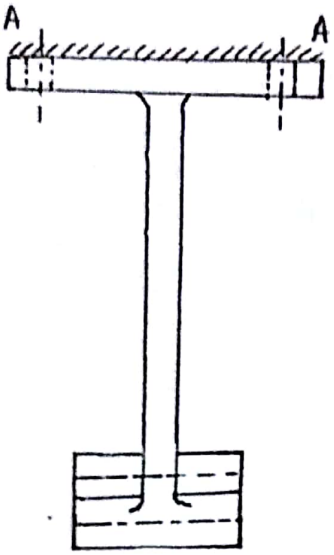
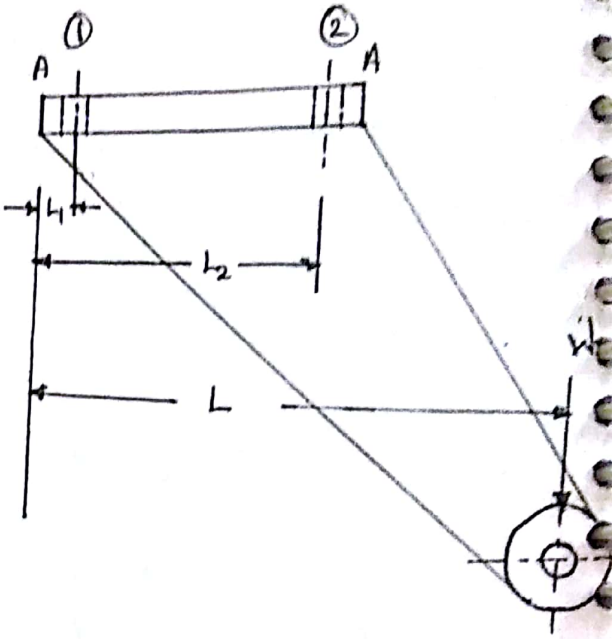
6). A bracket as shown in figure, supports a load of 30kN. Determine the size of the bolts, if the allowable tensile stress in the bolt material is 60Mpa. Take the distance are,

$L_1 = 80mm$, $L_2 = 250mm$ and $L = 500mm$.





Given!-

$W = 30kN \Rightarrow 30 \times 10^3 N$.

$\sigma_t = 60Mpa \Rightarrow 60 N/mm^2$

$L_1 = 80mm$

$L_2 = 250mm$

$L = 500mm$.

To find!-

- Size of the bolts = ?

Solution!-

WKT, the direct tensile load carried by each bolt,

$$W_{t_1} = \frac{W}{4} = \frac{30}{4} = 7.5kN. \Rightarrow 7.5 \times 10^3 N.$$

load / unit distance.

$$w = \frac{W.L}{2[(L_1)^2 + (L_2)^2]} = \frac{30 \times 500}{2[80^2 + 250^2]}$$

$$\boxed{w = 0.109 kN/mm.}$$

Since the heavily loaded bolt is at a distance of L_2 mm from the tilting edge, therefore load on the heavily loaded bolt,

$$W_{t_2} = w \cdot L_2 \Rightarrow 0.109 \times 250$$

$$\boxed{W_{t_2} = 27.25 \text{ KN}}$$

∴ Maximum tensile load on the heavily loaded bolt,

$$W_t = W_{t_1} + W_{t_2} = 7.5 + 27.25$$

$$\boxed{W_t = 34.75 \text{ KN}} \text{ (or)}$$

$$\boxed{W_t = 34750 \text{ N}}$$

Let,

d_c = Core diameter of the bolts.

WKT, maximum tensile load on the bolt (W_t).

$$34750 = \pi/4 (d_c)^2 \sigma_t$$

$$34750 = \pi/4 (d_c)^2 \times 60$$

$$34750 = 47 (d_c)^2$$

$$\boxed{d_c = 27.2 \text{ mm}}$$

WKT,

Standard core diameter of the bolt is 28.706 mm and corresponding size of the bolt is M33.