

PROB. 5.23

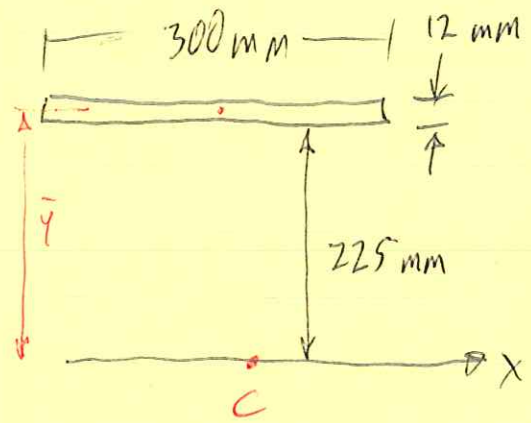
$$F_A \propto (Q_x)_A, \quad F_B \propto (Q_x)_B$$

$$\frac{F_B}{F_A} = \frac{(Q_x)_B}{(Q_x)_A}$$

$$Q_x = \sum \bar{y}_i A_i$$

$$F_B = F_A \frac{(Q_x)_B}{(Q_x)_A}$$

FIND $(Q_x)_A$:



$$(Q_x)_A = \sum \bar{y}_i A_i$$

$$A = (300)(12) = 3600 \text{ mm}^2$$

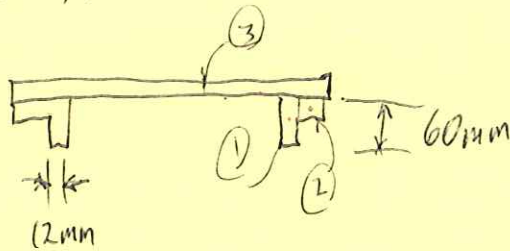
$$\bar{y} = 225 + 6 = 231 \text{ mm}$$

$$(Q_x)_A = (231)(3600) = 8.32 \times 10^5 \text{ mm}^3$$

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FIND $(Q_x)_B$:



FOR RECTANGLE 1:

$$\bar{y}_1 = 225 - 30 = 195 \text{ mm}$$

$$A_1 = (12)(60) = 720 \text{ mm}^2$$

$$\bar{y}_1 A_1 = (195)(720) = 1.4 \times 10^5 \text{ mm}^3$$

FOR RECTANGLE 2:

$$\bar{y}_2 = 225 - 6 = 219 \text{ mm}$$

$$A_2 = (12)(60 - 12) = 576 \text{ mm}^2$$

$$\bar{y}_2 A_2 = (219)(576) = 1.26 \times 10^5 \text{ mm}^3$$

FOR RECTANGLE 3:

$$\bar{y}_3 A_3 = 8.32 \times 10^5 \text{ mm}^3$$

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$$(Q_x)_B = \sum \bar{y}_i A_i$$

$$\text{blow} = (2)(1.4 \times 10^5) + 2(1.26 \times 10^5) + 8.32 \times 10^5$$

$$(Q_x)_B = 1.36 \times 10^6 \text{ mm}^3$$

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$$F_B = (280 \text{ N}) \left(\frac{1.36 \times 10^6}{8.32 \times 10^5} \right)$$

$$F_B = 459 \text{ N}$$

$$\bar{y} = \frac{\sum \bar{y}_i A_i}{\sum A_i}$$

