Impact of Jet

The liquid comes out from the O/t of Nozzle which Fitted to a Pipe through which liquid flowing under Pressure.
If some Plate which may be fixed or moving is placed in Path of jet a Force is Exerted by the jet on Plate.
this Force obtained from Newton's Second Law of motion or and Impuls momentum Eqn.
thus impact of jet means the Force Exerted by the jet on Plate which may be Stationary or moving.

change of momentom of jet
Exerted force on Plate.

Impuls momentum Eq^n

— find hydrodynamic force

✓ Bernaully Eq^n
✓ Conti nuty En^n
✓ Impuls momen^n Eq^n

based on
law conservation of momentum

"The net force acting on a fluid mass is equal to rate of change of momentum of flow per unit time in that direction"

from
Newton's II^nd Law

$$\Sigma F = \dot{m} a$$ mass of fluid

gravitational force
body force, Pressure force

ΣF = net force acting on fluid mass

$$a = \frac{dV}{dt}$$

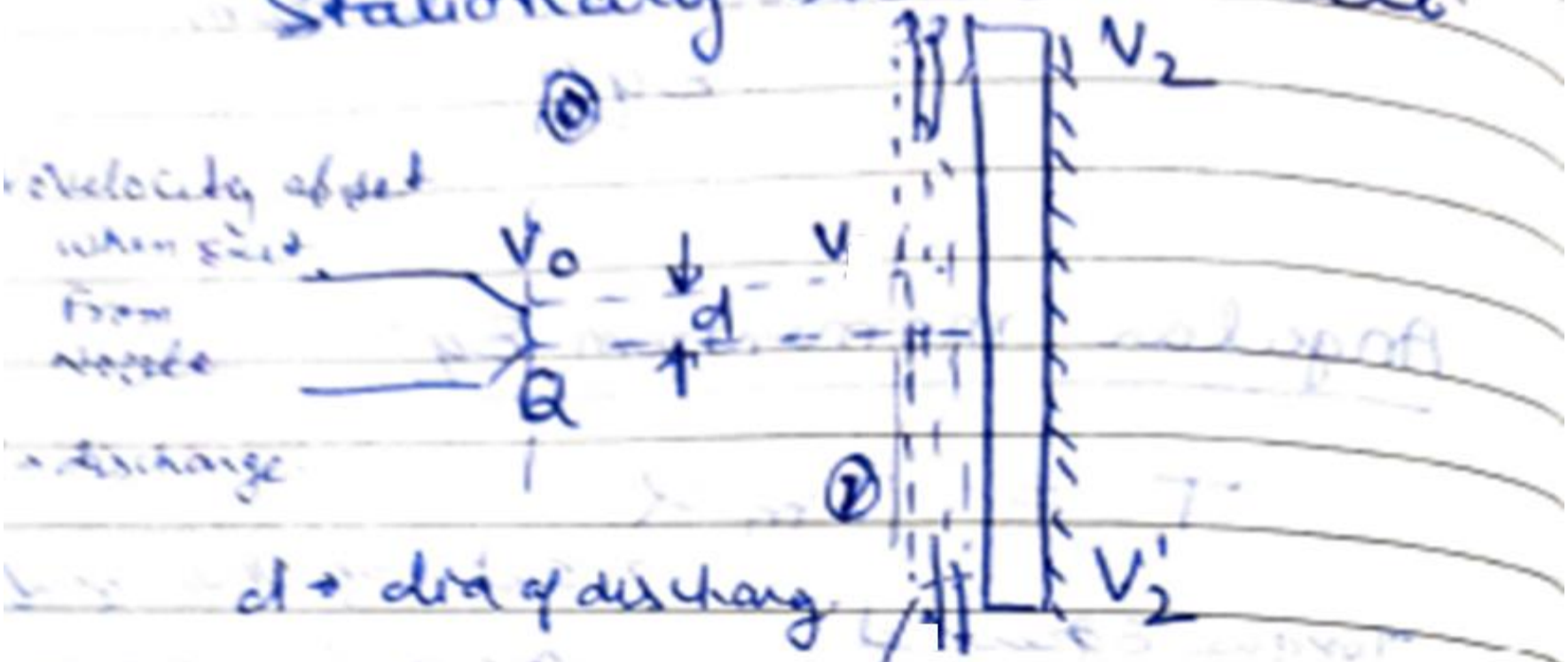
$$\Sigma F = m \frac{dV}{dt} \quad (m \text{ is constant})$$

$$\boxed{F = \frac{d\,Vm}{dt}}$$ momentum Principles

$$\boxed{F\,dt = d(Vm)}$$

impuls momentum Eqn

1→ Force Exerted by Jet on Stationary Vertical Flat Plate.



neglect Friction b/w Plate & water jet
(No Energy
loss)
Fluid rotate 90°

Newton's IInd Law

$$\Sigma F = ma$$

$$F_x = m a_x$$

$$F_x = \dot{m}\, dV$$

$$= \dot{m} (V_{2x} - V_{1x}) \quad *$$

Force on jet

$$m = \rho \times Q$$

$$= \rho \times A \times V_0 \rightarrow \text{Jet mitral velocity.}$$

$$m = \rho \times \frac{\pi}{4} d^2 \cdot V_0$$

* $V_2 x$ = Exit velocity in x direction in control volume

$V_1 x$ = Inlet " " "

f_x = force on jet

Impact direction / rate of change of moment

$F'_x = \dot{m}(V_{1x} - V_{2x})$ [Newtons third law of motion reaction]

$F'_x = \rho A V_0 [V - 0]$

↳ strike the plate $V_{2x} = 0$

$$F'_x = \rho A V_0 V$$

Force on Plate Exerted by jet.

Applying B.E b/w (1) & (2)

$$\frac{P_0}{\rho g} + \frac{V_0^2}{2g} + z_0 = \frac{P_1}{\rho g} + \frac{V_1^2}{2g} + z_1$$

$$V_0 = V$$

$$F'_x = \rho A V_0^2$$

When No 3 & 4 in H_2

$V_0 = V$