Question # 1

Define viscosity ? Derive newtow equation of viscosity

Viscosity :-

viscosity is a measure of fluid resistance to flow - It describes the internal frication of a moving fluid - A fluid with large viscosity resists motion because its molecular makeup gives it a lot of internal friction.

Example

Syrup has a higher viscosity then water

Newton Equation of viscosity

$$F \propto \frac{Au}{Y}$$

$$F = \mu \frac{Au}{Y}$$

F/A = Shear stress

$$\frac{F}{A} = \frac{\mu u}{Y}$$

$$\tau = \frac{\mu u}{y}$$

For Dry

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

This is called Newton Equation of viscosity.

Part = B

Density: The Density is the mass per unit volume - The symbol most of them used for density is ρ

Mathematically

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

Specific weight

The specifi weight know as the unit weight, is the weight per unit volume of material fluid

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

It is unit is N/m3

Relationship b/w Density And specific weight.

As we know that

$$\gamma = \frac{w}{\gamma}$$

where

$$w = mg$$

Now

$$\gamma = \frac{mg}{V}$$

Then $$\rho = \frac{m}{V}$$

Where ρ is density so

$$Y = \rho g \quad \text{or} \quad \rho = \gamma / g$$

Specific volume:

Specific volume is defined as the number of cubic meters occupied by one kilograms of matter - It is the ratio of a material volume to its mass, whic is reciprocal of its density simply inversl proportional to density.

Formula:

$$V = 1/\rho$$

ρ = density

Unit:

m^3/kg

(c) Specific volume of gas is $0.72\ m^3/kg$. What is specific weight in N/m^3?

Solution

Given that

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

we have to find

Specific weight, $\gamma = ?$

As $V = 1/\rho$

$$\rho = 1/v$$

$$\rho = 1/0.72$$

$$\rho = 1.38 \text{ kg/m}^3$$

Now

$$\gamma = \rho g$$

$$\gamma = 1.38 \times 9.81$$

$$\gamma = 13.541 \text{ N/m}^3$$

So The specific weight is $= 13.541 \text{ N/m}^3$

Question #2

=> Define Pressure? what is an absolute and guage pressure.

A **Pressure:**

The amount of forces exerted (thrust) on a surface per unit area is defined a "Pressure" It can also be defined as the ratio of the force to the area over which the force is acting.

Formula :-

$$P = \frac{\text{Thrust}}{\text{Area}}$$

SI unit :

Pascal (Pa)

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

Dimension :

$M L^{-1} T^{-2}$

Types :

1. Atmospheric Pressure
2. Absolute "
3. Differential "
4. Guage "

Absolute Pressure :-

Absolute Pressure is a pressure that is related or relative to the zero pressure in the empty, air free space of the universe. This reference pressure is the ideal or absolute vaccum. It is noted with subscript "abs" P_{abs}.

Guage Pressure :-

The guage pressure is defined as the difference b/w an absolute pressure (P_{abs}) and the prevaling atmospheric (P_{amb}). It is denoted with sub-cript "e" P_e and is calculated

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

Part B

Given :

$l = 1500mm = 1.5m$

$B = 1500mm = 1.5m$

$h = 798m = 7.982$

unit weight $= 9.81 kN/m^3$

Required :

① Net pressure = ?

② location of force = ?

③ If water level drops half of Depth, find p and location of force

Solution :

(a) Net pressure

$P = \gamma h$

$P = 9.81 \times 7.982$

$P = 7830$

(b) ~~Pressure at~~

$\bar{y} = h/3$

$\bar{y} = \frac{7.982}{3}$

$\bar{y} = 2.6606$

(c) Pressure at half depth

$P' = \gamma h/2$

$P = 9.81 \times \frac{7.982}{2}$

$P' = 39.15$

Centroid,

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

$\bar{y} = 1/3 \times \frac{7.982}{2}$

$\bar{y} = 1/3 \times 4.11$

$\bar{y} = 1.99$ m Ans -

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