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Section B

exam mid term

Assignment Fluid mechanics 1

Q No 1

Viscosity

is the property of fluid which opposes the relative motion b/w the two surface of the fluid. Different fluid have different viscosity depend upon the intermolecular force in fluid.

Co-efficient of viscosity

The numerical value of the resistance to the flow of a fluid is called the co-efficient of viscosity of the fluid denoted by η. Physically the co-efficient of viscosity can also be defined as. The tangential force per unit area required to maintain a unit relative velocity between the two layers of a fluid which

are a unit meter apart is called the co-efficient of viscosity. The tangential force F is directly proportional to the area A, velocity v of the fluid and inversely proportional to the distance x from the bottom solid surface.

Mathematically

$$F \propto \frac{Av}{x}$$

$$F = \eta \frac{Av}{x} \rightarrow (1)$$

$$\eta = \frac{Fx}{Av} \longrightarrow (2)$$

$$\eta = \frac{Fx}{A \times x/t} = \frac{Fxt}{Ax} = \frac{Ft}{A} \rightarrow (3)$$

~~Q2~~

~~Density~~

Density

The mass per unit volume of a material is called density.

Mathematically

$$\rho = m/v$$

Where ρ = density
m = mass
v = volume.

Specific weight.

The product of density "ρ" of material and standard gravity "g" is called specific weight

Mathematically

$$\gamma = \rho g$$

Where
γ = specific weight
ρ = density
g = acceleration due to gravity

Specific Volume

The volume occupied by one kilogram of a material is called specific volume.

Mathematically

Where = v = specific volume.

V = volume

m = mass of material

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

Relation B/w density and specific weight

$\gamma = \rho \times g$

γ ↙ specific weight

ρ → density

Q# 1 Part (C)

Given Data

Specific volume of gas =

$v = 0.72 m^3/kg$

Required Data

Specific weight in

$N/m^2 = ?$

Solution

As we know that

$v = 1/\rho$

So density 'ρ' $= 1/v$

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

$$\boxed{\rho = 1.389 kg/m^3}$$

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

$w = 1.389 \times 9.8$

$$\boxed{w = 13.62 N/m^3}$$

Q2 part (A)

Pressure

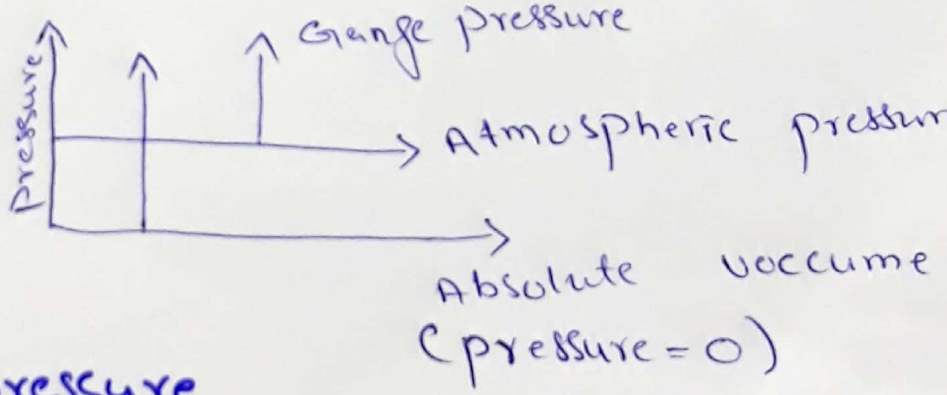
The force per unit volume is called pressure.

Mathematically

$$P = F/A$$

Absolute pressure

The pressure measured ~~force~~ from absolute vaccume is called absolute pressure.



Gauge pressure

If the pressure is measured using gauge then it is called gauge pressure.

* The value of gauge pressure is always greater than atmospheric pressure.

Q2 part (B)

Given Data

lenght = L = 1500 mm = 1.5 m

Breadth = B = 1500 mm = 1.5 m

Depth = h = 7962 = 7.962 m

~~Requriede~~

Require Data

(A) Net pressure = P = ?

(B) location of force.

If H_2O level drops half of Depth

Find P and location of force.

Solution

Net Pressure

$$P = \gamma h$$

$$P = 9.81 \times 7.962$$

$$\boxed{P = 78.10 \text{ kn/m}^2}$$

(B) Force Application

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

$$\bar{y} = \frac{7.962}{3}$$

$$\bar{y} = 2.654 m$$

Half Depth

Pressure at half depth $2p'$

$$p' = rh/2$$

$$p' = 9.81 \times \frac{7.962}{2}$$

$$p' = 38.05 \ kn/m^2$$

Centroid

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

$$\bar{y} = 1.327$$