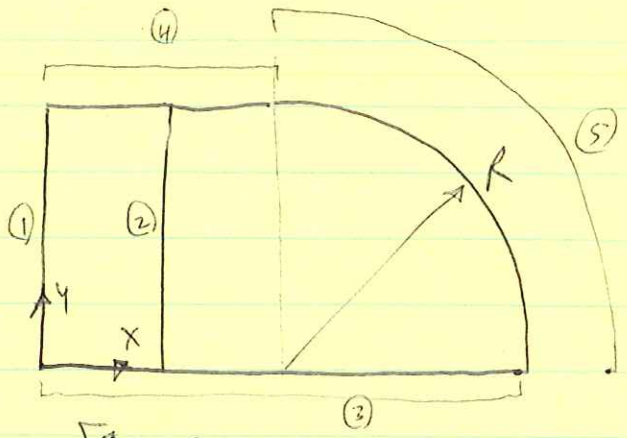
PROB. 5.31

$\gamma = 4.73 \ \frac{kg}{m}$

FIRST FIND WEIGHT AND CG:



$$W = \left(4.73 \ \frac{kg}{m}\right)\left(9.81 \ \frac{m}{s^2}\right)\left[2(0.75m) + (1.35m) + (0.6m) + \frac{\pi}{2}(0.75m)\right]$$

$W = 214.7 \ N$

$\bar{y}_1 = \frac{0.75}{2} = 0.375 m$, $L_1 = 0.75m$, $\bar{y}_1 L_1 = (0.375)(0.75) = 0.2812 \ m^2$

$\bar{y}_2 = 0.375m$, $L_2 = 0.75m$, $\bar{y}_2 L_2 = 0.2812 \ m^2$

$\bar{y}_3 = 0$, $\bar{y}_3 L_3 = 0$, $L_3 = 1.35m$

$\bar{y}_4 = 0.75m$, $L_4 = 0.6m$, $\bar{y}_4 L_4 = 0.45 \ m^2$

$\bar{y}_5 = \frac{2R}{\pi} = \frac{2}{\pi}(0.75) = 0.4775m$, $L_5 = \frac{\pi}{2}(0.75) = 1.178m$, $\bar{y}_5 L_5 = 0.5625 \ m^2$

5.31

110 C

$$\bar{Y} = \frac{\sum \bar{y}_i L_i}{\sum L_i} = \frac{0.2812 + 0.2812 + 0.45 + 0.5625}{0.75 + 0.75 + 1.35 + 0.6 + 1.178}$$

$$\bar{Y} = 0.3403 \text{ m}$$

$\bar{X}_1 = 0, L_1 = 0.75, \bar{X}_1 L_1 = 0$

$\bar{X}_2 = 0.2 \text{m}, L_2 = 0.75, \bar{X}_2 L_2 = 0.15 \text{ m}^2$

$\bar{X}_3 = \frac{1.35}{2} = 0.675 \text{m}, L_3 = 1.35 \text{m}, \bar{X}_3 L_3 = 0.9112 \text{ m}^2$

$\bar{X}_4 = 0.3 \text{ m}, L_4 = 0.6 \text{ m}, \bar{X}_4 L_4 = 0.18 \text{ m}^2$

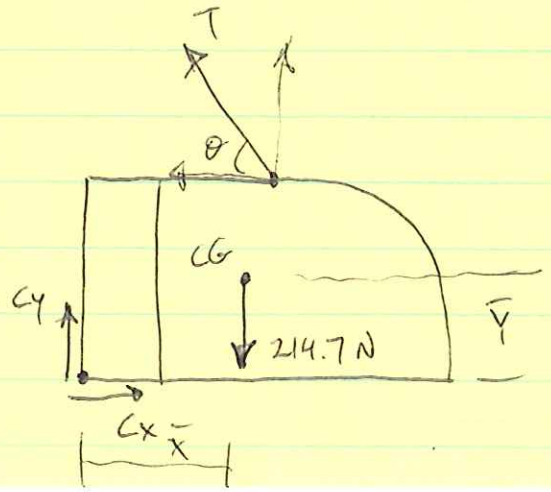
$\bar{X}_5 = 0.6 + \frac{2r}{\pi} = 0.6 + \frac{2}{\pi}(0.75) = 1.077 \text{ m}, L_5 = 1.178 \text{m}$

$\bar{X}_5 L_5 = 1.269 \text{ m}^2$

$$\bar{X} = \frac{\sum \bar{x}_i L_i}{\sum L_i} = \frac{0 + 0.15 + 0.9112 + 0.18 + 1.269}{2 \cdot 0.75 + 1.35 + 0.6 + 1.178}$$

$$\bar{X} = 0.5424$$

FBD



5.31

(110 d)

$$\theta = TAN^{-1}\left(\frac{0.8}{0.6}\right) = 53.1^\circ$$

$$\vec{T} = (-T\cos 53.1^\circ)\,\hat{i} + (T\sin 53.1^\circ)\,\hat{j} \quad N$$

$$\vec{T} = (-0.6T)\,\hat{i} + (0.8T)\,\hat{j}$$

$$\Sigma F_x = 0:$$

$$C_x - 0.6T = 0$$

$$\Sigma F_y = 0:$$

$$C_y + 0.8T - 214.7 = 0$$

$$\Sigma M_C = 0 \quad +\circlearrowleft:$$

$$-(0.5424\,m)(214.7\,N) + (0.75\,m)(0.6T) + (0.6\,m)(0.8T) = 0$$

$$T[(0.75)(0.6) + (0.6)(0.8)] = (0.5424)(214.7)$$

$$T = 125.2\ N$$

$$C_x = 75.1\ N$$

$$C_y = 114.5\ N$$