b. Define density, specific weight and specific volume show relation between Density and specific weight:

Ans: **DENSITY:**

Definition:

Density of a fluid is derived as:

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

OR:

"Mass per unit volume":

Mathematical Form:

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

Where

ρ = Rho = density
m = mass
V = volume

Specific Weight: **Definition:** Specific weight of a fluid is defined as; The ratio of the weight of a fluid to the volume of the fluid "or":
"Weight of a fluid per unit volume.

Mathematical form:

$$W = mg/v = pg = N/m^3$$

Where W = Specific Weight
mg = Weight of the fluid
V = volume.

Specific Volume:

Specific design is defined as;

"The ratio of the volume of a fluid to the of the fluid."

OR:

"Volume per unit mass of a fluid."

Mathematical form:

$$\text{Specific volume} = v/m = 1/\rho$$

Relation Between Density And Specific Weight:

As we know that,

$$W = w/v$$

and that, $w = mg$

So, $W = mg/v = W = pg$ $\quad \because \rho = m/v \Rightarrow \rho = \text{density}$

⇨ Subject= Fluid mechanics

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Depth, h = 794mm = 7.940 (9)

Unit weight of water = 9.81 KN/m³

Required Data:

→ a... net pressure, P = P

→ b... location of force

→ C... If water level drops half of depth find P and location of force.

Solution:

a. Net Pressure:

$$P = rh$$

$$P = 9.81 \times 7.940$$

$$P = 77.8914 KN/m^2$$

b. Force application (centriod)

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

$$\bar{y} = \frac{7.940}{3}$$

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

c. Half Depth.

Pressure at half depth, $P_1 = rh/2$

$P_1 = 9.81 \times 7.940/2$

Question No: 1:

(a) Define Viscosity? Derive Newton equation of Viscosity?

Viscosity:

Definition:

It is the property of a fluid which resists relative motion of its adjacent layers. It is due to cohesion and molecular mornen tum exchanged between fluid layers.

Unit:

The unit of viscosity is Poise

Example: syrup has a greator viscosity that water.

lower viscosity

water:

Question No.2:

Define Pressure? What is absolute and guage Pressure

Pressure:

Definition: Pressure is defined as;

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

Unit:

The SI unit of Pressure is Pascal (Pa).

Guage Pressure:

Definition:

Guage pressure is the pressure relative to atmospheric pressure. Guage pressure is positive for pressure above atmospheric pressure and negative for pressures below it.

Mathematically: Total pressure or absulute pressure is thus the sum of guage pressure and atmospheric pressure.

(b) A water tank having dimensions of 1500mm x 1500mm. Depth of water tank is equal to your school ID number in mm. What is the net pressure on the wall of water tank? Find the location of force application?

If the water tank level drops to the half of the depth, what will be force and point of application of force.

Given Data:

Length, l = 1500mm = 1.5m

Breadth, b = 1500mm = 1.5m

$P_{abs} = P_g = P_{atm}$ 1.

Where

P_{abs} = Absolute pressure
P_g = Guage pressure
P_{atm} = Atmospheric pressure

Absolute Pressure:

Definition:

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

Mathematically.

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

- P_{abs} → Absolute Pressure
- P_g → Guage Pressure
- P_{atm} → atmospheric Pressure

Example:

for example,

If your tire guage reads 39 psi (pounds 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).

$P = 38.94\ kN/m^2$ 10.

Centroid,

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

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

Newton Equation Of Viscosity.

Statement:

It states that,

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

Mathematical Representation:

$\tau \propto du/dy$

$\tau \rightarrow$ 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:

Newtation fluid :

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

5.

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

Given Data:

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

Required Data:

Specific Weight, $W = ?$

Solution:

As,

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

$$\rho = 1/V$$

$$\rho = 1/0.72$$

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

As,

$$W = \rho g$$

$$g = 9.81\ m/s^2$$

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

$$W = 13.54\ N/m^3$$