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* 7983
* Section B
* Fluid Mechanics.

Q.no1:

Define viscosity? Derive newton equation of viscosity.

Viscosity:

Viscosity opposess the relative motion between the two surfaces of the fluid. viscosity is not same for all fluids, it depends on the intermoleccular force in fluid.

Example:

viscosity of water is less while viscosity of Honey is great.

Equation:

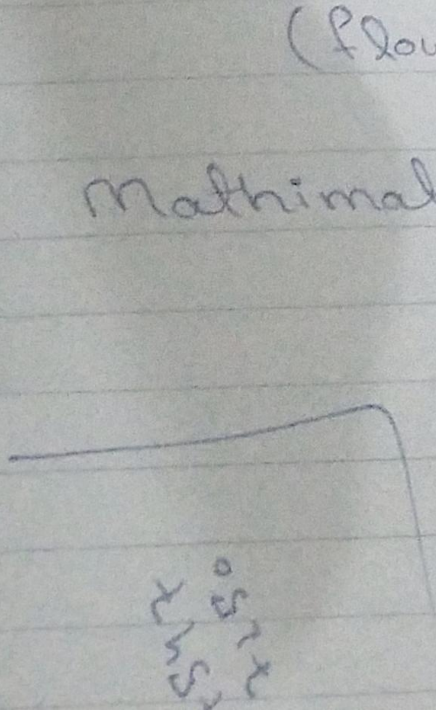
shear stress $\propto$ rate of shear strain.

(flowing fluid).

Mathimatically:

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

$\tau \rightarrow$ shear stress.



$\tau \propto du/dy$

$$\tau = \mu \, du/dy$$

μ = viscosity

$$\mu = \tau \, dy/du$$

$$\mu = \tau \, dy/du \, .$$

Part B:

Define density, specific-weight and specific volume. show relation b/w Density and specific weight.

Density:

(It is a Property of fluid).

"mass per unit volume of a fluid is called density.

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

Specific weight:

The weight possessed by unit volume.

denoted by "w".

$$w = \frac{\text{weight}}{\text{volume}} = \frac{N}{m^3}$$

Relation b/w Density and specific weight.

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

$$w = mg/V$$

$$w = \rho g$$

Specific volume:

volume of a fluid occupied per unit mass.

(It is also called reciprocal of density).

$$v = V/m$$

$$v = m^3/kg$$

$$v = 1/\rho$$

Part C:

(iii) -

Given data:

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

Required data:

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

Solution:

$v = 1/\rho$

$\rho = 1/v$

$\rho = 1/0.72$

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

Specific weight $= \rho \times g$

$w = 1.398 \times 9.8$

Result:

$w = 13.62 \ N/m^3$. Ans.

Qno 3:

(ii) -

Answer: Pressure is the force applied Perpendicular to the surface of an object per unit area over which that force is distributed.

Various units are used to express pressure.

SI unit:

Pascal

N/m^3

Pound force per square inch.

Atmospheric pressure is equal to this pressure.

Absolute pressure:

When any pressure is detected above the absolute zero of pressure. It is measured using a barometer, and it is ~~measured~~ equal ~~using~~ to measuring pressure plus the atmospheric pressure.

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

Guage pressure:

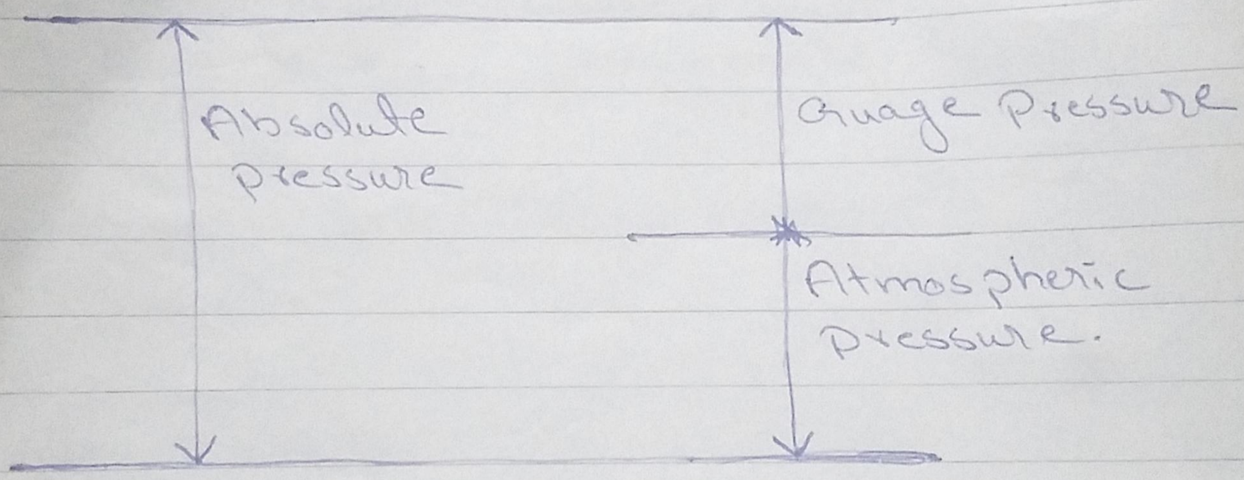
is the difference between absolute and atmospheric pressure. Guage pressure uses atmospheric pressure. It is also used for measuring the condition of fluid

$$P_g = P_s - P_{atm}$$

Guage pressure is zero-reffered against ambient air pressure, so it is equal to absolute pressure minus atmospheric pressure.

Ans 9:

(b) -



Given Data:

Length = 1500mm = 1·5m

Breadth = 1500mm.
= 1·5m

Depth = 7940mm
unit weight of water = 9.81 KN/m^3

Required data:

- net pressure.
- Location of force.
- find P & Location of force (water level drops half of depth).

Solution:

a)- we have to find net pressure.

$P = \gamma h$

putting values.

$= 9.81 \times 7.940$

$= 77.8914 \ KN/m^2$

b)- Force application:

$\bar{y} = h/3$

$\bar{y} = 7.940/3$

$\bar{y} = 2.646 m$

c)- Half Depth:

$$P' = \gamma h/2$$

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

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

Centroid:

$$\bar{y} = h/2 \times 1/3$$

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