

\* Stream function :- It is defined as the scalar function of space and time such that its partial derivative with respect to any direction gives the velocity component at right angle to that direction. It is denoted by  $\psi$ .

$$\frac{\partial \psi}{\partial x} = v, \quad \frac{\partial \psi}{\partial y} = -u.$$

$$\frac{\partial^2 \psi}{\partial x^2} + \frac{\partial^2 \psi}{\partial y^2} = 0$$

\* Equipotential line :- A line along which velocity potential function ( $\phi$ ) is constant.

$$\phi = \text{const.}$$

$$\therefore d\phi = 0$$

$$d\phi = \frac{\partial \phi}{\partial x} \cdot dx + \frac{\partial \phi}{\partial y} \cdot dy$$

$$= -u dx + v dy = 0$$

$$\Rightarrow v dy = -u dx$$

$$\boxed{\frac{dy}{dx} = -\frac{v}{u}}$$

$dy/dx$  is slope of equipotential line

\* Line of constant stream function :-

$$\psi = \text{const.}$$

$$\therefore d\psi = 0$$

$$d\psi = \frac{\partial \psi}{\partial x} dx + \frac{\partial \psi}{\partial y} dy$$