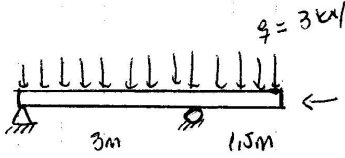
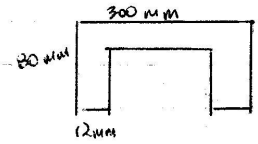
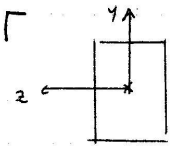
P1





Calcular los esfuerzos máximos de tracción y compresión

$$\bar{y} = \frac{\int_A y \, dA}{A}$$

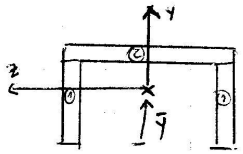


$$I_z = \frac{1}{12}(\text{ancho})(\text{altura})^3$$

// al eje giro

$$I_z = \frac{\pi R^4}{4}$$

Busquemos centro de gravedad:



$$\bar{y} = \frac{2 \cdot \bar{y} \cdot A}{\underbrace{2 \cdot 12 \cdot 68 + 300 \cdot 12}_{2A_1 + A_2}} = \frac{2 \cdot 34 \cdot 12 \cdot 68 + 74 \cdot 300 \cdot 12}{2 \cdot 12 \cdot 68 + 300 \cdot 12} = 61,52 \text{ mm}$$

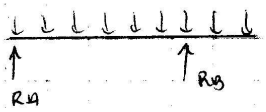
① (Steiner: Área × centroide²)

$$I_z = \int_A y^2 dA = \left[\frac{1}{12}\cdot 12\cdot(68)^3 + 12\cdot 68\cdot(61{,}52-34)^2\right]\times 2$$

$$+ \frac{1}{12}\,300\,(12)^3 + 300\cdot 12\,(74-61{,}52)^2$$

$$\Rightarrow I_z = 2{,}469\times 10^6\ mm^4$$

* Reacciones:

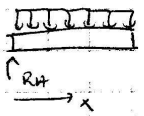


$$\Sigma M_A = 0 \rightarrow \quad R_B\cdot 3 = 3\cdot 4{,}5\cdot 2{,}25$$

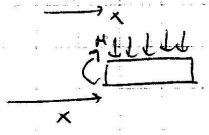
$$R_B = 10{,}125\ kN$$

$$R_A = 3\cdot 4{,}5 - 10{,}125 = 3{,}375\ kN$$

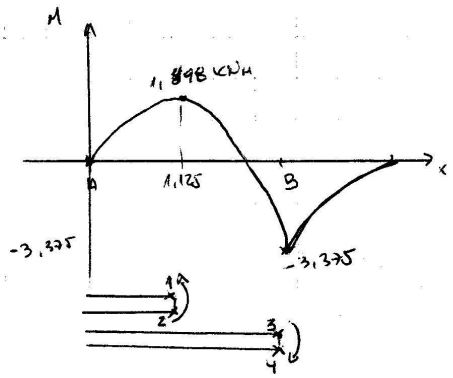
* Momentos internos.

AB | 

$$M = 3{,}375x - \frac{3x^2}{2}$$

BC | 

$$M = -3\,\frac{(4{,}5-x)^2}{2}$$



2 MAXIMOS

1 y 4 compresión
2 y 3 tracción

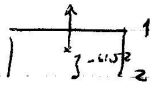
En la sección 1,125 m

$$\sigma_1 = -\frac{1,898 \cdot (.80 - 61,52)\,10^{-3}}{2,469 \times 10^{6} \cdot (\omega^{-3})^4} \quad \left(\frac{kN}{m^2}\right)$$

$$= -14200 \ kN/m^2$$

$$= -14,2 \ MPa \ //$$

$$\sigma_2 = -\frac{1,898\,(-61,52) \times \omega^{-3}}{2,469 \times 10^{6}\,(\omega^{-3})^4}$$



$$= 47,3 \ MPa \ //$$

En la sección 3 m

$$\sigma_3 = -\frac{(3,375) \cdot (80 - 61,52) \times \omega^{-3}}{2,469 \times \omega^{6}\,(\omega^{-3})^4} = 25,3 \ MPa \ //$$

$$\sigma_4 = -\frac{(-3,375)\,(-61,52) \times \omega^{-3}}{9/5} = -84,2 \ MPa \ //$$

