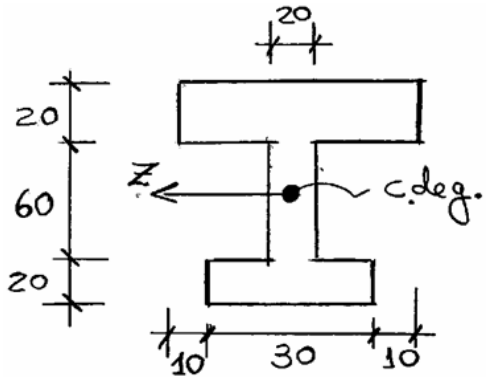
Universidad de Chile
Facultad de Ciencias Físicas y Matemáticas
Departamento de Ingeniería Mecánica

ME46A-02 Resistencia de Materiales
Profesor Cátedra: Francisco Escandón Artiz
Profesor Auxiliar : Felipe Donoso Ojeda

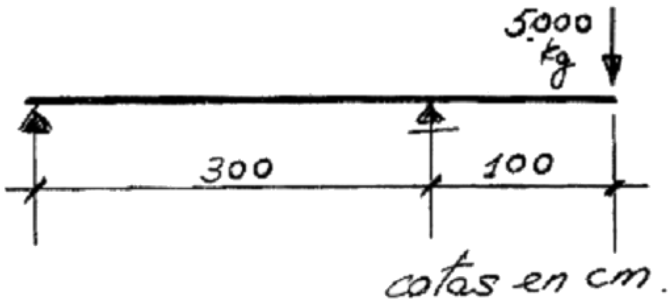
Semestre Otoño 2007
(2 de Mayo)

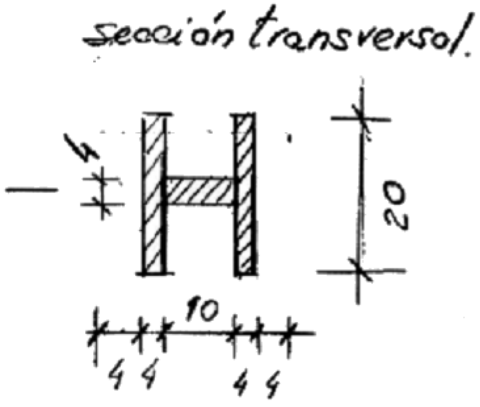
Clase Auxiliar Nº5

P1.- Calcule la posición del centro de gravedad y el momento de inercia I_z de la sección que se muestra en la figura.



P2.- Calcule el máximo esfuerzo de compresión en la viga del esquema.

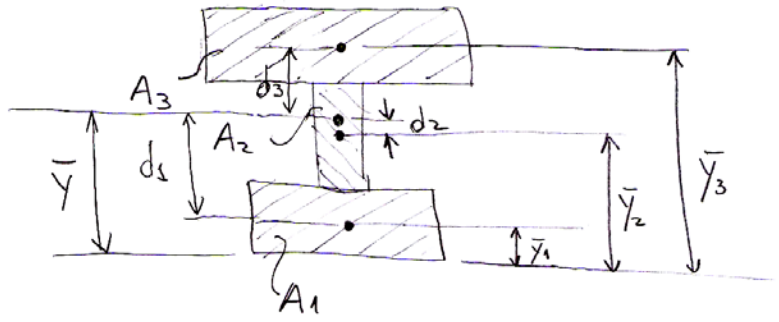




Pauta Ejercicio 3
2006-1

ME46A - 02
Felipe Donoso O.

