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I.D # 7902

Section :- A

Paper :- Fluid Mechanic

Date :- 25-4-2020

Q No 1 Part 'a'

Ans :- **Viscosity :-**

Viscosity is the property of fluid which opposses the relative motion b/w the two surface of the fluid.

Different fluid have different viscosity depends upon the intermolecular force in fluid.

e.g :- Honey has great viscosity then water.

## Newton Equation of viscosity :-

It states that.

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

Mathmatically :-

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

$\tau \rightarrow$ shear stress

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

change the sign of proportionality

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

$\mu$ = viscosity (Dynamic viscosity).

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

①

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

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 possessed by unit volume of a fluid ".

Denoted by 'w'.

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

## Relation b/w Density and weight :-

as. $w = \frac{W}{v}$

we know that $w = mg$

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

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

$\rho \rightarrow$ density

→ **Specific volume:-**

→ Property of fluid.

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

→ It is the reciprocal of density.

Specific volume :-

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

$$v = 1/\rho$$

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Part "C" →

**Given Data:-**

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

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

**Solution:-**

As we know that

$$v = 1/\rho$$

so. density "ρ" = $1/v$

$$= 1/0.72 \Rightarrow 1.389 \ kg/m^3$$

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

$$= 1.389 \times 9.8$$

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

**Ans.** ←

## Question No 2 :-

### Pressure :-

'Pressure is difined as'

"The force applied Perpenticulas to the surface of an objecd per unit area over which that force is distributed."

Unit:-

The SI unit of Pressure is Pascal (Pa).

## Gauge Pressure :-

Guage Pressure is the Pressure selative to atviespheric Pressure. Guage Pressure is positive for Perssure abae atmospheric Pressure and vegative for Perssure abelaw it.

Mathematically :-

Total Pressure or absolute pressure is thus the sum of guge Pressure and atmospheric Pressure.

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

where

$P_{abs}$ = Absolute Pressure

$P_g$ = Guage Pressure

$P_{atm}$ = Atmospheric Pressure

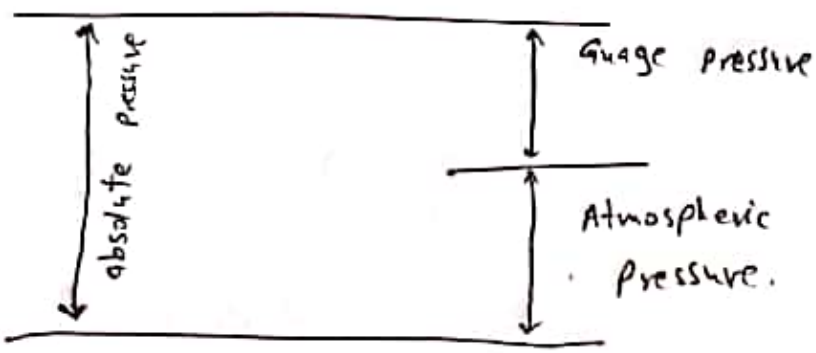
## ABsatute Pressure:-

It is the total pressure at a point in a fluid equelling the sum of guge pressure and the atmospheric pressure.

Mathamticelly :-

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

Example :- If your tire guge reads 39 Psi (Pound Per square inch) Then the absolute pressure is 39 Psi plus 14.7 Psi ($P_{atm}$ in Psi) or 53.7 Psi. (Equivalent to 337 KPA).



Part B

Given Data :-

Length $l$ = 1500 mm = 1.5 m

Breadth $B$ = 1500 = 1.5 m

And Depth which is my ID number

So $d$ = 7902 mm = 7.902 m

Unit weight of water = 9.81 $KN/m^3$

Required Data :-

→ Net Pressure . $P$ = ?

→ location of force = ?

→ If water level drops half of Depth of 'P' and location of force.

Solution :-

(a) Net Pressure

As we know that

$$P = \gamma h$$

as $\gamma = 9.81$ , $h = 7.902$

$$P = 9.81 \times 7.902$$

$$\Rightarrow 77.519 \ KN/m^2$$

(b) Force application centroid :-

$$\bar{y} = h/3$$

$$\bar{y} = \frac{7.902}{3}$$

$$\Rightarrow \quad 2.634 \text{ m}$$

(c) Half depth :-

Pressure at half depth = $P' = \gamma h/2$

$$P' = 9.81 \times \frac{7.902}{2}$$

$$P' = 9.81 \times 3.951$$

$$P' = 38.759 \text{ m}^2$$

Centroid :-

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

$$\bar{y} = \frac{7.902}{2} \times 1/3$$

$$\bar{y} = 1.317 \text{ m}$$