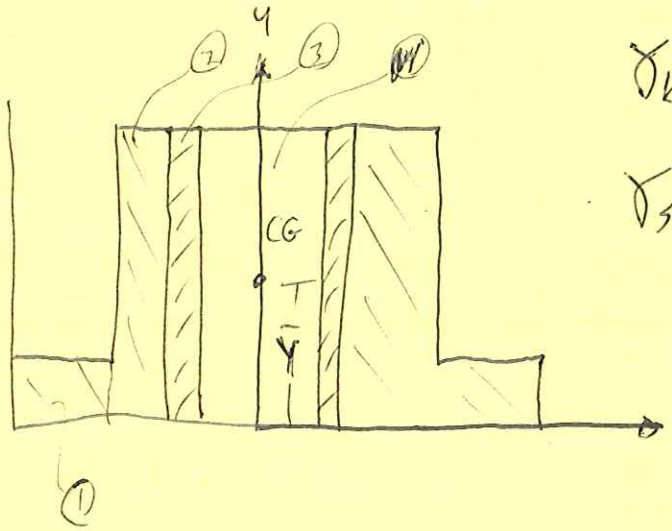
EXAMPLE PROB. 5.128



$\gamma_b = 0.318 \frac{LB}{IN^3}$

$\gamma_s = 0.284 \frac{LB}{IN^3}$

FIND CG.

BY SYMMETRY, $\bar{X} = 0$, $\bar{Z} = 0$

$$\bar{Y} = \frac{\Sigma \bar{y} W}{\Sigma W} = \frac{\Sigma y_i \gamma_i V_i}{\Sigma \gamma_i V_i}$$

FOR VOLUME 1:

$$\bar{y}_1 = \frac{1}{2}(0.4\,IN) = 0.2\,IN$$

$$V_1 = \pi (r_o^2 - r_i^2) h = \pi \left[\left(\frac{1.8}{2}\right)^2 - \left(\frac{1.125}{2}\right)^2 \right] (0.4) = 0.62\,IN^3$$

FOR VOLUME 2:

$$\bar{y}_2 = \frac{1}{2}(1.4\,IN) = 0.7\,IN$$

$$V_2 = \pi (r_o^2 - r_i^2) h = \pi \left[\left(\frac{1.125}{2}\right)^2 - \left(\frac{0.75}{2}\right)^2 \right] (1.4) = 0.773\,IN^3$$

FOR VOLUME 3:

$\bar{y}_3 = 0.7\ in$

$V_3 = \pi(r_o^2 - r_i^2)h = \pi\left[\left(\frac{0.75}{2}\right)^2 - \left(\frac{0.5}{2}\right)^2\right](1.4) = 0.344\ in^3$

$\gamma_s V_1 = \left(0.284\ \frac{lb}{in^3}\right)(0.62\ in^3) = 0.176\ lb$

$\gamma_s V_2 = \left(0.284\ \frac{lb}{in^3}\right)(0.773\ in^3) = 0.219\ lb$

$\gamma_b V_3 = \left(0.318\ \frac{lb}{in^3}\right)(0.344\ in^3) = 0.109\ lb$

$$\bar{Y} = \frac{\sum y_i \gamma_i V_i}{\sum \gamma_i V_i} = \frac{(0.2\ in)(0.176\ lb) + (0.7\ in)(0.219\ lb) + (0.7\ in)(0.109\ lb)}{(0.176\ lb) + (0.219\ lb) + (0.109\ lb)}$$

$$\boxed{\bar{Y} = 0.525\ in}$$