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seaction B

Assignment Fluid Mechanics

Question No 1:

(a) Viscosity:

Viscosity is the property of fluid which opposses the velative motion b/w the two surface of the fluid. Different fluid have different viscocity depends upon the intermolecular force in fluid.

Example:

Honey has great viscosity then Heo

Newton equation of viscosity:

It is state that

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

Mathmatically:

$$\tau \propto \frac{du}{dy}$$

$\tau \rightarrow$ shear stress

$$\tau \propto \frac{deg}{dy}$$

Change the sign of proportionality

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

μ = viscosity (Dynamic viscosity)

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

~~μ = viscosity (Dynamic~~

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

Part B

Density :-

It is property of fluid it may be define as "mass per unit volume of a fluid" is called density

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

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

Specific weight :-

"specific weight is the weight possessed by unit volume of a fluid" Denoted by "w"

$$w = \frac{\text{weight}}{\text{volume}}, \quad \boxed{w = \frac{N}{m^3}}$$

Relation B/w density & specific weight

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

We know that $W = mg$

$$w = \rho g \quad \because \rho = \frac{m}{V}$$

ρ = density

Specific volume:

Property of fluid

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

⇒ It is the reciprocal of density

Specific volume = $v = V/m$.

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

$$\boxed{v = 1/\rho}$$

Part 'c'

Q:

Given Data:

Specific volume of gas = v = 0.72 m³/kg.

Required Data:

Specific weight in N/m³ = ?

Sol:

As we know that

$v = 1/\rho$

So density 'ρ' $= 1/v$

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

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

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

$w = 1.389 \times 9.8$.

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

Q No 2 :-

a) Pressure :-

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

SI base unit $1 N/m^2 = 1 kg/m^2$

SI unit Pascal

Formula :- $P = F/A$

Absolute pressure :-

Absolute pressure that is relative to the zero pressure in the empty air-free space to the universe. This refrence pressure is the Ideal or absolute vacum it is denoted with the subscripts "abs" Pabs

Gruage pressure :-

The guage Pressure is defined as the difference b/w an absolute Pressure and the prevaining atmospheric Pressure

It is denoted with subscript 'e', Pe and is calculated as follow

Mathematically:

$P_e = P_{abs} - P_{atm}$.

2 B:

Given Data:

length, $L = 1500mm = 1.5m$

Breadth, $b = 1500mm = 1.5m$

Depth $= h = 7938mm = 7.938m$

Unit weight of $H_2O = 9.81 kN/m^3$

Required Data:

Net pressure, P_e?

Location of force

If water level drops half of ~~Deep~~ depth Find P & location of force.

a Sol:

Net pressure:

$$P = \gamma h$$
$$= 9.81 \times 7.938$$
$$\boxed{P = 77.871 \text{ kN/m}^2}$$

(b) Force Application (centroid)

$$\bar{y} = h/3$$
$$\bar{y} = \frac{7.938}{3}$$
$$\boxed{\bar{y} = 2.646 \text{ m}}$$

(c) Half Depth:

Pressure at half depth,

$$P' = \gamma h/2$$
$$P' = 9.81 \times \frac{7.938}{2} =$$
$$\boxed{P' = 38.935 \text{ kN/m}^2}$$

Centroid:

$$\bar{y} = \frac{h}{2} \times 1/3$$
$$\boxed{\bar{y} = 1.323 \text{ m}}$$