

[9.2절]

9.44 Centroid

① $A = (3.6 \text{ cm})(0.5 \text{ cm}) = 1.80 \text{ cm}^2$

$$\bar{x} = \frac{1}{2}(3.6 \text{ cm}) = 1.80 \text{ cm}$$

$$\bar{y} = \frac{1}{2}(0.5 \text{ cm}) = 0.25 \text{ cm}$$

② $A = (0.5 \text{ cm})(3.8 \text{ cm}) = 1.90 \text{ cm}^2$

$$\bar{x} = \frac{1}{2}(0.5 \text{ cm}) = 0.25 \text{ cm}$$

$$\bar{y} = (0.5 \text{ cm}) + \frac{1}{2}(3.8 \text{ cm}) = 2.40 \text{ cm}$$

③ $A = (1.3 \text{ cm})(1.0 \text{ cm}) = 1.30 \text{ cm}^2$

$$\bar{x} = \frac{1}{2}(1.3 \text{ cm}) = 0.65 \text{ cm}$$

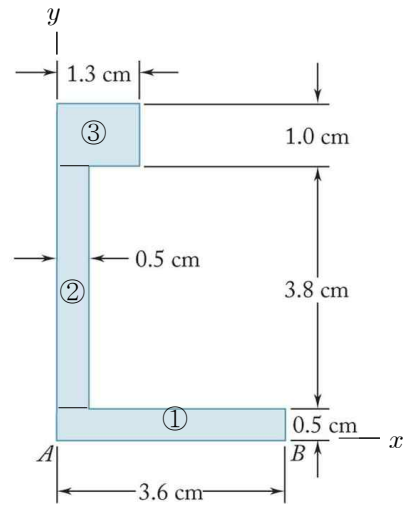
$$\bar{y} = (0.5 \text{ cm}) + (3.8 \text{ cm}) + \frac{1}{2}(1.0 \text{ cm}) = 4.80 \text{ cm}$$

$$\Sigma A = (1.80 \text{ cm}^2) + (1.90 \text{ cm}^2) + (1.30 \text{ cm}^2) = 5.00 \text{ cm}^2$$

$$\Sigma(\bar{x}A) = (1.80 \text{ cm})(1.80 \text{ cm}^2) + (0.25 \text{ cm})(1.90 \text{ cm}^2) + (0.65 \text{ cm})(1.30 \text{ cm}^2) = 4.56 \text{ cm}^3$$

$$\Sigma(\bar{y}A) = (0.25 \text{ cm})(1.80 \text{ cm}^2) + (2.40 \text{ cm})(1.90 \text{ cm}^2) + (4.80 \text{ cm})(1.30 \text{ cm}^2) = 11.25 \text{ cm}^3$$

$$\bar{X} = \frac{\Sigma(\bar{x}A)}{\Sigma A} = \frac{4.56 \text{ cm}^3}{5.00 \text{ cm}^2} = 0.912 \text{ cm}, \quad \bar{Y} = \frac{\Sigma(\bar{y}A)}{\Sigma A} = \frac{11.25 \text{ cm}^3}{5.00 \text{ cm}^2} = 2.25 \text{ cm}$$



$$I_{x1} = \bar{I}_{x1} + A_1 d_1^2$$

$$= \frac{1}{12}(3.6 \text{ cm})(0.5 \text{ cm})^3 + (1.8 \text{ cm}^2)(2.25 - 0.25 \text{ cm})^2$$

$$= 7.238 \text{ cm}^4$$

$$I_{x2} = \bar{I}_{x2} + A_2 d_2^2$$

$$= \frac{1}{12}(0.5 \text{ cm})(3.8 \text{ cm})^3 + (1.9 \text{ cm}^2)(2.25 - 1.9 - 0.5 \text{ cm})^2$$

$$= 2.329 \text{ cm}^4$$

$$I_{x3} = \bar{I}_{x3} + A_3 d_3^2$$

$$= \frac{1}{12}(1.3 \text{ cm})(1.0 \text{ cm})^3 + (1.3 \text{ cm}^2)(0.5 + 3.8 + 0.5 - 2.25 \text{ cm})^2$$

$$= 8.562 \text{ cm}^4$$

$$I_x = I_{x1} + I_{x2} + I_{x3} = (7.238 \text{ cm}^4) + (2.329 \text{ cm}^4) + (8.562 \text{ cm}^4) = 18.13 \text{ cm}^4$$

$$I_{y1} = \bar{I}_{y1} + A_1 d_1^2 = \frac{1}{12}(3.6 \text{ cm})^3(0.5 \text{ cm}) + (1.8 \text{ cm}^2)(1.8 - 0.912 \text{ cm})^2 = 3.363 \text{ cm}^4$$

$$I_{y2} = \bar{I}_{y2} + A_2 d_2^2 = \frac{1}{12}(0.5 \text{ cm})^3(3.8 \text{ cm}) + (1.9 \text{ cm}^2)(0.912 - 0.25 \text{ cm})^2 = 0.872 \text{ cm}^4$$

$$I_{y3} = \bar{I}_{y3} + A_3 d_3^2 = \frac{1}{12}(1.3 \text{ cm})^3(1.0 \text{ cm}) + (1.3 \text{ cm}^2)(0.912 - 0.65 \text{ cm})^2 = 0.273 \text{ cm}^4$$

$$I_y = I_{y1} + I_{y2} + I_{y3} = (3.363 \text{ cm}^4) + (0.872 \text{ cm}^4) + (0.273 \text{ cm}^4) = 4.51 \text{ cm}^4$$

