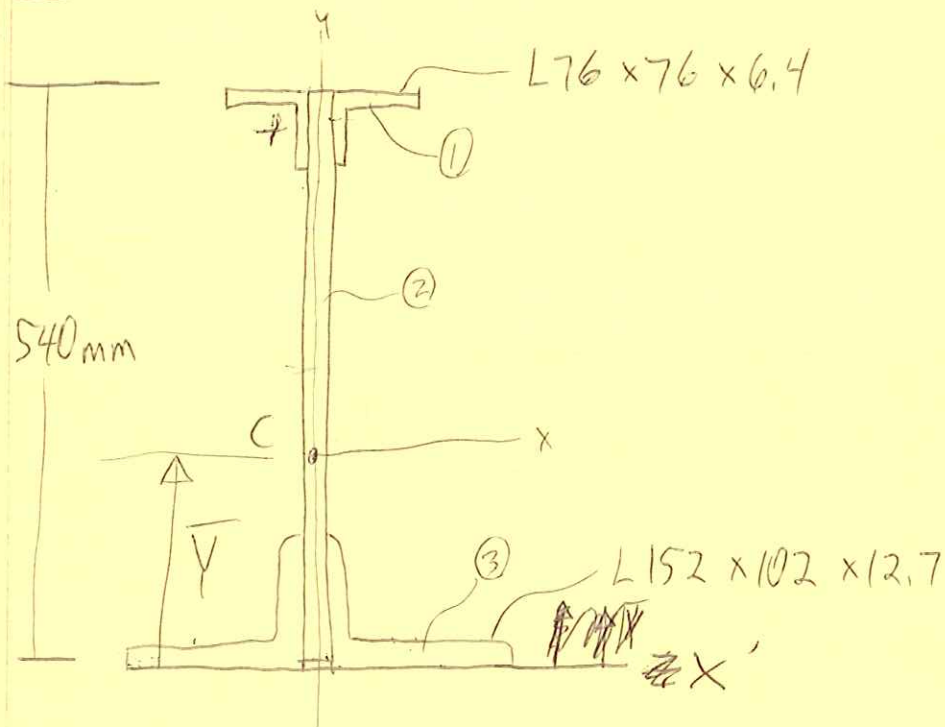


PROB. 9.51

$$(I_y)_2 = 37.1 \text{ in}^4$$

$$(I_y) = (I_y)_1 + (I_y)_2 = 142 \text{ in}^4$$

PROB. 9.54



FIRST, FIND CENTROID OF BEAM.

$$\bar{Y} = \frac{\sum \bar{y}A}{\sum A}$$

$$\text{FOR AREA 1: } \bar{y}_1 = 540 - 21.4 = 519 \text{ mm}$$

$$A_1 = 2(929 \text{ mm}^2) = 1860 \text{ mm}^2$$

$$\text{FOR AREA 2: } \bar{y}_2 = \frac{1}{2}(540 \text{ mm}) = 270 \text{ mm}$$

$$A_2 = (16 \text{ mm})(540 \text{ mm}) = 8640 \text{ mm}^2$$

PROB. 9.54

(6)

FOR AREA 3: $\bar{y}_3 = 50.5 \text{ mm}$,

$$A_3 = 2(3060 \text{ mm}^2) = 6120 \text{ mm}^2$$

$$\bar{Y} = \frac{(519)(1860) + (270)(8640) + (50.5)(6120)}{(1860) + (8640) + (6120)}$$

$$\bar{Y} = 217 \text{ mm}$$

FOR AREA 3: $\bar{y}_3 = 25.1 \text{ mm}$

$$A_3 = 2(3060 \text{ mm}^2) = 6120 \text{ mm}^2$$

$$\bar{Y} = \frac{(519)(1860) + (270)(8640) + (25.1)(6120)}{(1860) + (8640) + (6120)}$$

$$\bar{Y} = 208 \text{ mm}$$

$$(I_x)_1 = 2(\bar{I}_x + Ad^2)$$

$$= 2 \left[(0.516 \times 10^6 \text{ mm}^4) + (929 \text{ mm}^2)(540 - 208 - 21.4)^2 \right]$$

$$(I_x)_1 = 1.8 \times 10^8 \text{ mm}^4$$

$$(I_x)_3 = 2(\bar{I}_x + Ad^2)$$

$$= 2 \left[(2.61 \times 10^6 \text{ mm}^4) + (3060)(208 - 25.1)^2 \right]$$

$$(I_x)_3 = 2.1 \times 10^8 \text{ mm}^4$$

PROB. 9.54

7

$$\begin{aligned} (I_x)_{2^+} &= \frac{1}{3} b h^3 \\ &= \frac{1}{3} (16) (540 - 208)^3 \end{aligned}$$

$$(I_x)_{2^+} = 1.95 \times 10^8 \text{ mm}^4$$

$$\begin{aligned} (I_x)_{2^-} &= \frac{1}{3} b h^3 \\ &= \frac{1}{3} (16) (208)^3 \end{aligned}$$

$$(I_x)_{2^-} = 4.8 \times 10^7 \text{ mm}^4$$

$$I_x = 6.33 \times 10^8 \text{ mm}^4$$

$$\begin{aligned} (I_y)_1 &= 2 (\bar{I}_y + A d^2) \\ &= 2 \left[(0.516 \times 10^6) + (929) (8 + 21.4)^2 \right] \end{aligned}$$

$$(I_y)_1 = 2.64 \times 10^6 \text{ mm}^4$$

$$\begin{aligned} (I_y)_2 &= \frac{1}{12} b^3 h \\ &= \frac{1}{12} (16)^3 (540) \end{aligned}$$

$$(I_y)_2 = 1.84 \times 10^5 \text{ mm}^4$$

PROB. 9.54

$$(I_y)_3 = 2 [\bar{I}_y + Ad^2]$$

$$= 2 \left[(7.24 \times 10^6) + (3060)(8 + 50.5)^2 \right]$$

$$(I_y)_3 = 3.54 \times 10^7 \text{ mm}^4$$

$$I_y = 3.82 \times 10^7 \text{ mm}^4$$