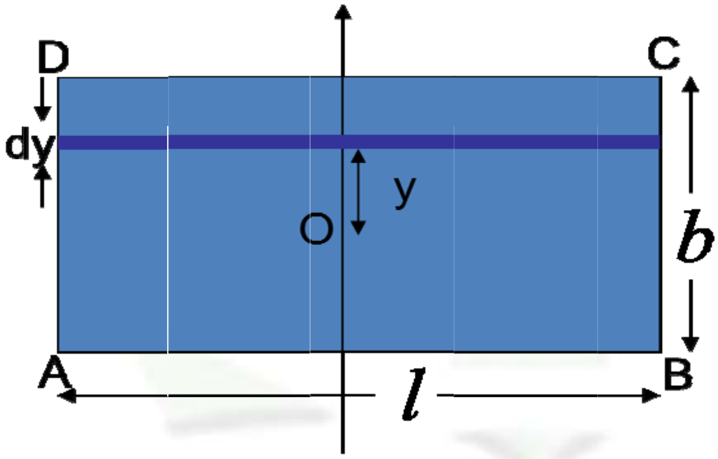
(A) About an axis passing through the center of lamina (laying in the plane of the lamina) and parallel to one of its sides.



Let ABCD be the given rectangular lamina. The axis Y passes through the center O lies in the plane of the lamina and parallel to the sides BC or AD

M = Mass of the lamina

l & b = length and breadth

Mass per unit area $= \frac{M}{l \times b}$

Let us imagine an elementary strip perpendicular to the axis Y of width dy at distance y from the center.

Mass of the elementary strip $= \frac{M}{l \times b} \times l \times dy$

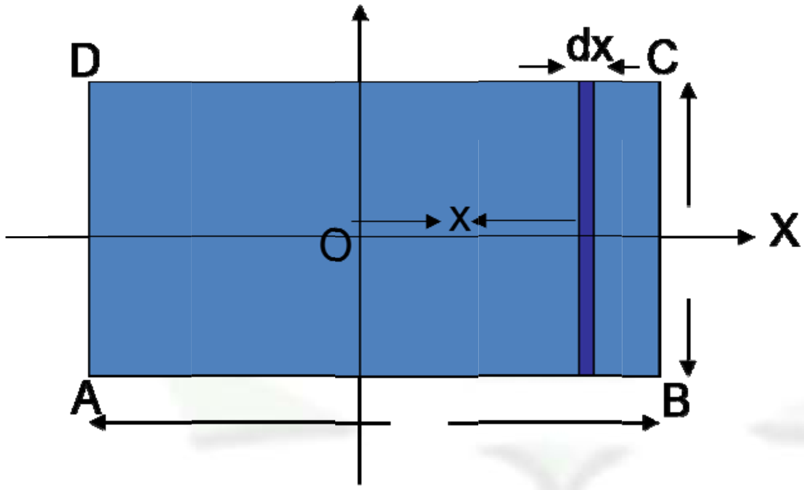
M.I of this elementary strip about the given axis Y = Mass of the strip x (length)^2

$$= \frac{M}{l \times b} \times l \times dy \times \frac{l^2}{12} = \frac{Ml^2 dy}{12}$$

Since the lamina can be assumed to be made up of many such strips, M.I of the lamina about the given axis can be obtained by integrating equation (1) between the limits Y = 0 to y = b/2 and multiplying by 2

$$Iy = 2\int_0^{b/2} \frac{Ml^2}{12b} dy = 2\frac{Ml^2}{12b} \times \frac{b}{2} = \frac{Ml^2}{12}$$

(B) About an axis passing through the center of lamina (laying in the plane of the lamina) and parallel to one of its sides AB or CD.

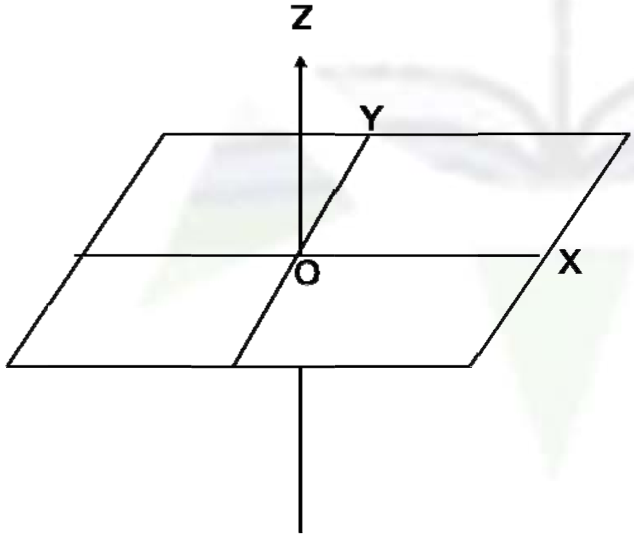


Proceeding in exactly similar way as above we find $Ix = \frac{Mb^2}{12}$

(B) about an axis passing through the center of lamina and perpendicular to the plane of the lamina

Let Iz = M.I of the lamina about Z axis.

Since X and Y axis lie in the plane of the lamina mutually perpendicular and intersect each other at the point O through which Z axis passes



Applying theorem of perpendicular axis Iz = Ix + Iy

Putting from equation (2) and (3) in equation (4) we get $= \frac{Mb^2}{12} + \frac{Ml^2}{12} = \frac{M(l^2 + b^2)}{12}$