LECTURE 2- PROPERTIES OF FLUIDS

FREQUENTLY ASKED QUESTIONS

1. What are the differences between a liquid and a gas

Liquids	Gases
The molecules of a liquids are much less further apart than those of a gas	The molecules of a gas are much further apart than those of a liquid.
A liquid is relatively incompressible, and if all the pressure, except that of its own vapourpressure, is removed, the cohesion between molecules hold them together, so that the liquid does not expand indefinitely	A gas is very compressible, and when all external pressure is removed, it tends to expand indefinitely
The volume of a liquid isnot greatly affected by changes in pressure or temperature or both.	The volume of a gas or vapouris greatly affected by changes in pressure or temperature or both.
They have definite mass and volume but no definite shape.	They have definite mass, but no volume and no definite shape

2. Define the terms specific density, specific weight and specific gravity

Density (ρ): It is defined as mass per unit volume.

$$Density, \rho = \frac{mass}{volume} = \frac{m}{V} = \frac{kg}{m^3} - - - - - -$$

Specific weight (γ): It is defined as weight per unit volume.

$$\text{Specific weight}, \gamma = \frac{weight}{volume} = \frac{N}{m^3}. - (2.2)$$

$$\rho = \frac{\gamma}{g}(or)\gamma = \rho g$$

Specific gravity (SG): Specific gravity of a given fluid is defined as the specific weight of the fluid divided by the specific weight of water.

$$SG_{oil} = \gamma_{oil} / \gamma_{water}$$

$$SG_{oil} = \frac{\rho\ oil}{\rho\ water\ at\ standard\ temperature} - - - - - - - - - - - - - - - - (2.4)$$

Specific gravity of a liquid is the dimensionless ratio

3. Differentiate between absolute and gauge pressure

Atmospheric Pressure is the force per unit area exerted against a surface by the weight of air above that surface in the Earth's atmosphere.

Gauge Pressure and Absolute Pressure: Gauge pressures are measured relative to the atmosphere, whereas absolute pressures are measured relative to perfect vacuum such as that existing in outer space.

4. What is meant by bulk modulus?. Give its typical value for liquid and gas.

Bulk modulus is a measure of the compressibility of a liquid and will be required when it is desired to calculate oil volume changes for high pressure, large system volumes such as forging pressures or natural frequencies generally caused by the interaction of fluid compressibility and moving mass.For liquids it is 1.72 x106 kPa. The volume modulus of mild steel is about 170000 MPa. Taking a typical value for the volume modulus of cold water to be 2200 MPa we see that water is about 80 times as compressible as steel. Thecompressibility of liquids covers a wide range. Mercury, for example, is approximately8% as compressible as water, while the compressibility of nitric acid isnearly six times greater than that of water.

5. Differentiate between viscosity and viscosity index

The viscosity of a fluid is a measure of its resistance to shear or angular deformation.Viscosity index is a relative measure of an oils viscosity change with respect to temperature change. Oil having a low VI is one that exhibits a large change in viscosity with temperature change. High VI oil does not change appreciably with temperature change.