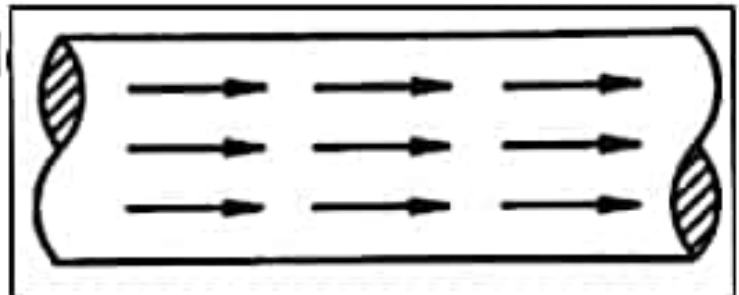


1. Laminar Flow:-

Laminar flow is defined as that type of flow in which the fluid particles move along well-defined paths or stream lines and all the stream lines are straight and parallel.

Factors responsible for laminar flow are:-

- High viscosity of fluid.
- Low velocity of flow.
- Less flow area.

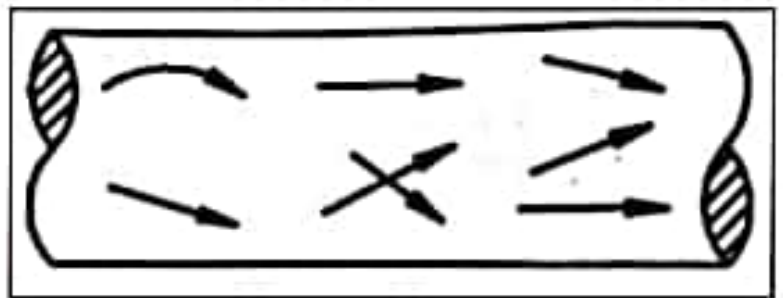


For example,

- Flow through pipe of uniform cross-section.

2. Turbulent Flow:-

Turbulent flow is defined as that type of flow in which the fluid particles move in a zigzag way. The fluid particles cross the paths of each other.



