ID : 7966

SECTION : B

SEMESTER : 4th

DEPT : Civil

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Q1) a) VISCOSITY:-

It is the property of fluid which imparts resistance of fluid motion by offering resistance to fluid motion movement of one layer over another.

unit μ ($N \cdot s/m^2$) or (kg/ms)

Newton equation of Viscosity.

Now consider two parallel plates placed at distance Y and space in blw is filled with fluid lower surface is assumed to be stationary while upper moved with velocity u. Thus.

$$F \propto \frac{Au}{Y} \quad \text{or} \quad \frac{F}{A} = \frac{u\mu}{Y}$$

$\therefore \tau$ = shear stress
μ = u- efficient
Y = distance
u = velocity
A = area

Thus $\tau = \frac{\mu u}{Y}$

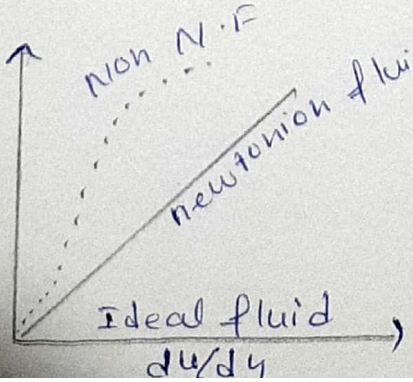
for dy the velocity will be du.

Thus

$\tau = \frac{\mu du}{dy}$ => Newton equation of viscosity

And

$\tau = \frac{\mu du}{dy}$ => Dynamic co-efficient of Absolute viscosity



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The fluid for which constant of proportionality μ doesnot change with rate of deformation is said to be newtonian fluid.

UNIT: $\left(\frac{N \cdot S}{m^2}\right)$

PART B:

Density: Density of fluid is its mass per unit volume. It is denoted by "ρ" and its unit $\boxed{kg/m^3}$

Specific weight: Weight per unit volume of fluid. Represented by gamma

$\gamma = w/v$ and its unit N/m^3

Specific volume: It is a volume occupied by unit mass of the fluid

$V = v/m = 1/\rho$

Relation blw Specific .W & density.

As $\gamma = w/v$ where $w = mg$

$\gamma = mg/v \quad \because m/v = \rho$

$\gamma = \rho g \Rightarrow \boxed{\rho = \frac{\gamma}{g}}$

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PART C:-

If specific volume of gas is $0.72\ m^3/kg$ what is specific weight in N/m^3?

Solution:-

Given that:

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

Required:- Specific weight $\gamma_s = ?$

As

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

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

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

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

As

$$\gamma = \rho g$$

$$\gamma = 1.38 \times 9.81$$

$$\boxed{\gamma = 13.54\ N/m^3}$$ Ans

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(Q2) PART A:- (4)

Pressure: The force applied perpendicular to the surface of an object per unit area over which that force is distributed

SI base unit

$1 N/m^2$

(Pascal) $P = F/A$

Absolute Pressure:

Absolute pressure that is relative to the zero pressure in the empty air free space to the universe. This reference pressure is the absolute vaccum, it is denoted with the subscription "abs" P_{abs}

Gauge pressure:

The guage is defined as the difference blw an absolute pressure and the prevailing atmospheric pressure, it is denoted by "e": P_e and is calculated as follows.

$$P_e = P_{abs} - P_{amb}$$

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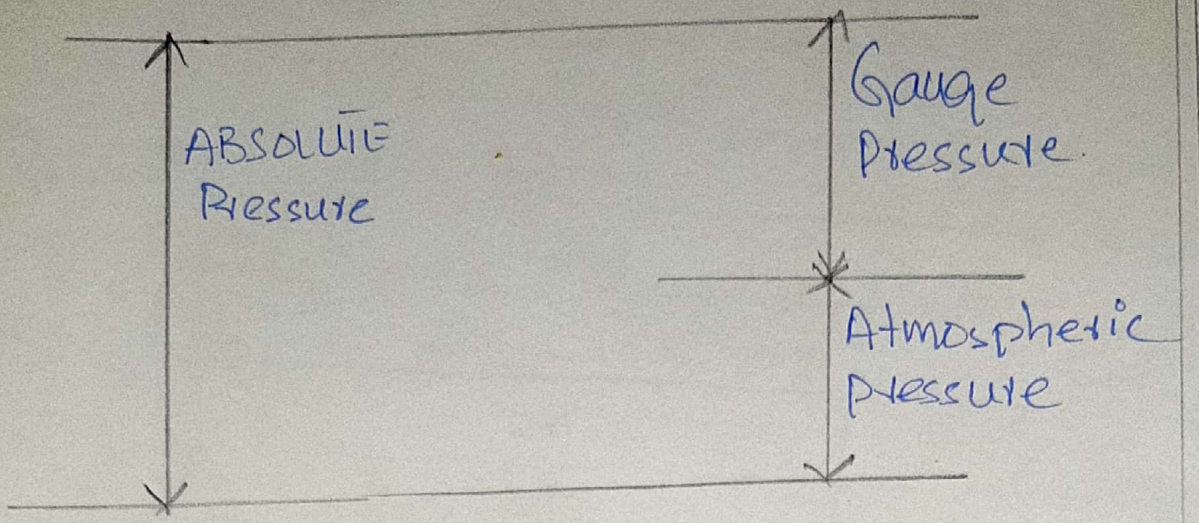
PART B:-



Given data:-

Length = $l = 1500mm = 1.5m$

Breadth, $b = 1500mm = 1.5m$

Depth, $h = 7966mm = 7.966m$

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

Required:-

Net pressure, $P = ?$

Location of force $= ?$

If water levels drops half of depth find P and location of force.

Solution:-

a) Net pressure:-

$$P = \gamma h$$

$$P = 9.81 \times 7.966$$

$$P = 78.14646\ KN/m^2$$

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b) Force Application (centroid):-

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

$$\bar{y} = \frac{7.966}{3}$$

$$\boxed{\bar{y} = 2.6553 \text{ m}}$$

c) **Half Depth:-**

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

$$p' = \frac{9.81 \times 7.966}{2}$$

$$p' = 39.07323 \text{ kN/m}^2$$

Centroid,

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

$$\bar{y} = \frac{7.966}{2} \times \frac{1}{3}$$

$$\boxed{\bar{y} = 1.327 \text{ m}}$$

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