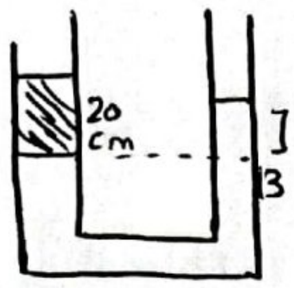
Assignment 3

1] 

$P_A = P_B$

$P_{atm} + \rho_o g 20cm = P_{atm} + \rho_w g 18cm$

$\rightarrow \rho_o = \rho_w * 9 = 0,9\ g/cm^3$

2] $A_{out} = A_{ins}$

$P_1 F_2 = P_2 F_1 \rightarrow P_1 \uparrow \quad P_2 \uparrow$

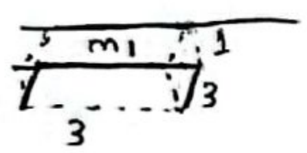
$P_1 \uparrow \Delta P \quad P_2 \uparrow \Delta P$

3] $W_{of\ obj} = 16 * 10^3\ N$

$\rightarrow$ displace $\rightarrow 16 * 10^3 N$ in any fluid

4] $W_{app} = \underbrace{mg}_{30N} - \underbrace{F_B}_{10N} \rightarrow W = 20\ N$

$\rightarrow F_B' = \frac{\rho}{2} U g = \frac{1}{2} F_B \rightarrow W = 30 - 5 = 25\ N$

5] 

$\rightarrow F_B = (m_{obj} + m_1) g$

$m_{obj} g - F_B = m_1 g$

$\rightarrow m_1 g = \rho_{obj} * V_{obj} * g - \rho_{water} * m_{obj} * g$

$\rightarrow m_1 = 7830\ kg$

6] $A_1 U_1 = A_2 U_2$, $AU = \pi r^2 U$, $U_1 = 2\ m/s$

$\pi (1)^2 (2) = 25\pi (0,05)^2 U_2$

$\rightarrow U_2 = 32\ m/s$

7] $U_2 = \sqrt{U_1^2 - 2gh}$

$U_2 = \sqrt{25 + 9,8} = 5,9\ m/s$

$\rightarrow A_1 U_1 = A_2 U_2 \rightarrow 3 * 10^{-5} * 5 = 5,9 A_2$

$\rightarrow A_2 = 2,5 * 10^{-5}\ m^2$

8] $k_E = \frac{1}{2} \rho U^2$

$= \frac{1}{2} * 9,1 * 10^2 * (5,3)^2 = 1,3 * 10^4\ J/m^3$

9] $\Delta U = \underbrace{\rho}_{10^3} \underbrace{g}_{9,8} \frac{\Delta h}{9,5} = 9,3 * 10^4\ J/m^3$

10] $P_1 + \cancel{\rho g h_1} + \frac{1}{2} \rho U_1^2 = P_2 + \cancel{\rho g h_2} + \frac{1}{2} \rho U_2^2$

$P_1 - P_2 = \frac{1}{2} \rho (U_2^2 - U_1^2)$

$16 + \frac{2 * 4,5 * 10^3}{10^3} = U_2^2 = 25 \rightarrow U_2 = 5\ m/s$

11] $U_2 = \sqrt{2gh}$ ↳ same Δh

$\rightarrow$ same U_2

12] $P = \rho g h + P_{ATm}$

$= \frac{1020 * 9,8 * 1000}{1,01 * 10^5} + 1 = 100\ ATm$

13] $A_1 U_1 = A_2 U_2$

$r_1 = r \quad r_2 = \frac{1}{2} r$

$A_1 = A \quad A = \frac{1}{4} A_1$

$\rightarrow U_2 = 4 U_1 = 16\ m/s$

14] $P = \frac{F}{A} \rightarrow F = (\cancel{\rho g h} + P_{atm} - \cancel{P_{atm}}) 4\pi r^2$

