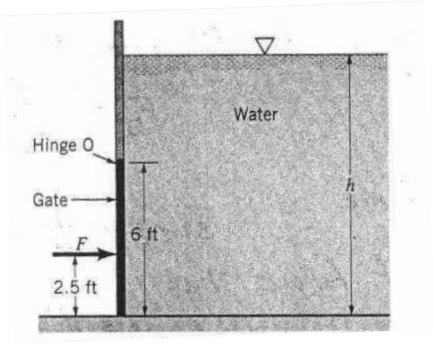
September 15, 2014

NAME

Fluids-ID



Quiz 2. A rectangular gate 6ft tall and 5ft wide in the side of an open tank is held in place by force F as indicated in the Figure. The weight of the gate is negligible, and the hinge at O is frictionless.

(a) Determine the water depth, h, if the resultant hydrostatic force of the water acts 2.5 ft above the bottom gate. (Hint: $I_{xc} = \frac{bh^3}{12}$)

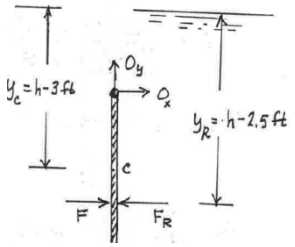
(b) Determine the magnitude of the resultant hydrostatic force.

Note: Attendance (+2 points), Format (+1 point)

Solution:

(a)

$$y_R - y_c = \frac{I_{xc}}{y_c A}$$ (+2 point)



$$(h - 2.5ft) - (h - 3ft) = \frac{\frac{1}{12}(5ft)*(6ft)^3}{(h-3ft)(6ft*5ft)}$$

$$h = 9ft$$ (+1 point)

(b)

$$F_R = \gamma h_c A$$ (+3 point)

$$F_R = \left(62.4\frac{lb}{ft^3}\right)(9ft - 3ft)(6ft * 5ft) = 11{,}200\ lb$$ (+1 point)