + \frac{11}{18} a \right)^2 = \frac{2135}{324} a^4$$

$$I_x = \frac{a(4a)^3}{12} + 4a \cdot a \left( 2a - \frac{11}{18} a \right)^2 = \frac{1057}{81} a^4 \rightarrow I_x = \frac{707}{36} a^4$$



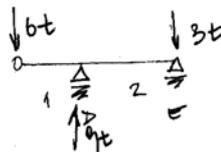
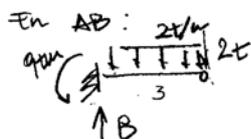
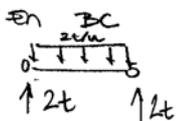
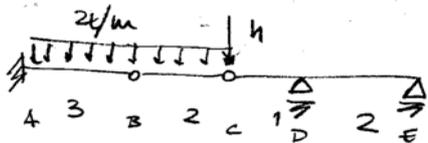
$$I_y = \frac{a(5a)^3}{12} + \frac{4a \cdot a^3}{12} + 2 \left[ \frac{b \cdot a^3}{36} + \frac{b \cdot a}{2} \left( \frac{5}{6} a \right)^2 \right] - \frac{b(2a)^3}{48}$$

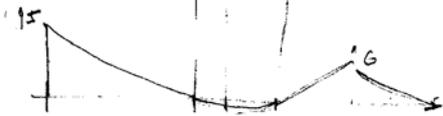
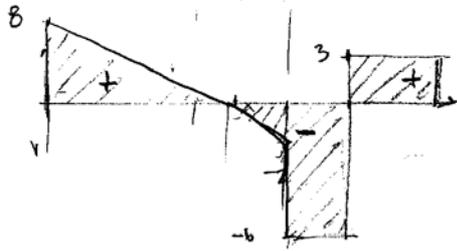
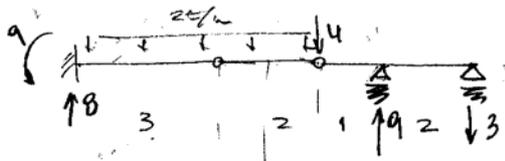
$$I_y = a^4 \left[ \frac{43}{4} + \frac{7}{12} a^3 b \right]$$

$$\frac{707}{36} a^4 = \frac{43}{4} a^4 + \frac{7}{12} a^3 b$$

$$\rightarrow \boxed{b = 1,38 a}$$

$$3) \mu_b = 5a^2 \left( \frac{a}{2} + \frac{11}{18} a \right) + a \cdot \frac{11}{18} a \cdot \frac{11}{36} a = 5,74 a^3$$





$$\tau_{\max} = 1400 \text{ kg/cm}^2$$

$$\tau_{\max} = 900 \text{ kg/cm}^2$$

$$\tau_{\max} = \frac{V_{\max} \cdot \mu}{I b} = \tau_0$$

$$\tau = \frac{8000 \cdot 574 \cdot a^2}{19,6 a^2 \cdot a} = 900$$

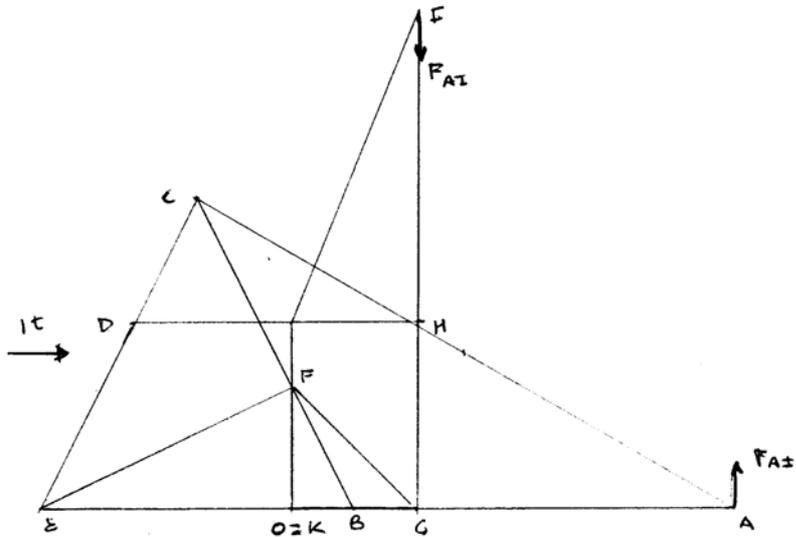
$$a^2 = 26 \text{ cm} \rightarrow a \geq 5,1$$

$$\tau_{\max} = \frac{1500000 \cdot 339a}{11,79,6 a^4} = 1400$$

$$\boxed{a = 5,7 \text{ cm}}$$



APOYO EN K



$$-5 F_{A2} + 1t \times 2,5 = 0 \Rightarrow F_{A2} = \frac{2,5}{5} = \boxed{0,5t = F_{A2}}$$

$$M_C \text{ al disco } ABC \quad F_{A1} \times 8,5 = F_B \times 5 \Rightarrow F_B = \frac{0,5 \times 8,5}{5} = \boxed{0,85t = F_B}$$

$$M_K \text{ a todo } -F_B \times 10 + 1t \times 2,5 - F_F \times 4 = 0 \Rightarrow F_F = \frac{-0,85 \times 10 + 1 \times 2,5}{4} = \boxed{-1,5t = F_F}$$

$$\text{Eq. vertical a todo } \Rightarrow 1t - F_B - V_K = 0 \Rightarrow V_K = 1 - 0,85 = \boxed{0,15t = V_K}$$

$$\text{Eq. horizontal a todo } \Rightarrow F_F + H_K = 0 \Rightarrow \boxed{H_K = 1,5t}$$