REVISION 2021

(3051)

FUNDAMENTALS OF FLUID MECHANICS

CO 01

Prepared by
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COURSE OUTCOMES - 1 :

Make use of various fluid properties and pressure measurement techniques.

QUESTION PAPER PATTERN

Total Marks: 75 **Time: 3 Hrs**

Part A (9 Marks)

- 1 mark x 9 Questions

Part B (24 Marks)

- 3 marks x 8 Questions

Part C (42 Marks)

- 7 marks x 6 Questions

A1. Define specific gravity.

- It is defined as the ratio of the Weight density (or density) of a fluid to the Weight density (or density) of a standard fluid.
- For liquids the standard fluid taken is water and for gases the standard liquid taken is air.
- The Specific gravity is also called relative density. It is a dimensionless quantity and it is denoted by s.

$$S = \frac{\rho \, of \ the \ fluid}{\rho \, of \ the \ std. fluid}$$

A2. Pressure below atmosphere is called ……

- Vacuum pressure

B1. Define the following
(a) Specific Gravity (b) Kinematic viscosity

(a) **Specific Gravity**

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(b) Kinematic viscosity

- Kinematic viscosity is defined as the ratio between dynamic viscosity and density of fluid. It is denoted by the Greek letter v (Neu).
- Mathematically, it is expressed as: $v = \mu / \rho$
- where v is the kinematic viscosity, μ is the dynamic viscosity, and ρ is the density. In S.I.units, the unit of kinematic viscosity is m^2 / sec.
- In CGS units, kinematic viscosity is expressed in cm^2/s or in stokes

B2. Determine (a) gauge pressure and (b) the absolute pressure of water at a depth of 9 m from the surface and the atmospheric pressure is $10N/m^2$..?

We know $P=\rho gh$

Pabsolute = Patm + Pgauge

Given as h=9m,

Taking, g=9.81m/s2 & Patm=10 N/m2

Therefore, we have (a) **Pgauge** $= \rho gh$

$=1000\times9.81\times9$

$=88290N/m2$ **Patm** $10N/m2$

Therefore, we can calculate the absolute pressure of water in the following way.

(b) **Pabsolute = Patm + Pgauge**

$= 88290+10$

$= \underline{88300N/m2}$

C1. Calculate the density, specific weight and weight of one liter of petrol of specific gravity = 0. 7 ..?

- Sol: given s=0.7

$$S = \frac{\rho \ of \ petrol}{\rho \ of \ water}$$

Density of petrol = s x = 0.7×1000 = **700 kg/m3**

Specific weight w = $\rho \ of \ petrol$ × g = 700×9.81= **6867 N/m3**

Weight (w) of petrol

Volume given = 1 liter = 0.001 m3

We know that,

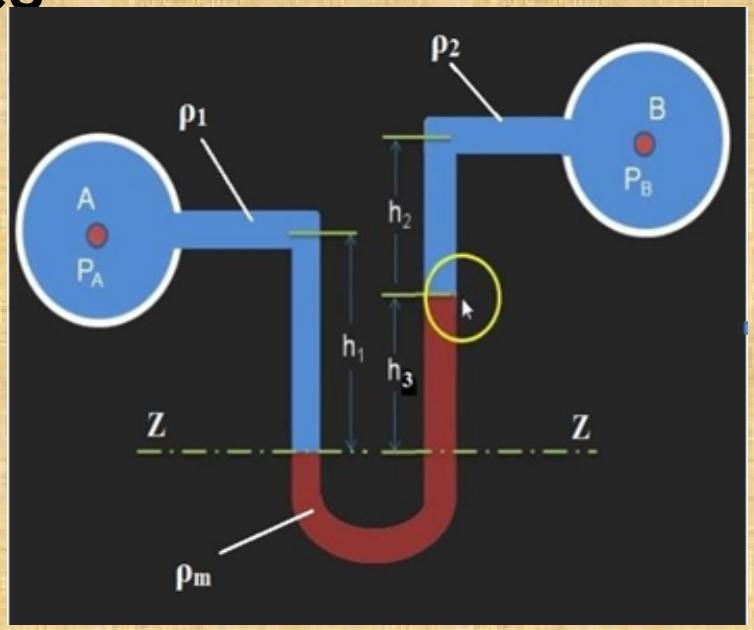
specific weight w = Weight of fluid (W) / volume of the fluid (V)

Weight of petrol (W) = Sp.weight (w) × volume of petrol (V)

= 6867 × 0.001

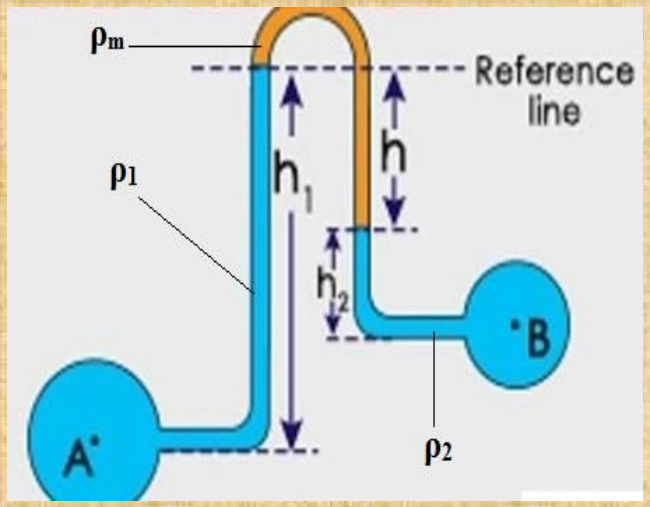
= 6.867 N

C2. What is the difference between U -Tube differential manometer and inverted U-Tube manometer. explain with the neat sketches



- **U tube Differential Manometer:-**
- Differential U-Tube manometer is used to measure the difference in pressure between two points in a pipe or in two different pipes carrying different liquids.
- Equating the pressures at ZZ in the both limbs,
- Pressure in left limb at Z-Z = Pressure in right limb at Z-Z

$$P_A + \rho_1 g h_1 = \rho_m g h_3 + \rho_2 g h_2 + P_B$$



Inverted U-Tube Manometer

- It is used to estimate the pressure difference between two points in the same pipe or in different pipe.
- The manometric fluid is lighter than the working fluid in pipe or pipes.
- Inverted U-tube manometers are employed for more accurate measurement of small pressure difference between two points.
- Equating the pressures at ZZ in the both limbs,
- Pressure in left limb below Z-Z = Pressure in right limb below Z-Z

$$PA - \rho 1.g.h1 = PB - \rho m .g.h - \rho 2.g.h2$$

Study well