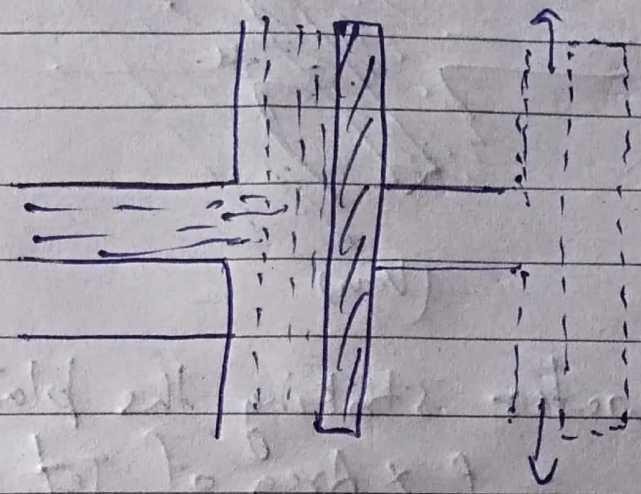
Section - 2

Q.1

Ans



When the plate is Normal to Jet.

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

$= \rho a (V - u)$ — (I)

(3) Force exerted by the jet on the moving Plate in the direction of the Jet

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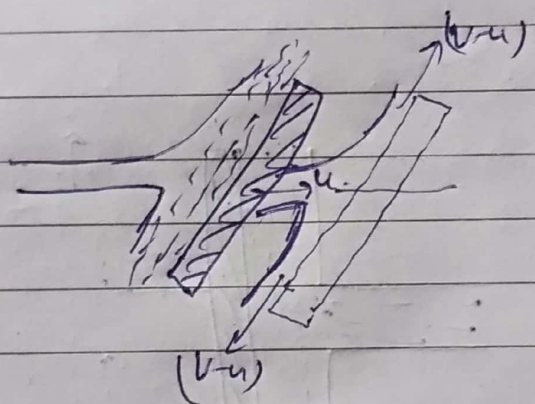
F_x = mass of water striking per sec
× [change in velocity of Jet]

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

= $\rho a (v-u)[(v-u)-0]$

= $\rho a (v-u)^2$

(ii) Flat Plate Inclined to the Jet



1. 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 = $a(v-u)\sin\theta$

3. Force exerted by the Jet in normal direction of Plate

F_n = Mass of water striking per sec × (Change in velocity normal to Plate)

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

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

4. Force exerted in x direction by the jet

$$F_x = F_n \sin\theta$$
$$= \rho a(v-u)^2 \sin\theta \times \sin\theta$$
$$= \rho a (v-u)^2 \sin^2\theta$$

5. Force exerted in Y direction by the jet

$$F_y = F_n \cos\theta$$
$$= \rho a (v-u)^2 \sin\theta \times \cos\theta$$
$$= \rho a (v-u)^2 \sin\theta \cos\theta$$