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SECTION: "A"

SUBJECT: Fluid Mechanic's I

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Question NO 1)
Part A)

DEFINE VISCOSITY? DERIVE NEWTON EQUATION OF VISCOSITY.

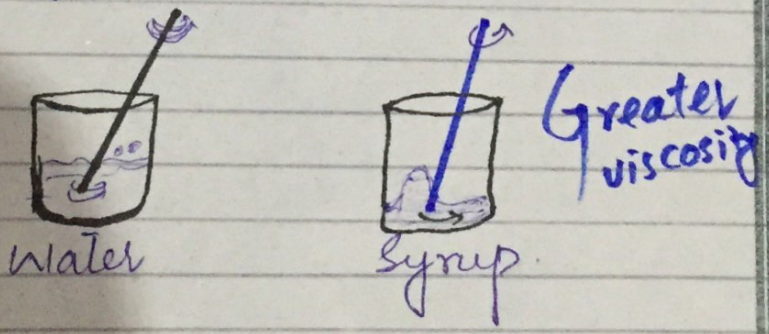
Answer :-

DEFINITION: It is the property of a fluid which resists relative motion of its adjustent layers. It is due to cohession and molecular momentum exchanged blw fluid layers.

UNIT:- The unit of viscosity is Poise.

EXAMPLE:-

Syrup has a greater viscosity that water.



NEWTON'S EQUATION OF VISCOSITY

Statement:

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

Mathematically Repreasentation

$$\tau \propto du/dy$$

$\tau \rightarrow$ Shear Stress

Change the sign of proportionality

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

where

μ = viscosity (dynamic viscosity)

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

$\frac{du}{dy}$ = Rate of shear deformation

NEWTONIAN FLUID:

The fluid which follows "Newton's" law of viscosity" are called Newtonian fluids..

Question NO 1st (part B)

DEFINE DENSITY, Spacific weight and Specific volume Show relation blw Density and Specific weight.

Answer:-

1) DENSITY:-

→ propesty of fluid

Density can define as "mass per unit volume of fluid"

"OR"

"The Ratio of mass of fluid a fluid to the volume of the fluid

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

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

Specific volume:-

The ratio of volume of fluid to the mass of the fluid.

Specific weight:

Specific weight of a fluid is defined as "the ratio of the weight of a fluid to the volume of the fluid

(OR)

Specific weight is the weight of possessed by unit volume of a fluid."

Denoted by "w"

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

* Relation between Density & Specific weight.

As we know that

$$w = w/g$$

and that;

$$w = mg$$

Sol

$W = mg/V \Rightarrow W = \rho g$

$\because \rho = m/V$ = Density

As

— (Question No 1) —

— (past C) —

IF Specific volume of gass is $0.72\ m^3/kg$. what is Specific weight in N/m^3 ?

Given data:

Specific volume, $V = 0.72\ m^3/kg$

Required data:

Specific weight = ?

Solution:

As

$V = 1/\rho$

$\rho = 1/V$

$\rho = 1/0.72$

$\rho = 1.38\ kg/m^3$

As,

$W = \rho g$

$g = 9.81\ m/s^2$

$W = 1.38\ kg/m^3 \times 9.81\ m/s^2$

$W = 13.054\ N/m^3$

$\boxed{W = 13.54\ N/m^3}$.

Question NO2:

Past "A" DEFINE PRESURE? WHAT IS ABSOLUTE AND GUAGE PRESURE?

ANS: PRESURE:-

"The force applied perpendicular to the surface of an object per unit area which that force is distributed".

The SI unit of pressure is Pascal (Pa)

- **Guage presure:-**

"Gauge pressure relative to atomospheic presure: Guage presure is positive for presure above atomospheic presure and negative for presure below it.

Mathimatically:

Total presure or absolute presure is thus the sum of guage presure and atomospheic presure.

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

- P_{abs} = Absolute presure.
- P_g = Guage presure.
- P_{atm} = Atmospheric presure.

ABSOLUTE PRESURE :-

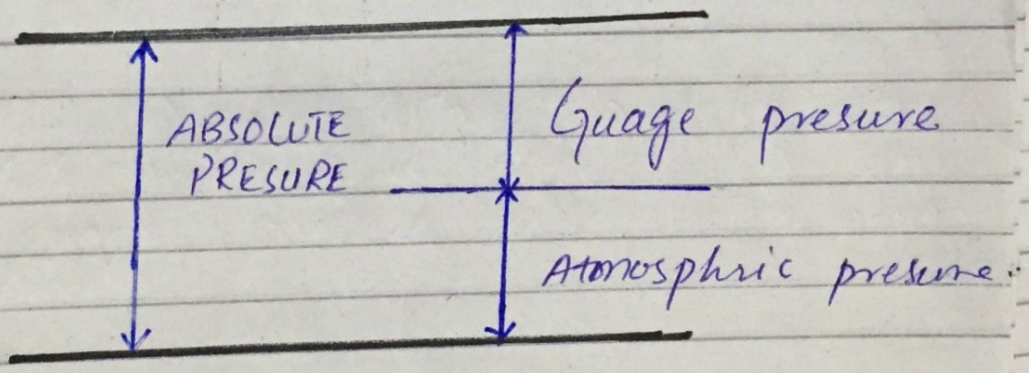
It is the total presure at a point in a fluid equalling the sum of guage presure and the atmospheric presure.

Mathimatically :-

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

For Example :-

If your tire guage roads 39psi (pound per Squre inch) Then the absolute presure is 39psi plus 14.7 psi (patm in psi) or 53.7 psi.



(B)

Given data

length = 1500mm = 1.5m
Breadth = 1500mm = 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 p and location of force.

Solution:

• net presure:

$P = \gamma h$

$P = 9.81 \times 7.940$

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

• FORCE Application: (centriod)

$\bar{y} = h/3$

$\bar{y} = 7.940/3$

$\bar{y} = 2.646 \text{ m}$

• Half Depth:

presure at half depth

$p' = \gamma h/2$

$p' = 9.81 \times 7.940/2$

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

Centroid:

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

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