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Sec = A

Paper = Fluid Mechanics

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Question = 1

(a)

Viscosity:

viscosity is the property of fluid which opposes the relative motion b/w the two surfaces of the fluid. Diff fluid have diff viscosity. depends upon the inter molecular force in fluid.

e.g.:

Honey is more viscous than water.

Newton Equation of viscosity:

It's states that

"The shear stress in a flowing fluid is directly proportional to the rate of shear strain".

Mathematically: $\tau \propto \frac{du}{dy}$

$\tau \rightarrow$ shear stress

$\tau \propto \frac{du}{dy}$

change the sign of $\propto$

$\tau = \mu \frac{du}{dy}$

$\mu$ = viscosity (Dynamic viscosity)

$\mu = \tau \frac{dy}{du}$

The fluid which follows newton's law of viscosity are called : 'Newton's fluid'.

(P.T.O)

Part (B)

**Density:**

property of fluid.

Density can be define as mass per unit volume of a fluid

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

$$\rho = \frac{m}{V} = kg/m^3$$

**Specific weight:**

" Specific weight is the weight prossessed by unit volume of a fluid, denoted by 'w'

$$W = \frac{w}{V} = N/m^3$$

Relation between Density & specific weight.

as $w = \frac{W}{V}$

we know that $W = mg$

$w = \frac{mg}{V}$

$w = \rho g \quad \because \rho = \frac{m}{V}$

$\rho$ is a density

Specific volume - property of fluid.

Specific volume is the volume of a fluid (v) occupied per unit mass (m)

It is reciprocal of density.

Specific volume $= v = \frac{V}{m} = \frac{m^3}{kg}$

$v = \frac{1}{\rho}$

Part (c):

Given data:

specific volume of gas $v = 0.72\ m^3/kg$

Required data:-

specific weight in $N/m^3$ = ?

Solution:-

As we know that

$$v = \frac{1}{\rho}$$

So density "$\rho$" $= \frac{1}{v}$

$$= \frac{1}{0.72}$$

$$= 1.389\ kg/m^3$$

specific weight "w" $= \rho \times g$

$$= 1.389 \times 9.8$$

$$= 13.62\ N/m^3$$

(Q NO 2)

(a) Define pressure? what is absolute and guage pressure?

(Ans):-

Pressure:- pressure is defined as The force applied perpendicular to the surface of an object per unit area over which that force is distuributed"

Unit:- pascal is the unit of pressure

Gauge pressure:- Gauge pressure is the pressure relative to atmospheric pressure. Gauge pressure is positive for pressure above atmospheric and negative for pressure below it.

(P#9.10)

Mathematically:-
Total pressure or absolute pressure is thus the sum of gauge pressure and atmospheric pressure.

$$P_{abs} = P_g + P_{atm}$$

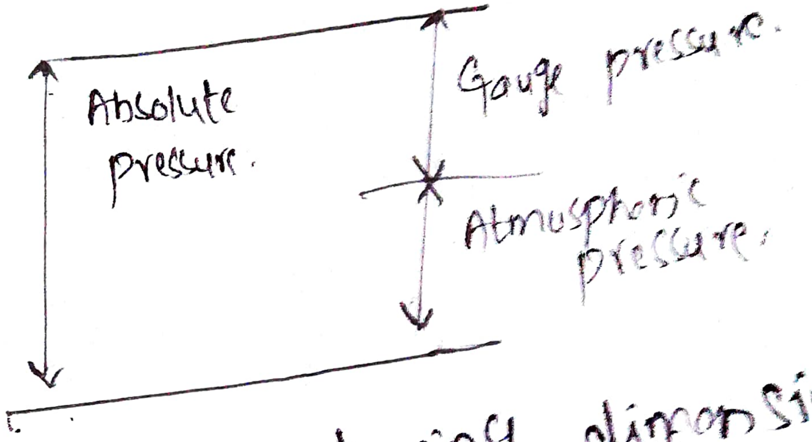
where,
$P_{ab}$ = Absolute pressure.
$P_g$ = Gauge pressure
$P_{atm}$ = Atmospheric ″.

Absolute Pressure:-
It is the total pressure at a point in a fluid equalling the sum of gauge pressure and the atmospheric pressure.

Mathematical form:-
$P_{abs} = P_g + P_{atm}$

eg:-
for example if your tire gauge reads 39 psi pounds per square inch then the absolute pressure is 39 psi plus 14.7 psi or 53.7 psi (equivalent to 337 kpa).

Q 2 (b):




A water tank having dimensions of 1500m x 1500 mm. Depth of water tank is equal to your student ID number in mm, what is the net pressure on the wall of water tank, find the location of force application. If the water tank level drops to the half of the depth, what will be the force and point of application of force?

Given data:

length = L = 1500 mm = 1.5m

Breadth = b = 1500 mm = 1.5m

Depth = h = 7940 mm = 7.940

Unit weight of water = 9.81 KN/m³

Required data:-

net pressure, P = ?
location of force.
If water level drops half of depth find P & location of force.

Solution:-

(a) Net pressure

$P = \gamma h$

$P = 9.81 \times 7.940$

$P = 77.8914 \text{ kN/m}^2$

(b) force applied centriod.

$\bar{y} = h/3$

$\bar{y} = \frac{7.940}{3}$

$\bar{y} = 2.64 \text{ m}$

(c) half Depth-

pressure at half depth, $P' = \gamma h/2$.

$P' = 9.81 \times \frac{7.940}{2}$

$P' = 38.94 \, kN/m^2$.

Centroid, $\bar{y}' = \frac{h}{2} \times \frac{1}{3}$

$\bar{y}' = 1.323 \, m$.