MID TERM EXAM

NAME SABA-UL-HASSAN

ID 7932

SECTION B

DEPT BE (C)

SUBJECT FLUID MECHANICS

SEMESTER 4

SUBMITTED TO Engr. Abdul Waheed.

DATE 18-April-2020

QUESTION # (0 1)

(a)

Define Viscosity ? Derive newton equation of Viscosity.

VISCOSITY :~

It is the property of fluid which resist the motion between the two surfaces of the fluid.

OR

Viscosity is the physical property that characterizes the flow of simple fluid.

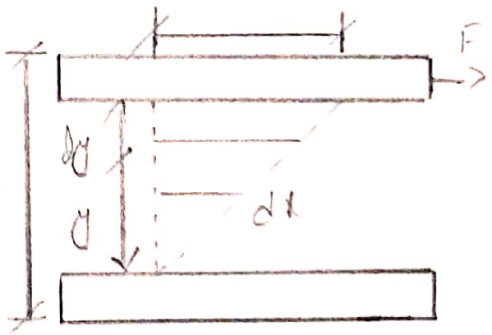
NEWTON EQUATION OF VISCOSITY :~

Consider two parallel plates placed at a distance Y and space between them is filled with fluid. The lower surface is assumed to be stationary while the upper move with velocity 'V' Then ;

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

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

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



where $\frac{F}{A} = \tau$ so

$$\tau = \frac{\mu A}{Y}$$

For dy the velocity will be du so then

$$\tau = \mu \frac{du}{dy} \quad -(i)$$

where μ is proportionality factor and called viscosity of fluid, and $\frac{du}{dy}$ is velocity gradient.

The above equation (i) is called as Newton equation of velocity.

(b)

Define density, specific weight and Specific Volumes. Show relation between Density and Specific Weight.?

DENSITY :-

"Density of fluid is its mass per unit volume of fluid."

The formula of density is $\rho = \frac{m}{V}$ and unit is Kg/m^3

It is denoted by 'ρ'

SPECIFIC WEIGHT :-

"Specific weight is the weight per unit volume of the fluid."

It is denoted by 'γ'. It's formula is $\gamma = w/V$.

The unit of specific weight is N/m^3

SPECIFIC VOLUME :-

"Specific volume is the volume occupied by unit mass of fluid"

It is denoted by v. It's formula is $v = \frac{V}{m}$ or $v = \frac{1}{\rho}$

The unit of specific volume is m^3/kg

RELATION BETWEEN DENSITY AND SPECIFIC WEIGHT :-

Specific weight $= \gamma = \frac{w}{V}$

where $w = mg$ so

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

As $\frac{m}{V} = \rho$ put in above equation

$$\gamma = \rho g \text{ or } \rho = \frac{\gamma}{g}$$

(C)

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

GIVEN THAT :-

$$\text{Specific Volume} = V = 0.72\ m^3/kg$$

SOLUTION :-

As we know that

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

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

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

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

So

$$\rho = \frac{\gamma}{g}$$

$$\gamma = \rho \times g$$

$$\gamma = 1.38 \times 9.8$$

$$\boxed{\gamma = 13.54\ N/m^3}$$

QUESTION # 02

(a)

Define Pressure. What is absolute and guage Pressure.

PRESSURE :~

"It is defined as normal force exerted by fluid on unit area".

$$P = \frac{F}{A} \text{ or}$$

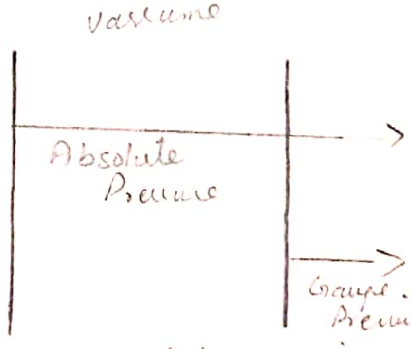
$$F = P \propto A$$

ABSOLUTE PRESSURE :~

"Absolute pressure is zero-refferenced against a perfect vacuum, so it is equal to gauge pressure plus atmospheric pressure."

GAUGE PRESSURE :~

"Gauge pressure is zero refferenced against ambient air pressure, so it is equal to absolute pressure mins atmospheric pressure"



(b)

A water tank having dimension ..... point of application of force?

GIVEN DATA :-

$l = 1500\ mm = 1.5\ m$

$b = 1500\ mm = 1.5\ m$

$h = 7932\ mm = 7.932$

weight of water $= 9.81\ KN/m^3$

Sol

a. NET PRESSURE :-

$$P = \gamma h$$

$$P = 9.81 \times 7.932$$

$$\boxed{P = 77.81292\ KN/m^3}$$

b. FORCE APPLICATION :-

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

$$\bar{y} = \frac{7.932}{3}$$

$$\boxed{\bar{y} = 2.644\ m}$$

C. HALF DEPTH :-

Pressure at half depth, $P' = \gamma h/2$

$$P' = 9.81 \times \frac{7.932}{2}$$

$$\boxed{P' = 38.94 \text{ KN/m}^3}$$

CENTROID,

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

$$\bar{y} = \frac{7.932}{2} \times \frac{1}{2}$$

$$\boxed{\bar{y} = 1.322 \text{ m}}$$