$= 1000 * 9,8 * 1000 * 4\pi (1)^2$

$= 1,26 * 10^8\ N$

15] $P = \frac{W}{t} = \frac{Fd}{t} = \frac{\rho A d}{t}$ or $\frac{mgd}{t}$

$\rightarrow \frac{m}{t} * g * d = 1000 * 9,8 * 100$

$= 980\ kw$

Assignment 3

16] $\Delta P = \frac{\Delta F}{A}$

$\rightarrow \frac{F_B}{A} = 1133 - 594$

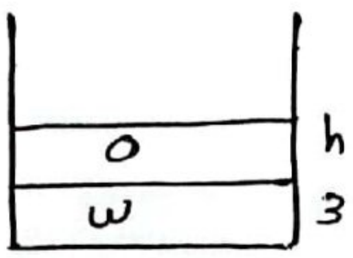
$\rightarrow \rho_F * g = \frac{539}{5*10^{-2}}$

$\rightarrow \rho_F = 1100 kg/m^3$

17] $P = \frac{F}{A} = \frac{\overbrace{m}^{1,2*10^3} g}{4*10^{-2}*10^{-4}}$

$= 2,94 * 10^5 pa$

18]



$P_{total} = P_o + P_w$

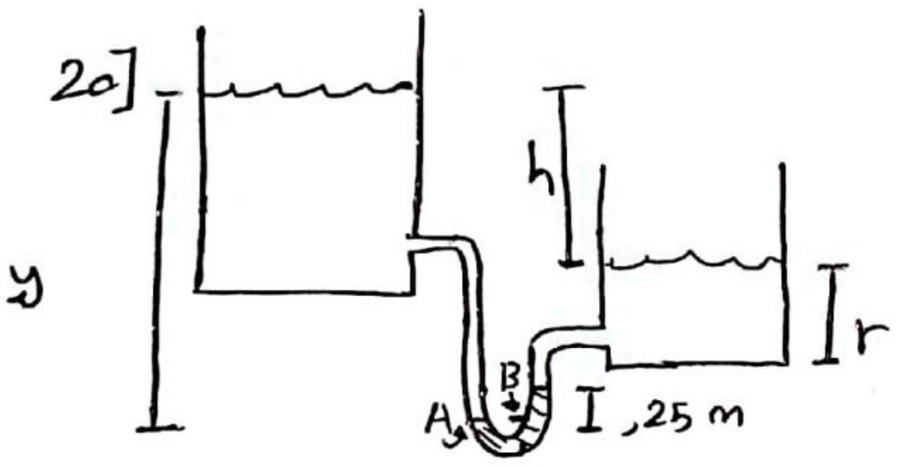
$5*10^4 = \rho_w g 3 + \rho_o g h$

$\rightarrow h = 4,12 m$

19] $U_{sub} = \frac{\rho_{obj}}{\rho_{fluid}} = ,350 U$

$\rightarrow U_{\text{above the surface of } w} = ,650 U$

20]



$P_A = P_B \rightarrow \rho_w g y = \rho_w g r + \rho_m g ,25$

$\rightarrow y - r = 3,4 m$

$\rightarrow h = y - r - ,25 = 3,15 m$

21] $\omega_{app} = mg - \frac{\rho_{fluid}}{\rho_{obj}} mg$

$\rightarrow \frac{21,2}{550} = 1 - \frac{\rho_{fluid}}{\rho_{obj}}$

$\rightarrow \rho_{obj} = 1040 kg/m^3$

22] $T = mg - mg \frac{\rho_{fluid}}{\rho_{obj}}$

$T = 7,89(1 - \frac{1}{2,5}) = 46 N$

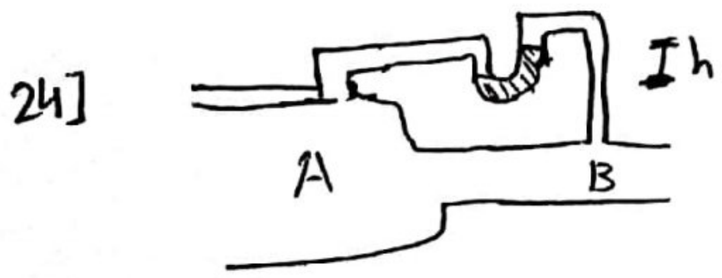
23] $A_1 U_1 = A_2 U_2$, $r_1 = r$ $r_2 = ,86r$

