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Section : A

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Sub : Fluid Mechanis

Q #01 * part a *

a) Define Viscosity? Derive newton equation of Viscosity.

Ans: The behavior of fluid in flow is very much related it two intransic propety of fluid. Viscosity is the propety of fluid which opposses the relative motion b/w the two surface of fluid. Different fluid have different viscosity depends upon the intermoleucler force in fluid.

e.g ① honey has great viscosity than water

②

Newton equation of viscosity.

It states that

" the shear stress is a flowing fluid is directly proptional to the rate of ~~change~~ shear strain "

Mathe:. $\tau \propto \frac{du}{dy}$

$\tau \Rightarrow$ Shear stress

$\tau \propto \frac{du}{dy}$ => change the sign of proportionality

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

μ = viscosity (Dynomic viscosity)

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

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

Part(b)

Density : Density of fluid is it mass per unit of fluid. it is denoted by "ρ" its unit is kg/m^3

OR

→ property of fluid

Density can be define as mass per unit volum

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

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

Specific weight :

specific weight : It is a weight of the fluid per unit volume. It is represented by "γ"

OR

Specific weight of is the weight

Prossessed by unit volume of a fluid

$W = mg$ $\quad \gamma = \frac{\text{weight}}{\text{volume}} = N/m^3$

* Relation b/w Density and Specific weight.

As $\gamma = W/V$ ① and $W = mg$

put $W = mg$ in eq ①

$\gamma = \frac{mg}{V}$ where m/V^2

Thus $\gamma = \rho \times g$ or $\rho = \gamma/g$

ρ density

$\rho \rightarrow$ Density.

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

m^3/kg $\quad v = \frac{V}{m} = \frac{1}{\rho}$

OR

Specific volume is the volume of a fluid "V" occupied per unit mass (m) It is the reciprocal of Density.

$v = \frac{V}{m} = m^3/kg \quad v = \frac{1}{\rho}$

Part C :: if a specific volume of gass is $0.72 m^3/kg$. what is specific weight in N/m^3?

Answer :: Sol::

Given Data

-> ~~specific weight of~~

-> specific volume of gas

$v = 0.72 m^3/kg$

Required data:

specific weight in N/m^3 >

Sol... As we know that

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

So density 'ρ' $= \frac{1}{v} = \frac{1}{0.72} \Rightarrow 1.389 kg/m^3$

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

$= 1.389 \times 9.8$

Required Ans $\Rightarrow$ $= 13.62 N/m^3$

Q#02

Part a:. Define pressure? and what is an absolute and gauge pressure.

Pressure:. Pressure is defined as force per unit area. It is usually more convenient to use pressure rather than force to describe the influence upon fluid behavior.

OR

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

→ The standard unit for pressure is the Pascal. which is Newton per meter square.

N/m^2 or Nm^{-2}

Pressure in denoted by p·P

$P = f/A$

$1\ N/m^2 = 1\ Pa$

Common symbols of pressure

(P·P)

SI unit => pascal [Pa]

Dimension $ML^{-1}T^{-2}$

Absolute pressure: Absolute pressure is the sum of gauge pressure of and atmospheric

OR

It is the total pressure at a point in a fluid equalling the sum of the gauge

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

P_{abs} => Absolute pressure

P_g => Gauge pressure

P_{atm} => atmospheric pressure

Example:. If your tire gauge is 34 psi (pound per square inch) then the absolute pressure is 34 psi plus 14.7 psi.

Gauge pressure: Gauge pressure is the ~~system~~ Pressure of a system above the atmospheric pressure.

OR

~~Graug~~ and negative for pressure below

General Example

Most pressure gauge compare to atmospheric (i.e) this room is at zero (0) gauge)

Absolute P is 1 atm more

$P = P_{gauge} + 1\,atm$ $\quad 32 + 14.7 = 46.7$

$1\,atm = 1.013 \times 10^5\,Pa = 101.7\,kPa = 760\,Torr = 14.7\,psi$

absolute	Gauge
46.7 psi	32 psi

Q#2

Part b

Given Data

Length = 1500 mm = 1.5m

Bredth = 1500 mm = 1.5m

Depth = 7925 mm = 7.925m

Unit Wt water = 9.81 KN/m³

Required

a = net pressure, P = ?

b = location of pressure = ?

c = If water level drop half of depth

Find P and location of force

Solution:

1) Net pressure

$$P = \gamma h$$

$$P = 9.81 \times 7.925$$

$$\boxed{P = 77.74\ KN/m^2}$$

2) (Force Application (centroid)

$$\bar{y} = h/3 \Rightarrow \bar{y} = \frac{7.925}{3}$$

$$\boxed{\bar{y} = 2.641\ m}$$

3) Half of Depth

pressure at half depth

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

$$P' = 9.81 \times \frac{7.925}{2} \Rightarrow 9.81 \times 3.9625$$

$$P' = 38.87\ m^2$$

Centroid

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

$$\bar{y}' = \frac{7.925}{2} \times \frac{1}{3}$$

$$\bar{y}' = 3.9625 \times 0.333$$

$$\boxed{\bar{y}' = 1.3208\,m}$$

The End