HYDRAULICS AND FLUID MECHANICS

Introduction

The word 'Hydraulics' has been derived from Greek word ' Hudour ' which means water. The subject 'Hydraulics' is the branch of Engineering-science which deals with water at rest or in motion . The subject ' Fluid mechanics ' is the branch of Engineering-science which deals with the behaviour of fluids under certain conditions of rest or in motion .

Important term Used in Hydraulics and fluid mechanics.

The following are important terms used in Hydraulics and fluid mechanics.

1. ***Density or mass density*** *:* It is defined as the mass per unit volume of a liquid at a standard Temperature and pressure . It is usually denoted by **p**(*rho*) . It is expressed in kg/m^3 / Mathematically density or mass density ,

$$\mathbf{p} = m/v$$

where *m = mass density*
V = volume of the liquid .

2. ***Weight density or Specific Weight*** : It is defined as the weight per unit volume of the liquid at a standard Temperature and Pressure . It is usually denoted by *w* . It is expressed as kN/m^3 or N/m^3 or N/mm^3 .
Methematically ,weight density or specific weight.

$$W = p \cdot g$$

where
p = *Mass density or density*
g = gravity

Note: For water , $w = 9.81kN/m^3 = 9.81 \times 10^3 N/m^3 = 9.81 \times 10^{-6} N/mm^3$

3. ***Specific Volume*** : It is defined as the volume per unit mass of the liquid . It is denoted as *v . Mathematically,Specific volume ,*

$$v = V/m = 1/p .$$

4. ***Specific Gravity*** : It is defined as the ratio of specific weight of a liquid to the specific weight of pure water at a standard Temperature (4^0C) . it has no units.

Note : The Specific gravity of pure water is taken as unity.

Properties of Liquid :

1. ***Viscosity*** : It is also known as * *absolute Viscosity or dynamic Viscosity .* It is defined s the property of liquid which offers resistence to the movement of one layer of liquid to another adjacent layer of the liquid . The viscosity of a lliqud is due to cohesion and interaction between particles
2. ***Kinematic viscosity .*** It is defined as the ratio of dynamic viscosity to the density of the liquid .

3. ***Compressibility .*** It is that property of liquid by virtue of which liquid undergo a change in volume with the change of pressure . The compressibility is the reciprocal of bulk modulus of elastisity , which is defined as the rartio of compressive stress to volumetric stress.

4. ***Surface Tension .*** It is that property of a liquid which enables it to resist tensile stress .It denoted by (sigma) . It is expressed in N/m .