$U_1 = 36 m/s$

$U_2 = \frac{r^2 * 36}{(,86r)^2}$

$U_2 = 49 m/s$

24]



$\rightarrow$ 

$P_A = P_B$

$P_A = P_B + \rho_m g h$

$\rightarrow A_A U_A = A_B U_B$

$V_B = \frac{25}{8}$

~~$\rho_w = 1020 kg/m^3$~~ not 1000

$\rightarrow P_A + \rho_w g h_A + \frac{1}{2}\rho_w U_A^2 = P_B + \rho_w g h_B + \frac{1}{2}\rho_w U_B^2$

$P_A - P_B = \frac{1}{2}\rho_w (U_B^2 - U_A^2)$

$\rho_m g h = \frac{1}{2}\rho_w (U_B^2 - U_A^2)$

$\rightarrow h = ,0216 m = 2,16 cm$

25] $\Sigma F = ma$

$N - mg = ma$

$\rightarrow N = mg + ma$

$w \rightarrow mg \rightarrow w \rightarrow m(g+a)$

$\Delta P = \frac{F_A}{A}$

$\rightarrow \Delta P = \frac{m(g+a)}{A} * \frac{h}{h}$

$\Delta P = \rho (g+a) h$

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Assignment 3

26] $\Delta P = \frac{\Sigma F}{A} = \frac{m(g-a)}{A} * \frac{h}{h}$

$= \rho(g-a)h$

* $\Sigma F = ma$

$\rightarrow -N + mg = ma$

$\rightarrow N = mg - ma$

27] $\Sigma F = 0$

$\rightarrow F + F_B + mg = 0$

$\rightarrow F = \frac{\rho_{fluid}}{\rho_{obj}} mg - mg$

$F = \frac{1}{.6} mg - mg = 1.07 N$

* $SG = \frac{\rho_{obj}}{\rho_w} = .6$

28] $\frac{Volume}{t} = \frac{A * h}{t} = A * speed$

$\frac{V}{t} = \pi(1.5 * 10^{-2})^2 * 7 = 4.9 * 10^{-3} m^3/s$

$\frac{V}{t}$ we will use it in [29]

29] $\frac{m}{t} = \rho \frac{V}{t} = 10^3 * 4.9 * 10^{-3}$

$= 4.9 kg/s$

30] $P_1 - P_2 = \frac{\rho}{2}(v_2^2 - v_1^2) + \rho g(h_2 - h_1)$

$(7)^2 \quad (2)^2 \quad 5 \quad -2$

$P_1 - P_2 = 9.1 * 10^4 pa$

31] $T = mg - mg\frac{\rho_{Li}}{\rho_{obj}}$

$26 = mg(1 - \frac{\rho_{Li}}{2600})$

$\rightarrow \rho_{Li} = 1470 kg/m^3$

32] $m_b = .112 kg$

$\rightarrow F_B = (m_b + mercury)g$

$\rightarrow F_B - m_b g = m_{mercury}$

$\frac{\rho_w V_w g - .112 g}{g} = \rho_m V_m$

$\rightarrow V_m = 3.75 cm^3$

33] $w = mg - \frac{\rho_{fluid}}{\rho_{obj}} m_{obj} g$

$w = (\rho_{obj} V_{obj} - \rho_{fluid} V_{obj}) g$

$w = (\rho_{Fe} - \rho_{fluid}) L^3 g$