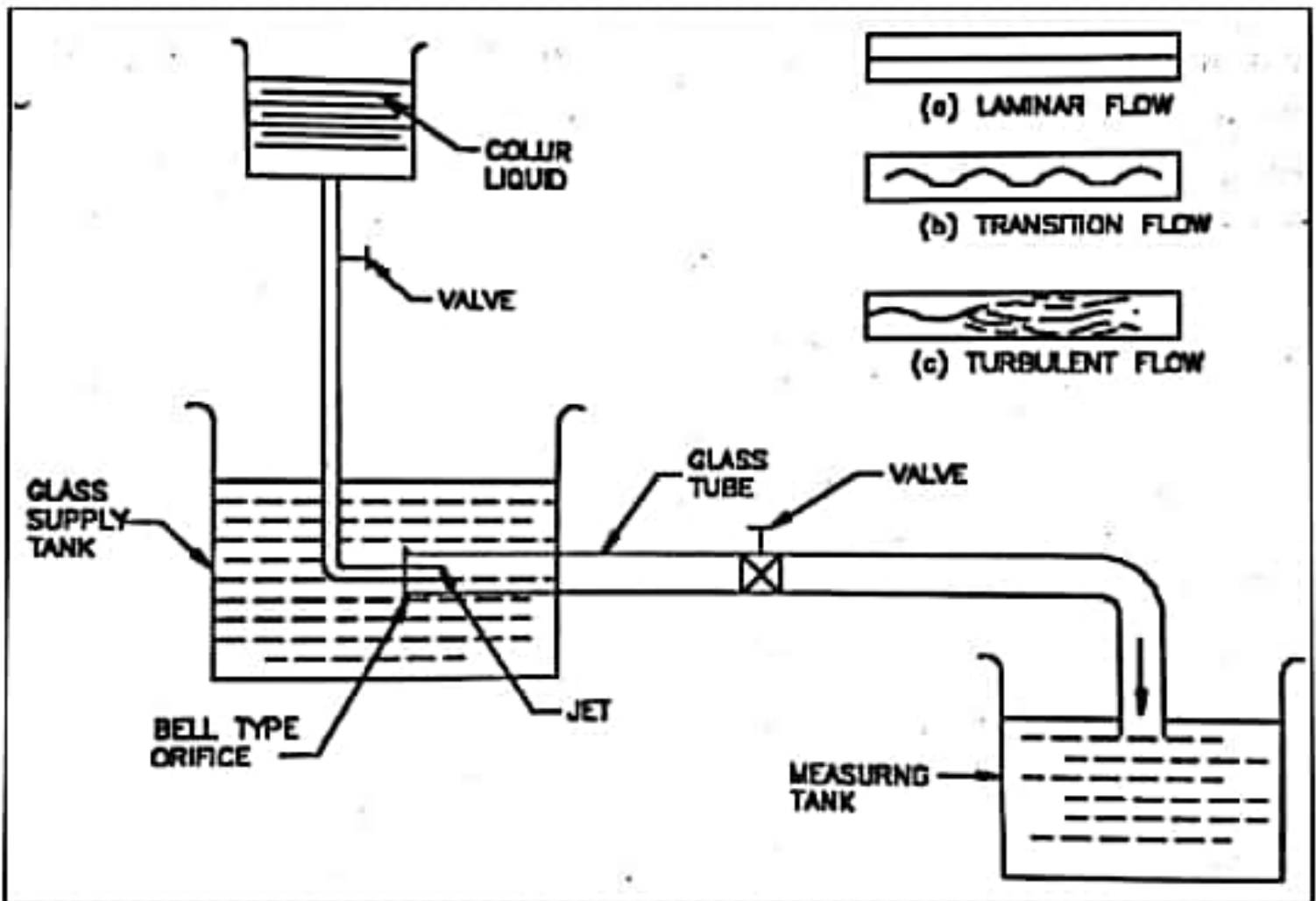
For example,

- Flow in river at the time of flood.
- Flow through pipe of different cross-section.

What is Reynolds Number ?

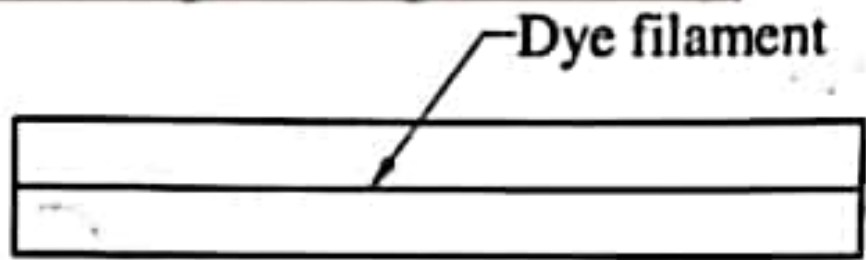
- The ratio of inertia force to viscous force is said to be the Reynolds number (R_N).

APPARATUS



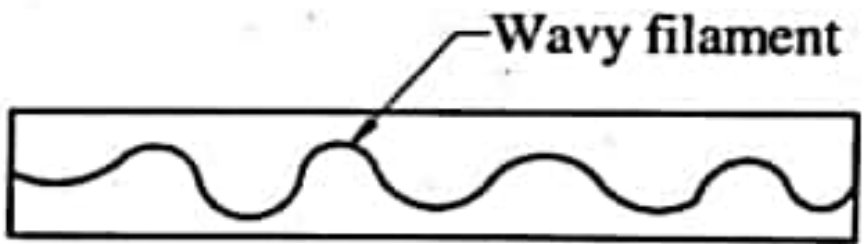
Observation by Reynolds

1. At low velocity, the dye will move in a line parallel to the tube and also it does not get dispersed.



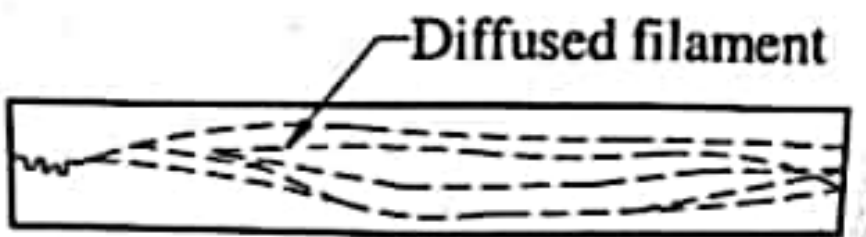
(a) Laminar flow

2. At velocity little more than before the dye moves in a wave form.



(b) Transition

3. At more velocity the dye will no longer move in a straight-



(C) Turbulent flow

FORMULAS

$$R_N = \frac{\text{Inertia Force}}{\text{Viscous Force}}$$

$$R_N = \frac{\rho \times V \times D}{\mu}$$

$$R_N = \frac{V \times D}{\nu}$$

Where

$$\nu = \frac{\mu}{\rho}$$

Where,

ρ = density of liquid (Kg/m³)

V = mean velocity of liquid
m/S

D = diameter of pipe (m)

μ = dynamic viscosity (N.S/m²)

ν = kinematic viscosity (m²/S)

➤ Reynold number is a dimensionless quantity.

Types Of Flows Based On Reynold

Number:-

- If Reynold number, $R_N < 2000$ the flow is **laminar flow**.
- If Reynold number, $R_N > 4000$ the flow is **turbulent flow**.

- If Reynold number i.e. $2000 < R_N < 4000$, we observe a flow in which we can see both laminar and turbulent flow to gather. This flow is called **Transition flow**.
- $R_N = 2300$ is usually accepted as the value at transition , R_N that exists anywhere in the transition region is called the **critical Reynolds number**.