Hindbookcenter

Hind Book Center & Photostat

MADE EASY
Mechanical Engineering
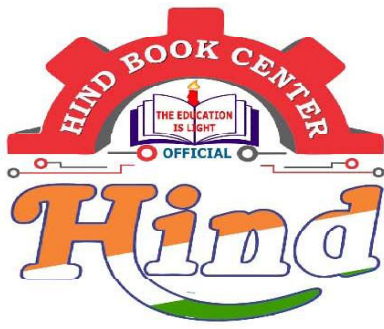### Toppers Handwritten Notes
FULUD MACHINERY
By-Shailnder Sir

- Colour Print Out
- Blackinwhite Print Out
- Spiral Binding,& Hard Binding
- Test Paper For IES GATE PSUs IAS, CAT
- All Notes Available & All Book Availabie
- Best Quaity Handwritten Classroom Notes & Study Materials
- IES GATE PSUs IAS CAT Other Competitive/Entrence Exams

Visit us:-**www.hindbookcenter.com**

Courier Facility All Over India
(DTDC & INDIA POST)
Mob-9711475393

ALL NOTES BOOKS AVAILABLEALL STUDY MATERIAL AVAILABLE

COURIERS SERVICE AVAILABLE

MADE EASY , IES MASTER , ACE ACADEMY , KREATRYX

ESE , GATE, PSUs BEST QUALITY TOPPER HAND WRITTEN NOTES

MINIMUM PRICE AVAILABLE @ OUR WEBSITE

1. ELECTRONICS ENGINEERING
2. ELECTRICAL ENGINEERING
3. MECHANICAL ENGINEERING
4. CIVIL ENGINEERING
5. INSTRUMENTION ENGINEERING
6. COMPUTER SCIENCE

