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ECHE225: QUIZ #6 // 10.17.24

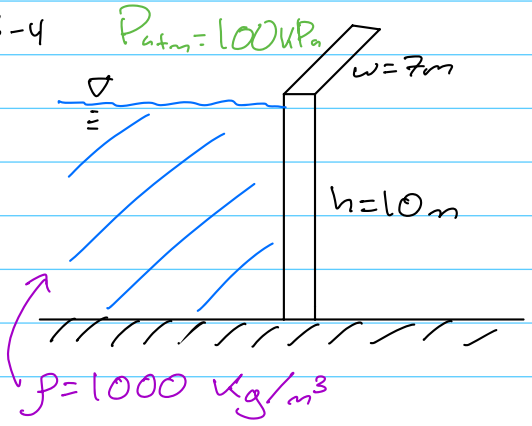
1. $Re = \frac{\text{inertial}}{\text{viscous}}$

2. $u(h=0) = 0$ no-slip

$u(h=A) = V_0$

$u(h=C) > 0$, but $< V_0$, increases from 0 to A

3-4 $P_{atm} = 100 kPa$



3. $P_{gage} = P_{absolute} - P_{atm}$ } $P_{atm} = 100 kPa$

$P_{absolute} = P_{gage} + P_{atm}$ } $P_{gage} = \rho g h$

$\therefore P_{absolute}(h=5) = 100 + S\rho g$

$= 100\ kPa + S_m (1000 \frac{kg}{m^3})(9.81 \frac{m}{s^2})$

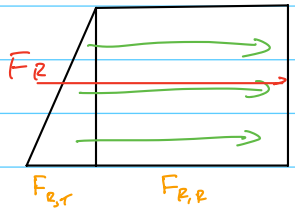
$= 100 + 49050 \frac{kg}{m \cdot s^2}$

$1 N = \frac{kg \cdot m}{s^2}$ → our answer is in $\frac{N}{m}$, $1 Pa = 1 N/m$

$= 100 + 49.050 = \boxed{149.05\ kPa}$

4. Resultant Force

height is distance from free surface h=10m



$F_{R,T} = \frac{1}{2} \rho g h (hw)$ ← $P_{avg} \cdot A$

$= \frac{1}{2}(1000 \frac{kg}{m^3})(9.81 \frac{m}{s^2})(10m)(10 \times 7 m^2)$

$= 3{,}433{,}500 \frac{kg \cdot m}{s^2} = N$

$F_{R,R} = \rho g h (hw)$

$= (1000 \frac{kg}{m^3})(9.81 \frac{m}{s^2})(10m)(10 \times 7 m^2)$

$= 6{,}867{,}000\ N$

$F_R = F_{R,T} + F_{R,R} = 10{,}300{,}500\ N$

$\boxed{F_R = 10{,}300\ kN}$