No reply Homework 2:

Calculate the moment of inertia I_{xc} with respect to an axis through the centroid C and parallel to the x axis for the composite area **(you must find $I_{xc} = 106.10^6$ mm⁴)**.

Calculate the product of inertia I_{xy} for the composite area **(you find $I_{xy} = 24{,}3.10^6$ mm⁴)**.

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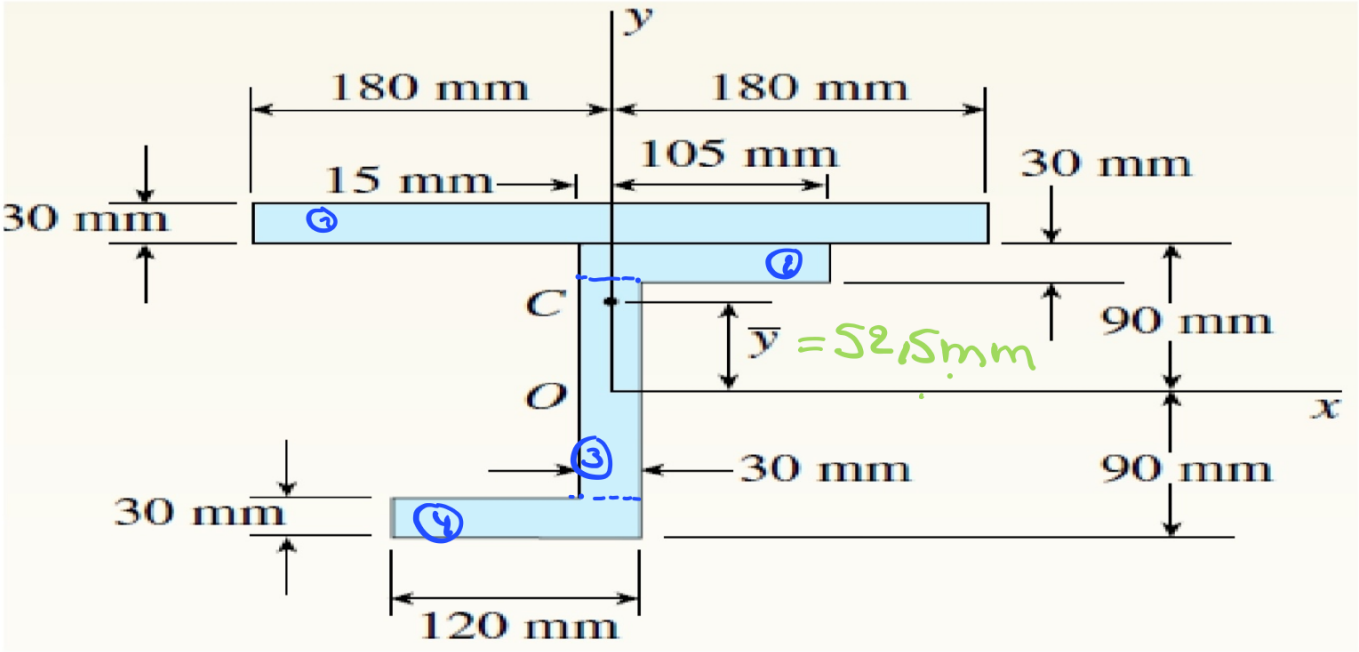

$I_{xc} = ?$

we have $I_{xc} = I_x - A d^2$

$= I_x - A \bar{y}^2$

$I_x = \sum_{i=1}^{4} I_{xi}$

* $\bar{y} = ?$

i	A_i	$\bar{y}_i$	$A_i \cdot \bar{y}_i$
1	10 800	105	1134 000
2	3 600	75	270 000
3	3600	0	0
4	3600	−75	−270000
$\sum_{i=1}^{4}$	21 600	//	1134 000

$$\bar{y} = \frac{\sum A_i \bar{y}_i}{\sum A_i} = 52,5 \text{ mm}$$

$$* I_x = \sum_{i=1}^{4} I_{x_i} = ?$$

$$I_{x_1} = I_{x_{c_1}} + A_1 d^2$$

$$I_{x_c} \text{ (Rectangle)} = \frac{b h^3}{12}$$

$$I_{x_1} = \frac{bR^3}{12} + A_1 \cdot \bar{y}_1^2$$

$$= \frac{360 \times (30)^3}{12} + 10800 \cdot (105)^2$$

$$I_{x_1} = 11\,988\,0000 \text{ mm}^4$$

$$I_{x_2} = I_{x_{c_2}} + A_2 d^2$$

$$= \frac{bR^3}{12} + A_2 \cdot \bar{y}_2^2$$

$$= \frac{120 \times (30)^3}{12} + 3600 \times (75)^2$$

$$I_{x_2} = 2052\,0000 \text{ mm}^4$$

$$I_{x_3} = I_{x_{c_3}} + A_3 \cdot d^2$$

$$= I_{x_{c_3}} + A_3 \bar{y}_3^2$$

$$= I_{x_{c_3}} = \frac{bR^3}{12} = \frac{30 \cdot (120)^3}{12}$$

$$I_{x_3} = 43200000 \text{ mm}^4$$

$$I_{x_4} = I_{x_{c_4}} + A_4 d^2$$

$$= \frac{b h^3}{12} + A_4 \cdot \bar{y}_4^2$$

$$= \frac{120 \times (30)^3}{12} + 3500 (75)^2$$

$$I_{x_4} = 20\,52\,00000 \text{ mm}^4$$

$$I_x = \sum_{i=1}^{4} I_{x_i} = 16524\,0000 \text{ mm}^4$$

$$I_{x_c} = I_x - A\, d^2$$

$$A = \sum_{i=1}^{4} A_i \quad / \quad d = \bar{y}$$

$$I_{x_c} = 165\,21\,0000 - 21600 \times 52{,}5^2$$

$$= 10570\,5000 \simeq 106 \times 10^6 \text{ mm}^4$$