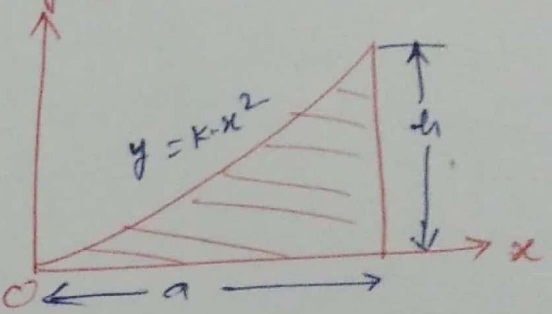
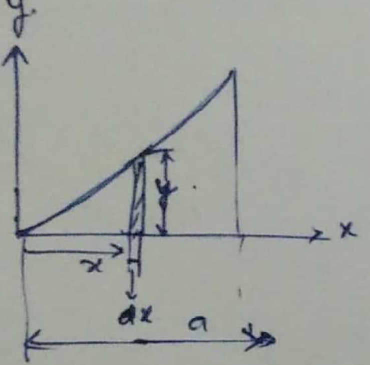
2- Locate the centroid of the area of the parabolic shaded portion as shown in fig.



Sol^n.



$y = Kx^2$

$x = a, \quad y = h.$

$h = K \cdot a^2 \Rightarrow K = h/a^2$

$$y = \frac{h}{a^2} \times x^2$$

area of elementary strip $= y \cdot dx \Rightarrow \frac{h}{a^2} \times x^2 \cdot dx$

area of entire shaded portion $= \int_0^a \frac{h}{a^2} \cdot x^2 \cdot dx$

$$= \frac{h}{a^2} \times \left(\frac{x^3}{3}\right)_0^a = \frac{ah}{3}$$

Position of centroid from y Axis.

moment of ~~an~~ elemental area about y Axis

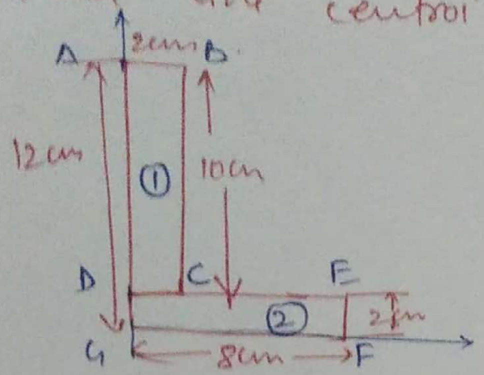
$$= y \cdot dx \times x \Rightarrow \frac{h}{a^2} \times x^2 \times x \cdot dx \Rightarrow \frac{h}{a^2} x^3 \cdot dx$$

$\bar{x}$ is the centroid from y Axis, then from moment principle

$$\frac{ah}{3} \times \bar{x} = \int_0^a \frac{h}{a^2} \times x^3 \cdot dx \Rightarrow \frac{h}{a^2}\left(\frac{x^4}{4}\right)_0^a \Rightarrow \frac{ha^2}{4}$$

$$\boxed{\bar{x} = \frac{3}{4} a}$$

Find the centroid of L-section as shown in fig. (15)



Sol^n –

$y_1 = 2 + \frac{10}{2} = 2 + 5 = 7\ cm$.

$a_1 = 10 \times 2 = 20\ cm^2$.

$a_2 = 8 \times 2 = 16\ cm^2$

$y_2 = \frac{2}{2} = 1\ cm$

$$\bar{y} = \frac{a_1 y_1 + a_2 y_2}{a_1 + a_2} = \frac{20 \times 7 + 16 \times 1}{20 + 16} = 4.33\ cm$$

$x_1 = \frac{2}{2} = 1\ cm, \quad x_2 = \frac{8}{2} = 4\ cm.$

$$\bar{x} = \frac{a_1 x_1 + a_2 x_2}{a_1 + a_2} = \frac{20 \times 1 + 16 \times 4}{20 + 16} = \frac{7}{3} = 2.33\ cm$$

$$\boxed{\bar{x} = 2.33\ cm, \quad \bar{y} = 4.33\ cm}$$