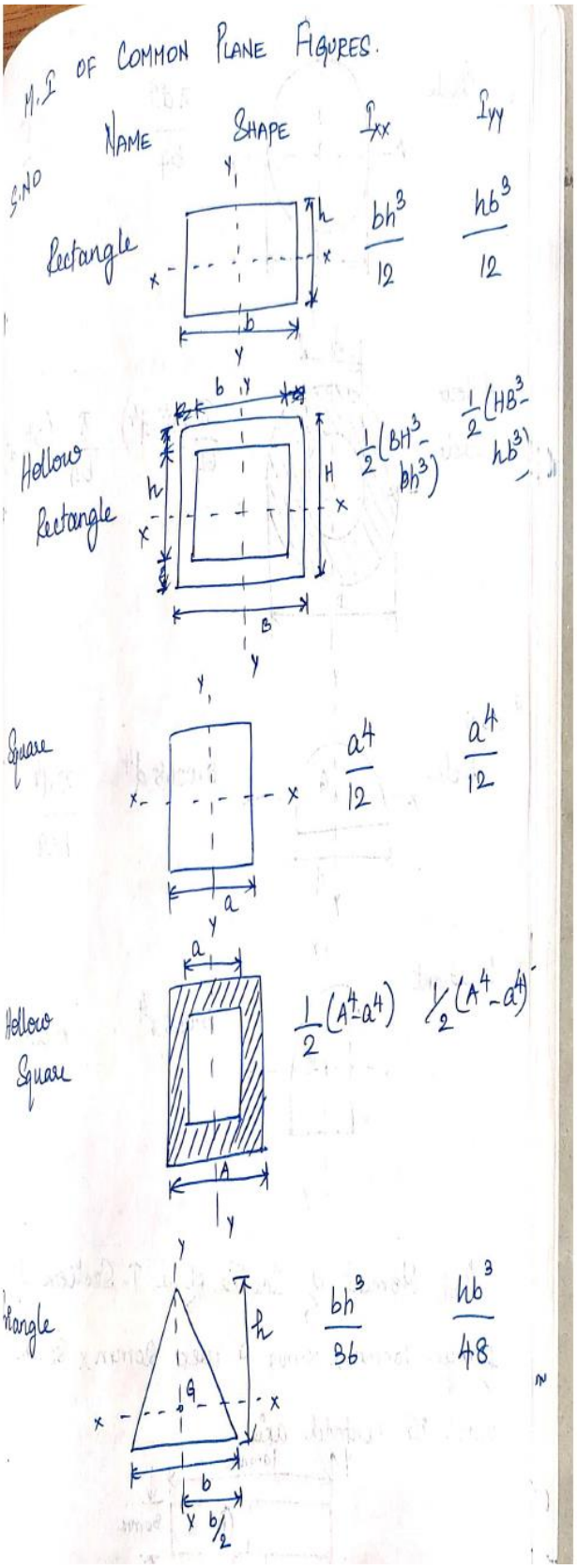
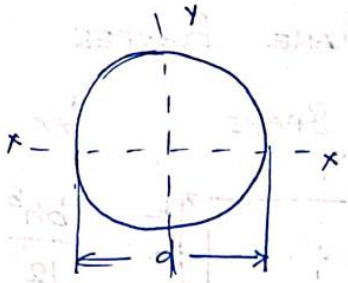
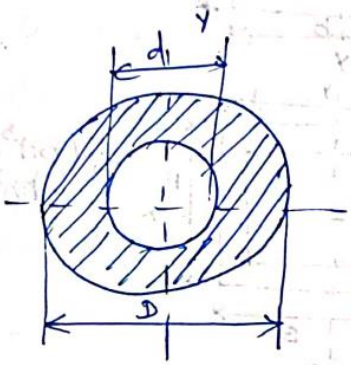

M.I OF COMMON PLANE FIGURES.
S.NO
NAME
SHAPE
I_{xx}
I_{yy}
Rectangle
$\frac{bh^3}{12}$
$\frac{hb^3}{12}$
Hollow Rectangle
$\frac{1}{2}(BH^3 - bh^3)$
$\frac{1}{2}(HB^3 - hb^3)$
Square
$\frac{a^4}{12}$
$\frac{a^4}{12}$
Hollow Square
$\frac{1}{2}(A^4 - a^4)$
$\frac{1}{2}(A^4 - a^4)$
Triangle
$\frac{bh^3}{36}$
$\frac{hb^3}{48}$

6. Circle



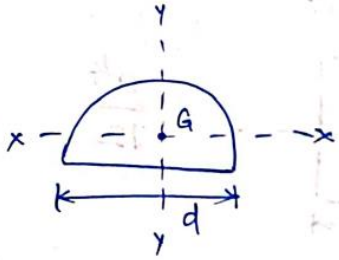
$\frac{\pi d^4}{64}$ $\frac{\pi d^4}{64}$

7. Hollow Circle



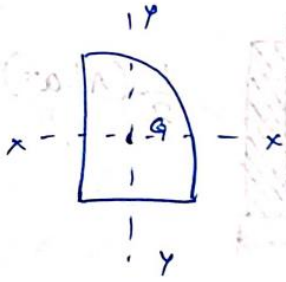
$\frac{\pi}{64}(D^4-d^4)$ $\frac{\pi}{64}(D^4-d^4)$