σ_2 máxima tracción

σ_4 " compresión

P2

$R_A + R_B = 1{,}5 \times 4{,}5 + 3 \operatorname{sen} 30$

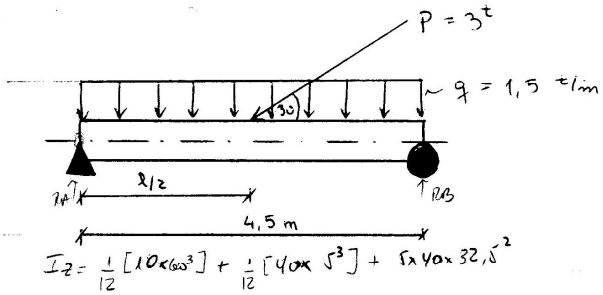
$\boxed{R_A + R_B = 8{,}25}$

$-3 \operatorname{sen} 30 \times 2{,}25 - 1{,}5 \times 4{,}5 \times 2{,}25 + R_B \times 4{,}5 + 3 \cos 30 \times 0{,}35$

$R_B = 3{,}92$

$R_A = 4{,}327$

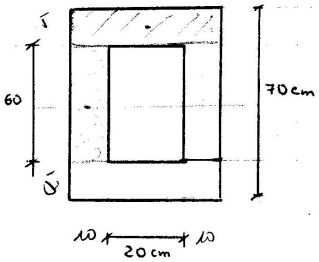
Para la viga cargada como se indica determine los esfuerzos axiales máximos.

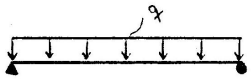


$I_z = \frac{1}{12}[10 \times 60^3] + \frac{1}{12}[40 \times 5^3] + 5 \times 40 \times 32{,}5^2$

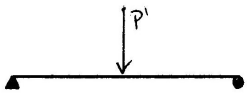
$=$

Sección transversal

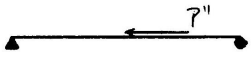




(+)



(+)

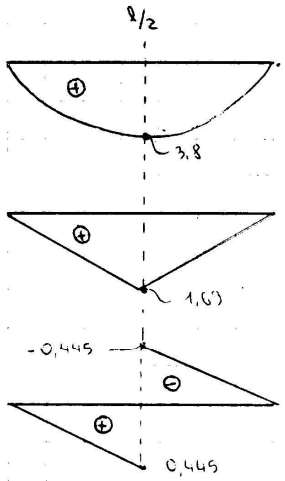


$M_{MAX} = \frac{q l^2}{8} = \frac{1{,}5 \times (4{,}5)^2}{8} = 3{,}8$ tm

$M_{MAX} = \frac{P' l}{4} = \frac{3 \operatorname{sen} 30 \times 4{,}5}{4} = 1{,}69$ tm

$M = P'' \times 0{,}35 = 0{,}91$ tm

$2{,}6 \times 0{,}35 = 0{,}91$

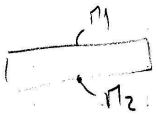


en l/2 el momento será:

$M_1 = -3,8 + 1,69 + 0,455 = -5,035$

$M_2 = 3,8 + 1,69 + 0,455 = 5,945$

Se escoge M_2 por ser mayor



Cálculo de I

$$I = \frac{1}{12}\left[40 \times 70^3 - 20 \times 60^3 \right]$$

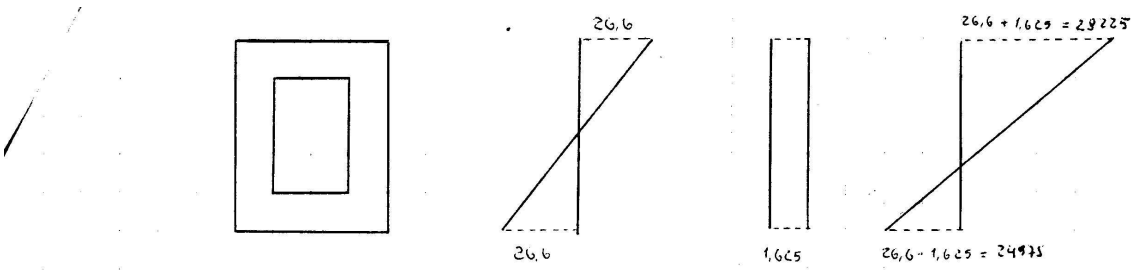
$$I = 783333 \ cm^4$$

$$|\sigma_s| = |\sigma_I| \quad \text{por simetría}$$

$$|\sigma_s| = \frac{5,95 \times 10^5}{783333} \times 35 = 26,6 \ kg/cm^2$$

Por otra parte, la compresión producto de la carga axial es

$$\sigma_c = \frac{P''}{A} = \frac{2,6 \times 1000}{(2800 - 1200)} = 1,625 \ kg/cm^2$$


26,6
26,6
1,625
26,6 + 1,625 = 28225
26,6 - 1,625 = 24975