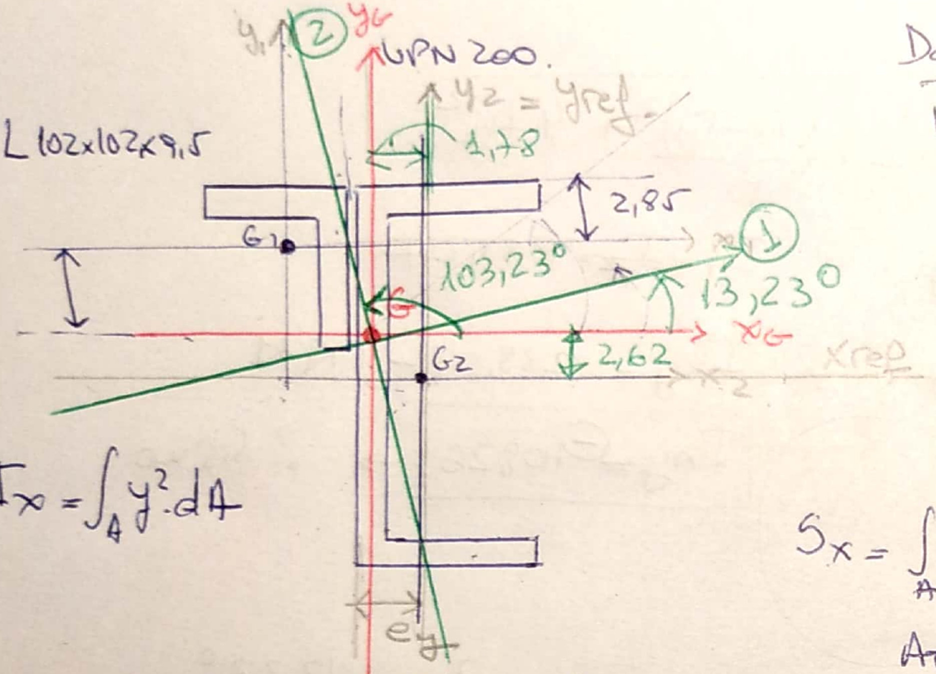


$I_x = \int_A y^2 \cdot dA$

Datos De los Perfiles.

L 4x4x3/8.

$b = 101,6$ mm.

$e_x = e_y = 2,85$ cm.

$A = 18,63\ cm^2$.

$I_x = I_y = 179,81\ cm^4$.

$I_v = 70,56\ cm^4$.

$I_z = 289,07$

$I_{xy} = \int_A x\, y\, dA$

1

UPN 200.

$h = 200$ mm

$b = 75$ mm.

$A = 32,2\ cm^2$.

$e_y = 2,01$ cm

$I_x = 1910\ cm^4$.

$I_y = 148\ cm^4$.

$S_x = \int_A y \cdot dA \qquad S_y = \int_A x\, dA$

$A_T = A_1 + A_2 = (18,63 + 32,2)\ cm^2 \Rightarrow \boxed{A_T = 50,83}$

Determinación del Baricentro

$y_G \cdot A_T = 18,63\ cm^2 \cdot (10cm - 2,85cm) \Rightarrow \quad y_G = \dfrac{18,63 \cdot (10 - 2,85)}{50,83} \Rightarrow \boxed{y_G = + 2,62 cm}$

$x_G \cdot A_T = 18,63\ cm^2 (2,85 + 2,01) \Rightarrow \boxed{x_G = -1.78 cm}$

$I_{xy} = I_{x_G y_G} + A \cdot ab$

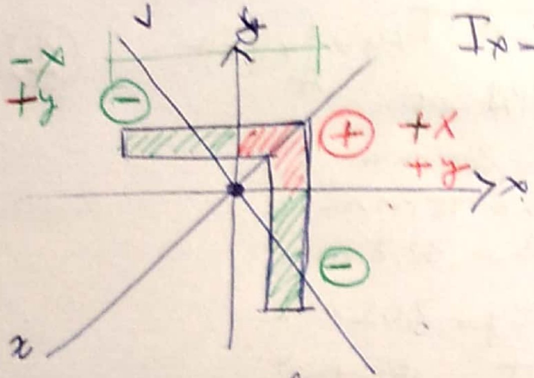
Determinación I_{x_G}, I_{y_G}, $I_{x_G y_G}$ $\rightarrow$ Teorema de Steiner: $\boxed{I_x = I_{x_G} + A \cdot d^2}$

$I_{x_G} = 178,81 + 18,63 \cdot (4,52)^2 + 1910 + 32,2 \cdot (2,62)^2 \Rightarrow \boxed{I_{x_G} = 2690,46 cm^4}$

$I_{y_G} = 178,81 + 18,63 \cdot (3,08)^2 + 148 + 32,2 (1,78)^2 \Rightarrow \boxed{I_{y_G} = 605,56 cm^4}$

$I_{x_G y_G} = \overset{-109,26}{?} + 18,63 (+4,52)(-3,08) + 0 + 32,2 \cdot (-2,62)(+1,78) \quad \boxed{I_{x_G y_G} = -518,8 cm^4}$

Determinar Ejes Ppales. de Inercia



$I_x - I_y$.

$$I_{1,2} = \overbrace{\frac{I_x + I_y}{2}}^{2I_x} \pm \frac{1}{2}\sqrt{\underbrace{(I_x - I_y)^2}_{0} + 4 I_{xy}^2}$$

$$I_{1,2} = I_x \pm I_{xy}. \qquad I_1 - I_{\cancel{z}} = 289{,}07$$

$$I_z = I_x + I_{xy} \longrightarrow I_{xy} = 289{,}07 - 179{,}81$$

$$\boxed{I_{xy} = -109{,}26} \rightarrow \text{? signo}$$

$$I_{xy} = \int_A xy\, dA$$

Direcciones. Pples de Inercia

$$tg\, 2\alpha = \frac{2 I_{x_G y_G}}{I_{\cancel{y_G}} - I_{x_G}} = \frac{2 \cdot (-518{,}8)}{(605{,}56 - 2690{,}46)} \Rightarrow \begin{cases} \alpha_1 = 13{,}23^\circ \\ \alpha_2 = \alpha_1 + 90^\circ = 103{,}23^\circ \end{cases}$$

$$tg\, 2\alpha = -0{,}49. \qquad 2\alpha = 26{,}45^\circ$$

$$I_{1,2} = \underbrace{\frac{(2690{,}46 + 605{,}56)}{2}}_{1648} \pm \underbrace{\frac{1}{2}\sqrt{(2690{,}46 - 605{,}56)^2 + 4(-518{,}8)^2}}_{1164}$$

$$\boxed{\begin{aligned} I_1 &= 2812\, cm^4 \\ I_2 &= 484\, cm^4. \end{aligned}}$$

$$I_x =$$

$$I_x = I_{x_G} \cdot \cos^2\alpha + I_{y_G} \operatorname{sen}^2\alpha - I_{x_G y_G} \cdot \operatorname{sen} 2\alpha = \boxed{2812\, cm^4}$$