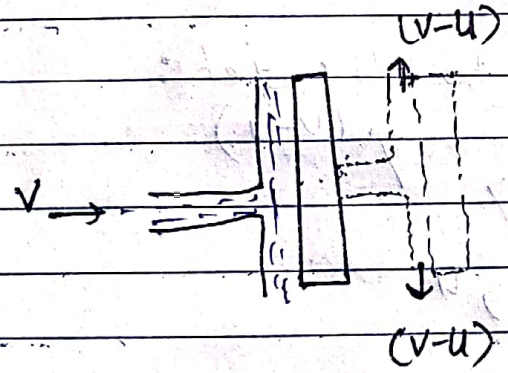
Section-2

1. Explain force exerted by a jet on moving normal plate? Explain force exerted by a jet on moving inclined? plate.

Expression for force exerted by fluid jet on moving plate: The notation used are same as used in case of fixed plate The one extra notation is of 'u' representing velocity of plate.

(1) When the plate is normal to jet:



Jet striking a flat vertical moving plate

1. Relative velocity of jet with respect to plate $(v-u)$

2. mass of water striking the plate/sec

$= \rho \times$ Area of jet $\times$ Relative velocity

$= \rho a(v-u)$

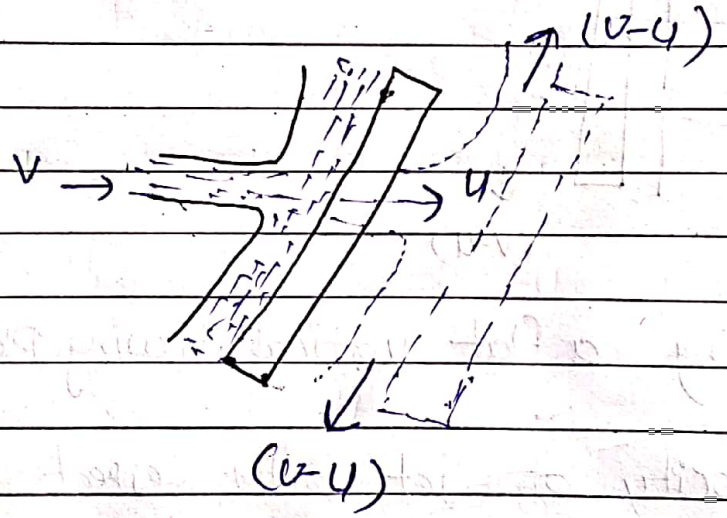
3. Force exerted by the jet on the moving plate in direction of the jet

F_x = mass of water striking per sec × change in velocity of jet

= $\frac{\text{mass}}{\text{Time}}$ × [Initial velocity which water striked − Final velocity]

$F_x = \rho a (V-u)[(V-u)-0] = \rho a (V-u)^2$

(ii) Flat Plate - Inclined to the jet:



i) mass of water striking the plate per sec

= ρ × Area of jet × Relative velocity

= $\rho a (V-u)$

2. Component of relative velocity of jet striking normal to the plate.

$= (V-u)\sin\theta$

3. Force exerted by the jet on normal direction of Plate:

F_n = mass of water striking /sec × [change in velocity normal to plate

= mass of water striking per sec × [initial velocity in normal direction with which jet strikes − final velocity].

$= \rho a (V-u)[(V-u)\sin\theta - 0]$

$F_n = \rho a (V-u)^2 \sin\theta$

4. Force exerted in x-direction by the jet

$F_x = F_n \sin\theta$

$= \rho a (V-u)^2 \sin\theta \times \sin\theta = \rho a (V-u)^2 \sin^2\theta$

$F_y = F_n \cos\theta$

$= \rho a (V-u)^2 \sin\theta \times \cos\theta$

$= \rho a (V-u)^2 \sin\theta \cos\theta$