IES ,GATE , PSU TEST SERIES AVAILABLE @ OUR WEBSITE

❖ IES –PRELIMS & MAINS

❖ GATE

➢ **NOTE;- ALL ENGINEERING BRANCHS**

➢ **ALL PSUs PREVIOUS YEAR QUESTION PAPER @ OUR WEBSITE**
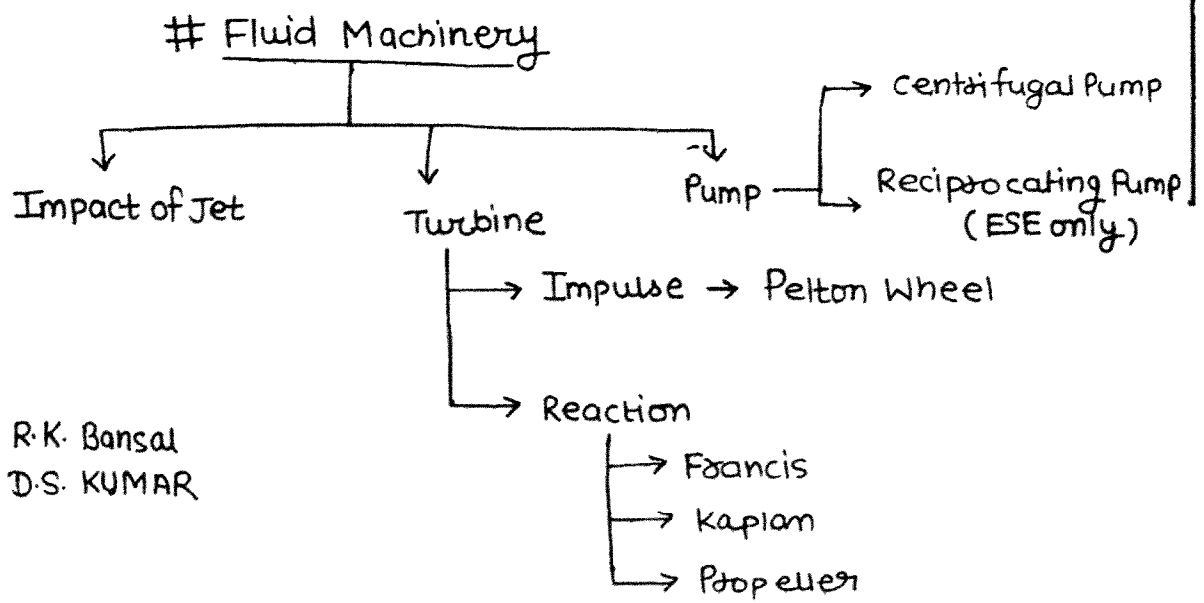
PUBLICATIONS BOOKS -

MADE EASY , IES MASTER ,ACE ACADEMY ,KREATRYX ,GATE ACADEMY, ARIHANT ,GK

RAKESH YADAV, KD CAMPUS , FOUNDATION , MC –GRAW HILL (TMH) ,PEARSON...OTHERS

HEAVY DISCOUNTS BOOKS AVAILABLE @ OUR WEBSITE

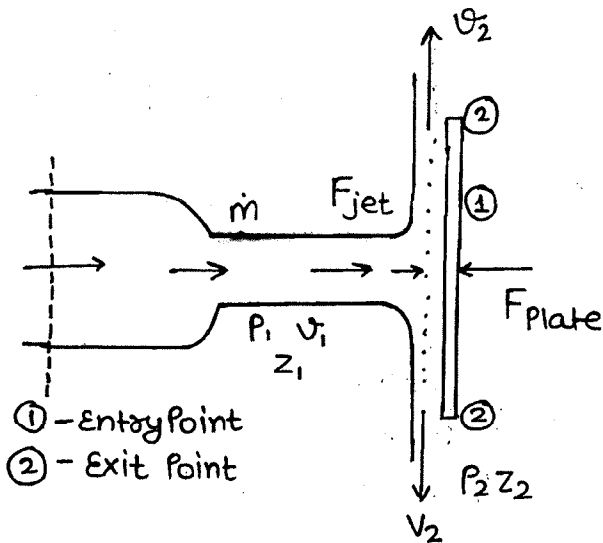| Shop No.7/8 Saidulajab Market Neb Sarai More, Saket, New Delhi-30 | Shop No: 46 100 Futa M.G. Rd Near Made Easy Ghitorni, New Delhi-30 | F518 Near Kali Maa Mandir Lado Sarai New Delhi-110030 | |

Website: www.hindbookcenter.com

Contact Us: 9711475393

Fluid Machinery

- Impact of Jet
- Turbine
  - Impulse → Pelton Wheel
  - Reaction
    - Francis
    - Kaplan
    - Propeller
- Pump
  - Centrifugal Pump
  - Reciprocating Pump (ESE only)

Book:→ R.K. Bansal
        D.S. KUMAR

1

Impact of Jet : →

Newton's II Law

F_{Plate} = Rate of change in Linear Momentum of jet

F_{Plate} = (Final - Initial) momentum of Water

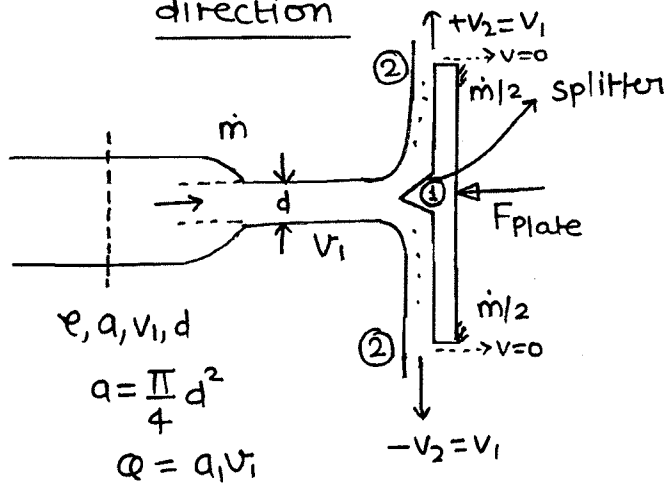$$\boxed{F_{jet} = -F_{Plate} = \dot{m}\vec{V_1} - \dot{m}\vec{V_2}}$$

$\dot{m}$ = mass flow rate of Water Which Strike the Plate /body.

① - Entry Point
② - Exit Point

Water → Reaction force
Plate → Initial force

Case : I

Jet Strikes Stationary Flat Plate in Normal direction

$P_1 = P_2 = P_{atm}$

$z_1 = z_2$

e, a, V_1, d

$a = \dfrac{\pi}{4} d^2$

$Q = a_1 V_1$

$$\dfrac{P_1}{\rho g} + \dfrac{V_1^2}{2g} + z_1 = \dfrac{P_2}{\rho g} + \dfrac{V_2^2}{2g} + z_2 + h_f$$

→ Smooth Plate ($V_2 = V_1$)
→ Rough Plate ($V_2 < V_1$)

