TYPES OF FLOW

1. Steady and Unsteady flows:

The **steady flow** is defined as that type of flow in which the fluid characteristics like velocity, density, pressure, etc at a point do not change with the time.

The **Unsteady flow** is defined as that type of flow in which the fluid characteristics like velocity, density, pressure, etc at a point change respected to time.

2.Uniform and Non-uniform fluid flow:

This **uniform fluid** flow is defined as the type of flow in which the velocity at any given time does not change with respect to space (i.e length of direction of the flow).

This **non-uniform fluid flow** is defined as the type of flow in which the velocity at any given time changes with respect to space (i.e length of the direction of the flow).

3. Laminar, and Turbulent fluid flow:

This **laminar fluid flow** is defined as the type of flow in which the fluid particles move along well-defined paths or streamline and all the streamlines are straight and parallel.

Thus the particles move in laminas or layers gliding smoothly over the adjacent layer. This type of fluid is also called as streamline flow or viscous flow.

Turbulent fluid flow is defined as the type of flow in which the fluid particles move in a zig-zag way, the eddies formation takes place which is responsible for high energy loss. For pipe flow, The type of flow is determined by a non-dimensional number $Rn=(\rho VL)/\mu$ called the Reynolds number.

Where,

- D = Diameter of pipe
- V = Mean velocity flow in a pipe
- ν = Kinematic viscosity of the fluid.
- If the Reynold Number is less than 2000, the flow is called Laminar flow.

- Reynold Number is more than 4000, the flow is called Turbulent flow.
- If the Reynold Number is lies between 2000-4000, the flow may be laminar or turbulent.

4. **compressible and Incompressible fluid flow:**

Compressible fluid flow is defined as the flow in which the density is not constant which means the density of the fluid changes from point to point.

Incompressible fluid flow is defined as the flow in which the density is constant which means the density of the fluid does not change from point to point.

5. **Rotational and irrotational Fluid flow:**

The rotational fluid flow is defined as the type of fluid flow in which the fluid particles while flowing along streamline and also rotate about there own axis.

Whereas, The Ir-rotational fluid flow is defined as the type of fluid flow in which the fluid particles while flowing along streamline and do not rotate about there own axis.

6. **One, Two and Three-dimensional fluid Flow:**

One dimensional flow is that type of flow in which the flow parameter such as velocity is a function of time and one space co-ordinate only, say x.

$$\mathbf{u=f(x),\ v=0\ and\ w=0}$$

Where u,v and w are velocity component in x,y and z directions respectively.

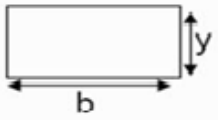
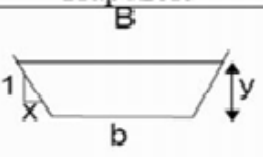
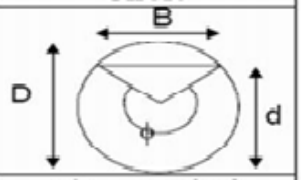
Two-dimensional fluid flow is the type of flow in which velocity is a function of time and two rectangular space co-ordinate say x,y.

$$\mathbf{u= f_1(x,y,),\ v= f_2(x,y,)\ and\ w= 0.}$$

Three-dimensional fluid flow is the type of flow in which velocity is a function of time and three mutually perpendicular directions. The function of 3 space coordinates (x,y,z).

$$\mathbf{u= f_1(x,y,z),\ v= f_2(x,y,z)\ and\ w= f_3(x,y,z).}$$

CHARACTERISTICS OF OPEN CHANNEL

	Rectangle	Trapezoid	Circle
			
Area, A	by	$(b+xy)y$	$\frac{1}{8}(\phi-\sin\phi)D^2$
Wetted perimeter P	$b+2y$	$b+2y\sqrt{1+x^2}$	$\frac{1}{2}\phi D$
Top width B	b	$b+2xy$	$(\sin\phi/2)D$
Hydraulic radius R	$by/(b+2y)$	$\frac{(b+xy)y}{b+2y\sqrt{1+x^2}}$	$\frac{1}{4}\left(1-\frac{\sin\phi}{\phi}\right)D$
Hydraulic mean depth D_m	y	$\frac{(b+xy)y}{b+2xy}$	$\frac{1}{8}\left(\frac{\phi-\sin\phi}{\sin(1/2\phi)}\right)D$

Depth(y)-the vertical distance from the lowest point of the channel section to the free surface.

Stage (z) - the vertical distance from the free surface to an arbitrary datum

Area (A) - the cross-sectional area of flow, normal to the direction of flow

Wetted perimeter (P) - the length of the wetted surface measured normal to the direction of flow.

Surface width (B) - width of the channel section at the free surface

Hydraulic radius (R) - the ratio of area to wetted perimeter (A/P)

Hydraulic mean depth (Dm) - the ratio of area to surface width (A/B)