8. Semi Circle



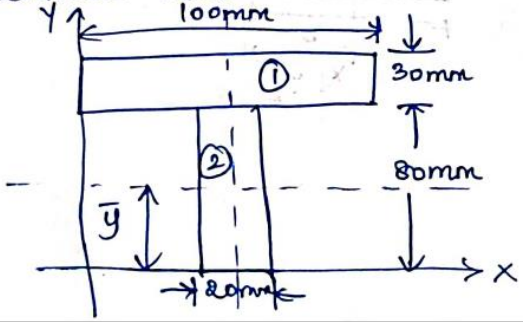
$0.0068\,d^4$ $\frac{\pi d^4}{128}$

9. Quadrant



$0.055r^4$ $0.055r^4$

1. Find Moment of Inertia of a T. Section of flange 100mm x 30mm & web 20mm x 80mm about its centroid axis.



↑ Section is symmetrical about y axis.

∴ To Draw xx axis we need $\bar{y}$

$$\bar{y} = \frac{a_1 y_1 + a_2 y_2}{a_1 + a_2}$$

① Flange (100 × 30mm)

$$a_1 = 100 \times 30$$

$$= 3000 mm^2$$

$$y_1 = 80 + \frac{30}{2}$$

$$= 95mm$$

② Web (20mm × 80mm)

$$a_2 = 20 \times 80$$

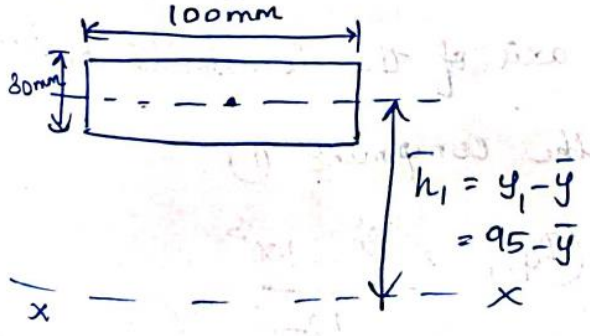
$$= 1600 mm^2$$

$$y_2 = \frac{80}{2} = 40mm.$$

$$\bar{y} = \frac{(3000 \times 95) + (1600 \times 40)}{3000 + 1600}$$

$$= 75.87mm.$$

Moment of Inertia about xx axis.



MOI about xx axis is equal to sum of M.I of Component ① & ② about same axis xx.

$$I_{xx} = (I_{xx})_1 + (I_{xx})_2$$

M.I of (1) about xx axis

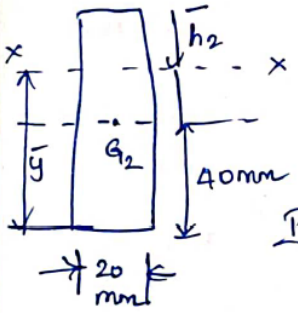
$$(I_{xx})_1 = (I_G)_1 + A_1 \bar{h}_1^2$$

$$= \left(\frac{100 \times 30^3}{12}\right) + (100 \times 30 \times 19.13^2)$$

$$= 1.323 \times 10^6 \text{ mm}^4$$

$$(I_{xx})_2 = (I_G)_2 + A_2 \bar{h}_2^2$$

$$= \frac{20 \times 80^3}{12} + [(20 \times 80) \times 35.87^2)]$$

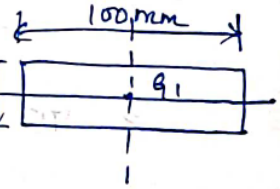


$$= 2.911 \times 10^6 \text{ mm}^4$$

$$I_{xx} = I_{xx_1} + I_{xx_2}$$

$$= 4.234 \times 10^6 \text{ mm}^4.$$

M.O.I about yy axis



$$I_{yy} = (I_{yy})_1 + (I_{yy})_2$$

$$(I_{yy_1}) = (I_G)_1 + A_1 \bar{h}_1^2$$

Here, $\bar{h}_1 = 0$ as yy axis of the composite section lies on the yy of the component (1)

$$(I_{yy})_1 = (I_G)_1 = \frac{30 \times 100^3}{12}$$

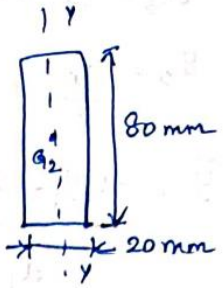
$= 2.5 \times 10^6 \text{ mm}^4$

$(I_{yy})_2 = (I_G)_2 + A_2 \bar{h}_2^2$

$\bar{h}_2 = 0$

$(I_{yy})_2 = (I_G)_2$

$= \frac{80 \times 20^3}{12} = 5.33 \times 10^4 \text{ mm}^4$



NOTE:

While finding I_{xx} :

$\bar{h}_1 = \bar{y} \sim y_1$

$\bar{h}_2 = \bar{y} \sim y_2$

$\bar{h}_3 = \bar{y} \sim y_3$ etc

While finding I_{yy}

$\bar{h}_1 = \bar{x} \sim x_1$

$\bar{h}_2 = \bar{x} \sim x_2$

$\bar{h}_3 = \bar{x} \sim x_3$ etc.