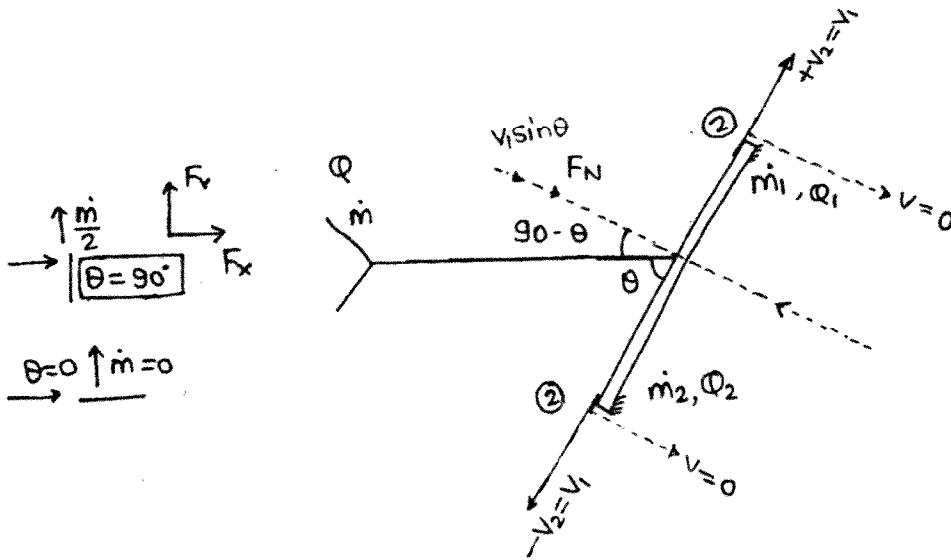$$\boxed{\dot{m} = \rho a V_1 = \rho Q}$$

→ $F_X = F_N = \dot{m}V_1 - \left[\dfrac{\dot{m}}{2} \times 0 + \dfrac{\dot{m}}{2} \times 0 \right]$

→ $F_X = F_N = \dot{m}V_1$
$\quad = \rho a V_1^2 \, N$

→ $F_y = F_T = \dot{m} \times 0 - \left[\dfrac{\dot{m}}{2} \times V_2 + \dfrac{\dot{m}}{2}(-V_2) \right]$

$$\boxed{F_y = F_T = 0}$$

2

NOTE→ When Jet Strikes over a Flat Plate then it Will apply the force only in Normal direction to Plate, there will not be any force in tangential direction to Plate.

case: II
Jet Strikes Stationary Inclined Plate

$$\dot{m} = \dot{m}_1 + \dot{m}_2 \Rightarrow \boxed{Q = Q_1 + Q_2} \rightarrow (1)$$

$$\boxed{\dot{m} = \rho a v_i = \rho Q}$$

$$F_N = \dot{m} v_1 \sin\theta - \left[\dot{m}_1 \times 0 + \dot{m}_2 \times 0\right]$$

$$F_N = \dot{m} v_1 \sin\theta = \rho a v_1^2 \sin\theta$$

$$F_x = F_N \sin\theta = \rho a v_1^2 \sin^2\theta$$

$$F_Y = F_N \cos\theta = \rho a v_1^2 \sin\theta \cdot \cos\theta$$

$$\dot{m}_1, \dot{m}_2 \Big/ Q_1, Q_2 = ?$$
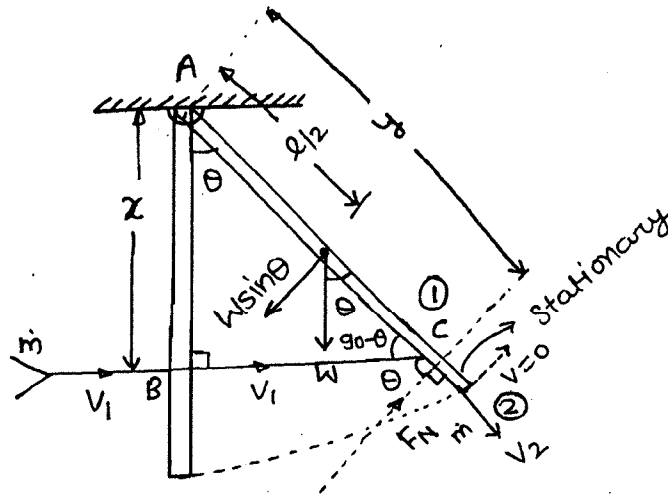
$$\therefore \boxed{F_T = 0}$$

$$\rightarrow \dot{m} v_1 \cos\theta - \left(\dot{m}_1 \times v_1 + \dot{m}_2 \times (-v_1)\right) = 0$$

$$Q\cos\theta - Q_1 + Q_2 = 0 \rightarrow (II)$$

$$Q = Q_1 + Q_2 \longrightarrow (I)$$

Case-III

Jet Strikes Vertical Hanging Plate

ℓ = length of Plate

W= Weight of Plate = Mg

→ $\sum M_A = 0$

→ $F_y \cdot y = W\sin\theta \cdot \dfrac{\ell}{2}$

→ $\dot{m} = \rho a v_1$

→ $F_N = \dot{m}\, v_1 \cos\theta - \dot{m} \times 0$

$$\boxed{F_N = \rho a v_1^2 \cos\theta} \quad \text{(Newton)}$$

ΔABC

$$\cos\theta = \frac{x}{y} \quad \Rightarrow \quad y = \frac{x}{\cos\theta}$$

$$\rho a v_1^2 \cos\theta \cdot \frac{x}{\cos\theta} = W\sin\theta \cdot \frac{\ell}{2}$$

$$\boxed{\sin\theta = \frac{2\rho a v_1^2}{W\ell} \cdot x}$$