P1)



$$\bar{Y} = \frac{\bar{y}_1 \cdot A_1 + \bar{y}_2 \cdot A_2 + \bar{y}_3 \cdot A_3}{A_1 + A_2 + A_3}$$

$$\bar{Y} = \frac{10 \cdot (30 \cdot 20) + 50 \cdot (20 \cdot 60) + 90 \cdot (50 \cdot 20)}{(30 \cdot 20) + (20 \cdot 60) + (50 \cdot 20)}$$

$$\boxed{\bar{Y} = 55{,}71 \ [u\ell]}$$

$$I_1 = \frac{1}{12} \cdot 30 \cdot 20^3 + (30 \cdot 20) \cdot \underbrace{[55{,}71 - 10]}_{d_1}^2 = 1{,}27 \times 10^6$$

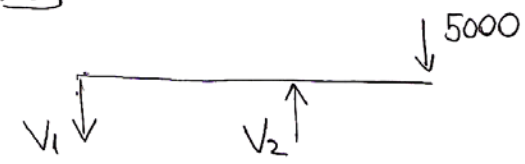
$$I_2 = \frac{1}{12} \cdot 20 \cdot 60^3 + (20 \cdot 60) \cdot \underbrace{[55{,}71 - 50]}_{d_2}^2 = 399\,184$$

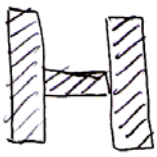
$$I_3 = \frac{1}{12} \cdot 50 \cdot 20^3 + (50 \cdot 20) \underbrace{[90 - 55{,}71]}_{d_3}^2 = 1{,}21 \times 10^6$$

$$I = I_1 + I_2 + I_3$$

$$\boxed{I = 2{,}88 \times 10^6 \ [u\ell]^4}$$

P2)





$\Sigma F_y = 0 \Rightarrow V_2 - V_1 = 5000$

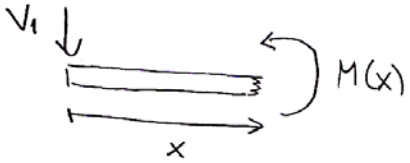
$\Sigma M_z = 0 \Rightarrow 300\,V_2 - 400 \cdot 5000 = 0$

$$V_2 = \frac{20000}{3}$$

$$V_1 = \frac{5000}{3}$$

$$I = \frac{1}{12}\left(2 \cdot 4 \cdot 20^3 + 10 \cdot 4^3\right)$$

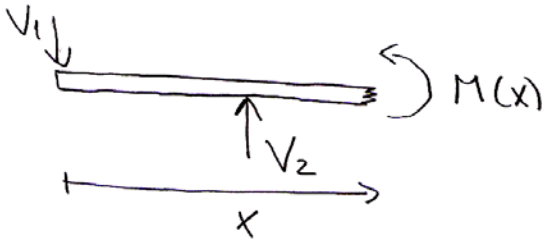
$$I = 538\tfrac{2}{3}\,[cm^4]$$



$x \in [0, 300)$

$M(x) + x\,V_1 = 0$

$$M(x) = -\frac{5000}{3}\,x$$

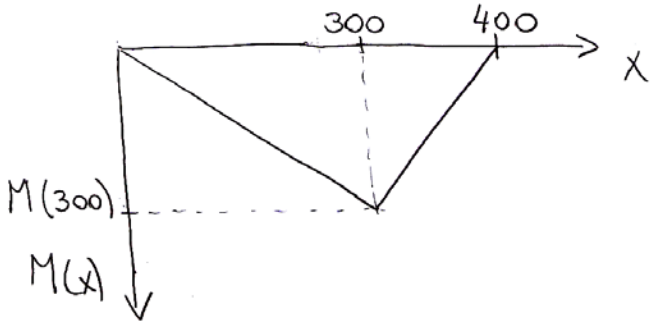


$x \in [300, 400)$

$M(x) + x V_1 - (x-300) V_2 = 0$

$M(x) = x(V_2 - V_1) - 300\,V_2$

$M(x) = 5000\,x - 2000000$



$$M_{max} = |M(300)| = |5000 \cdot 300 - 2000\,000|$$

$$M_{max} = 500000\ [kg \cdot cm]$$

$$\Rightarrow \quad \sigma_{max} = -\frac{M_{max} \cdot y_{max}}{I}$$

$$\sigma_{max} = -\frac{500\,000 \cdot 10}{5387}$$

$$\boxed{\sigma_{max} = -928{,}22\ kg/cm^2}$$