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PAPER :— Fluid Mechanics - I

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Q:- 1:-

Part (a)

ANS:- Fluid Mechanics:-

Fluid Mechanics is the branch of Physics which deal with the study of fluids and forces on them. it has application in a wide range of disciplines, including mechanical, civil, chemical and biomedical engineering geophysics, meteorology and biology.

⇒ Branches of Fluid Mechanics:-

Fluid mechanics can be divided into "fluid statics" and "Fluid dynamics".

⇒ Fluid Statics:- The study of fluid at a rest are called as Fluid statics. The calculation of Pressure exerted by a tall column of fluid.

Fluid dynamics:-

They are dealing with the study in motion. The calculation of drag on a velical in wind tunnel. Fluid Dynamics can be further divided into Experiment FD and Computional F.D.

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Q:-1
(Part b)

Ans:- ABSOLUTE PRESSURE:-

Absolute pressure is a pressure that is relative to the zero pressure in a enty air-free space of universe. This reference pressure is the ideal or absolute vacuum.

GUAGE PRESSURE:-

Guage Pressure is the pressure relative to atmospheric pressure. Guage pressure is positive for pressure above atmospheric pressure & negative for pressure below it. In fact atmospheric pressure does add to the pressure in any fluid not enclosed in a rigid container.

Q No (02)

(a) GIVEN DATA :-

tank = hf = h = S.I.D$^{m^2}$ = 7278 mm

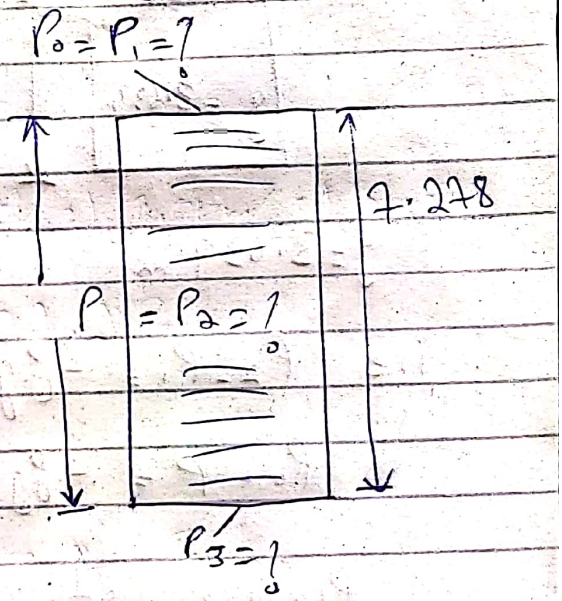
h = 7.278 m

Cross section area A = 0.2 m^2

(1) Pressure at surface of water = ?
(2) Pressure water at center = ?
(3) Pressure water at bottom = ?

Calculations :-

Free, Body Diagram



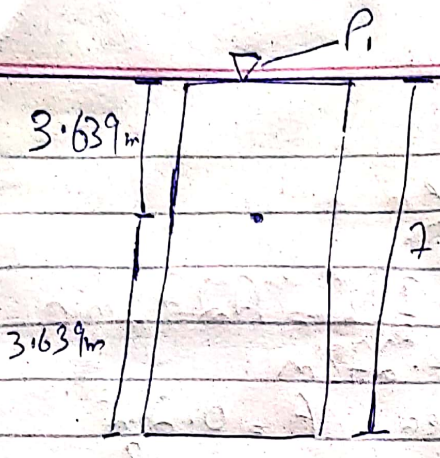
As specific weight of water = 9810 N/m^3

we know that = ρ = 1000 kg^3/m^3 = 9810 N/m^3

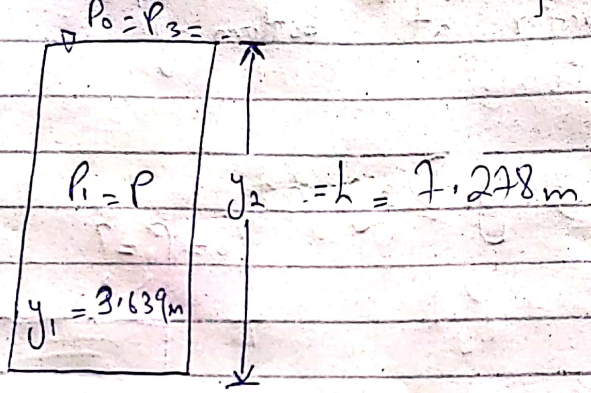
g = 9.8 m/sec^2

As h = height = 7.278

As 1 ATm = 101300 Pa from table



(1) Pressure at the surface of water.



$y = 3.639$ m

i.e $P_2 - P_1 = -\rho g (y_2 - y_1)$

$P_0 - P = -\rho g h$ (at center)

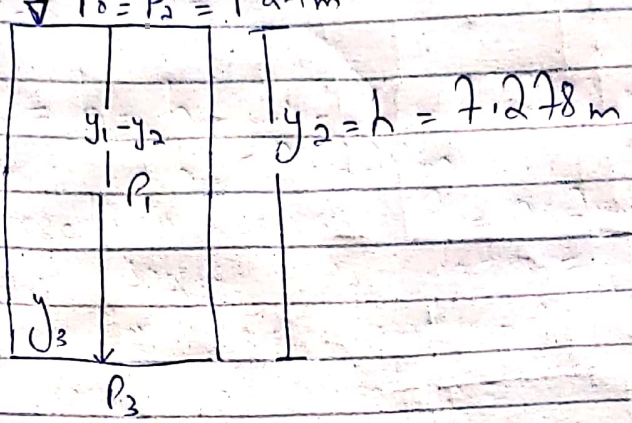
Pressure at surface

$P_0 = \rho g h + P_{atm}$

$P_0 = P_{atm}$

$\boxed{P_0 = 101\ kPa}$

(2) Pressure at center



As from Table

H_2O @ 20°C $= \rho = 998\ kg/m^3$

$\Rightarrow P_1 = P_0 + \rho g h$

$\Rightarrow P_1 = 101300\ Pa + (998\ kg/m^3)(9.81\ m/sec^2)(3.639)$

$\Rightarrow P_1 = 101,300\ Pa + 35627.2\ Pa$

$\Rightarrow P_1 = 136.927\ kPa$

(3) Pressure at the bottom of Tank.

$P_3 = P_0 + \rho g h$

$h = 7.278\ m$

$P_3 = 101,300\ Pa + (998\ kg/m^3)(9.81\ m/sec^2)(7.278\ m)$

$\Rightarrow P_3 = 101,300\ Pa + 71254.4\ Pa$

$\Rightarrow P_3 = 101,300\ Pa + 71254.4\ Pa$

$\Rightarrow P_3 = 172554.4\ Pa$

$\Rightarrow \boxed{P_3 = 172.554\ kPa}$