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SECTION A.

SUBJECT PAPER FLUID MECH.

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ANSWER TO QUESTION NO 1 :- PART A

Ans: Viscosity :- Viscosity is the property of fluid which opposes the relative motion b/w the two surface of the fluid. Differend fluid have different viscosity depends upon the intermolecular forces in fluid. for example: Honey has great viscosity than water.

NEWTON EQUATION OF VISCOSITY :-

This equation states that shear stress in a fluid is directly proportional to shear strain.

→ The unit of viscosity is poise.

MATHEMATICALLY :- $\tau \propto \frac{du}{dy}$

$\tau \to$ shear stress

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

change the sign

$\tau = u \frac{dy}{dy}$

$\mu =$ viscosity (dynamic viscosity)

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

→ Newton law of viscosity also caled Newton fluids.

PART B :-

DENSITY :- Define as " Mass per unit volume" known as density

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Denoted as

$$\rho = m/V$$

unit = Kg/m^3

⇒ **Specific weight** :- Also known as unit weight Is the weight per unit volume of material. Specific weight of water on earth at 4°C while is $9.807\ KN/m^3$ or $62.43\ lbf/ft^3$.

Also used for relative density

Denoted by w

$$w = \frac{\text{weight}}{\text{Volume}}, \quad N/m^3$$

⇒ **Relationship b/w Density & Specific weight** :-

Density is simply mass per unit volume of a body where Specific weight per unit volume of a body.

e.g: A body will have same density in space but will have different specific weight.

$W = w/v$

we know that $w = mg$.

$w = mg/v$

As we know that

$w = \rho g$

$\rho = \frac{m}{V}$ ∴ ρ is known as density.

⇒ <u>SPECIFIC VOLUME</u> :- Reciprocal of density

Stated as → Volume of a fluid occupied per unit mass.

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

$V = m^3$

$m = kg$

$v = m^3/kg$.

$(v = \frac{1}{\rho})$.

X————X————Y————X.

PART C

Given data

$V = 0.72 \ m^3/kg$

Required data

Specific weight in $N/m^3 = ?$

Solution: As we know that

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

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

Putt the given the data.

$\rho = \frac{1}{0.72} = 1.389 \ kg/m^3$

As we known that

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

1.389×9.8

$13.62 \ N/m^2$ Ans

ANSWER TO QUESTION NO 2 :-

PART A PRESSURE :-

Pressure means force per unit area enterted by a fluid on the surface of the container

$$P = F/A$$

where F = Force (in newton)
A = Area (meter).

→ The force applied perpendicular to the surface aften objed per unit area over which that force is distributed.

→ There are two types of Pressure :-

* Static pressure.
* Dynamic pressure.

→ UNIT :- pascal (pa)

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

⇒ GUAGE PRESSURE :- (i) Guage pressure is the relative of atomospheric pressure.

(ii) Guage pressure is zero refrenced against ambient air pressure. So it is equal to absolute pressure minus atmospheric presure negative sign are usully omitted.

(iii) Guage pressure is positive far above atmoshseric pressure but negative in below atomsheric pressure.

→ Total pressure or absolute pressure is the sum of guage pressure & atmospheric pressure.

$$P_{ab} = P_g + P_{abn}$$

where

P_{abs} = Absolute pressure.

P_g = Gauge pressure

P_{abn} = Atmospheric pressure.

ABSOLUTE PRESSURE :-

Total pressure at a point in a fluid equalling the sum of guage pressure & the atmospheric pressure.

→ Absoluto pressure is zero refrenced against a perfect vaccum.

MATHMATICALLY :-

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

P_{abs} → absolute pressure

P_g → Guage pressure.

P_{atm} → atmospheric pressure

Example: if your tire guage reads 39psi (P7)

Then the absolute pressure is 39psi plus 14.7psi or 53.7 psi equivalent to 337kPa.

x———x———x

ANSWER TO QUESTION NO 2:

PART B:-

Given:

Length = 1500mm = 1.5 m

Bredth = 1500mm = 1.5 m

height or depth = 7907 mm = 7.907 m

Density of water = 1000 kg/m³

SOLUTION:- As we know that

$P = \rho g h$.

$\rho g = \gamma$.

$P = \gamma h$

⇒ $P = 9.81 \times 7.907$

$P = 77.567$ KPa.

→ Per unit width:-

$$P_1' = \frac{P}{\text{width}}$$

$$P_1 = \frac{77.567}{1.5}$$

$= 51.711$ kN/m.

LOCATION OF FORCE :-

$y' = h/3$

$y' = \frac{7.907}{3}$

$y' = 2.655$

RESULTANT FORCE :-

Resultand Force $= \frac{1}{2} bh$

$= \frac{1}{2}(52.110)(7.906)$

Resultand Force $= 206.016$ KN

→ Water Level half at half Height :-

$h = \frac{7.907}{2} = 3.963$

DET PRESSURE :-

$P = \gamma \frac{h}{2}$

$= 9.81 \times \frac{7.907}{2}$

$P = 9.81 \times 3.963$

$P = 38.778$ kPa.

PRESSURE P/UNIT WEIGHT:-

$P = P / \text{width}$

$P = \frac{38.778}{1.5}$

$P = 25.825 \text{ KN/m}$

RESULTANT FORCE:

$R.F = \frac{1}{2} bh$

$= \frac{1}{2}(38.778)(3.953)$

$= 76.6447 \text{ KN}$

RESULTANT:-

$P_1 = 76.6447 \text{ KPa}$ $\quad$ $P_2 = 38.778 \text{ KPa}$

$P_1' = 51.70 \text{ KN/m}$ $\quad$ $P_2' = 25.825 \text{ KN/m}$

$y' = 2.635 \text{m}$

$R.R = 205.99 \text{kN}$ $\quad$ $y' = 1.992$.

Location Force:

$y' = \frac{3.956}{2} = 1.976$

x ——— ✓.