Section-2

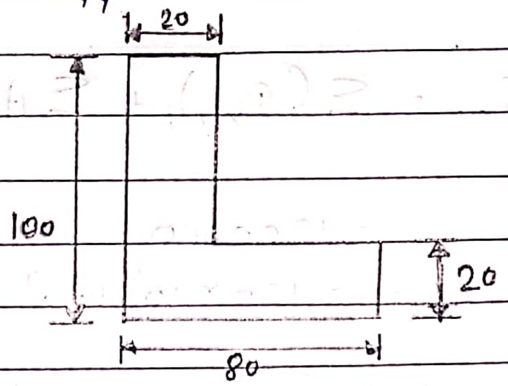
Q1

Ans. Given :- $\bar{x} = 25 mm$

$\bar{y} = 35 mm$

$I_{xx} = 290.67 \times 10^4 mm^4$

$I_{yy} = 162.67 \times 10^4 mm^4$



- To calculate the max. and min. moment of inertia, we need to find the product of ineratia.

- The composite section can be considered to be made up of two rectangles.

- The centroidal coordinates of the two rectangles can be determined as (40, 10) & (10, (20 + 80/2 = 60)), the coordinates being with respect to lower left corner.

- The calculation are summarized below :-

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S. No.	$(I_{xy})_i$ mm^4	$A_i(\bar{x}_i - \bar{x})(\bar{y}_i - \bar{y})$ mm^4
1	0	$1600(40-25)(10-35) = -600000$
2	0	$1600(10-25)(60-35) = -600000$
$\Sigma =$	0	-1200000

$$\therefore \quad I_{xy} = \Sigma (I_{xy})_i + \Sigma A_i(\bar{x}_i - \bar{x})(\bar{y}_i - \bar{y})$$

$$= -1200000$$

$$I_{xy} = -120 \times 10^4 \text{ mm}^4$$

- We know that,

$$R = \sqrt{\left(\frac{I_{xx} - I_{yy}}{2}\right)^2 + (I_{xy})^2}$$

$$= \sqrt{\left(\frac{290.67 - 162.67}{2}\right)^2 \times 10^8 + (-120 \times 10^4)^2}$$

$$\boxed{R = 136 \times 10^4 \text{ mm}^4}$$

- Also, $I_{ave} = \frac{I_{xx} + I_{yy}}{2} = 226.67 \times 10^4 \text{ mm}^4$

$$I_{max} = I_{ave} + R$$

$$= (226.67 + 136) \times 10^4$$

$$\boxed{I_{max} = 362.67 \times 10^4 \text{ mm}^4}$$ Ans

$$I_{min} = I_{ave} - R = (226.67 - 136) \times 10^4$$

$$\boxed{I_{min} = 90.67 \times 10^4 \text{ mm}^4}$$ Ans