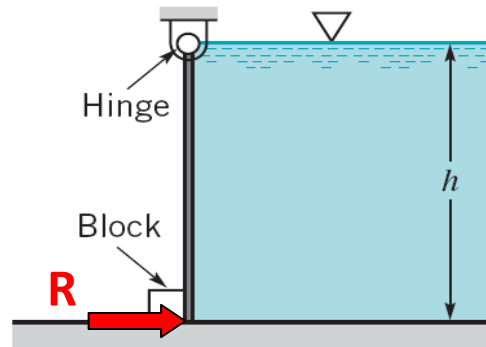


NAME _____

Student ID _____

Quiz 2. A gate of negligible weight is used to hold back water in a channel of width b as shown below.



- (a) Find the resultant force F_R acting on the gate. (3 points)
- (b) Find the vertical location of center of pressure y_R . (Hint: $I_{xc} = \frac{bh^3}{12}$) (3 points)
- (c) Determine the force of the block against the gate R in terms of the specific weight of water γ , water depth h , and width b . (4 points)

Solution:

$$(a) F_R = \gamma h_c A = \gamma \left(\frac{h}{2}\right) (h \times b) = \frac{\gamma h^2 b}{2}$$

$$(b) y_R = \frac{I_{xc}}{y_c A} + y_c = \frac{bh^3/12}{(h/2)(bh)} + \frac{h}{2} = \frac{2}{3}h$$

$$(c) \sum M_{hinge} = 0$$

$$hR = y_R F_R = \left(\frac{2}{3}h\right) \left(\frac{\gamma h^2 b}{2}\right)$$

$$\text{Ans: } R = \frac{\gamma h^2 b}{3}$$

