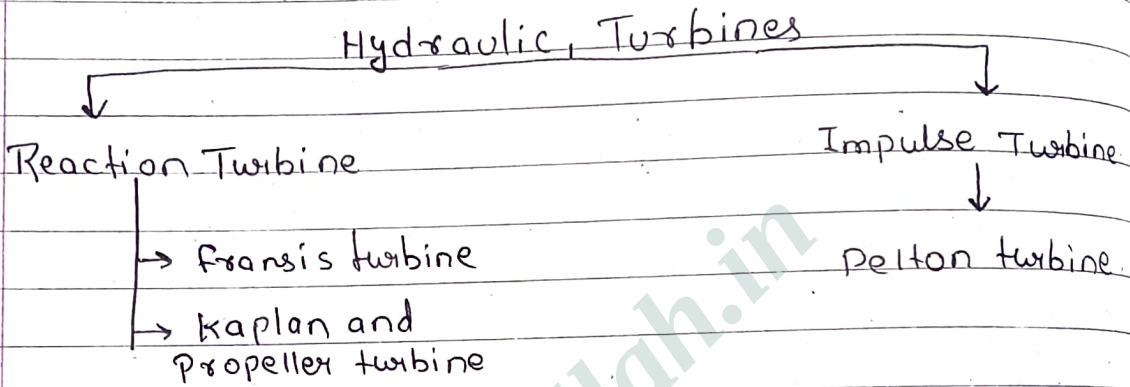


Unit-6

1. classification of hydraulic Turbines.
2. Explain the working principle of impulse Turbine and its Application.

#



→ Based on Energy Conversion :

(a) Impulse Turbines :

- utilize the kinetic energy of water.
- water strikes the turbine blades at high velocity from nozzles.
- operates in atmospheric pressure

Example : Pelton Turbine.

(b) Reaction Turbines :

- utilize both kinetic and pressure energy of water.
- water flows through the blades, undergoing change in velocity and pressure.
- operates in a pressurized environment.

Example : Francis turbine, Kaplan Turbine.

Date ___ / ___ / ___

→ Based on Head (Waterfall Height) :

- (a) High - Head Turbines :
 - Suitable for heads above 250 meters,
Example : Pelton Turbine.
- (b) Medium - Head Turbine :
 - Suitable for heads between 50 to 250 meters.
Example : Francis Turbine.
- (c) Low - Head Turbines :
 - Suitable for heads below 50 meters,
Example : Kaplan Turbine.

→ Based on Direction of flow

- (a) Axial flow turbines :
Water flows parallel to the axis of rotation.
Example : Kaplan turbine.
- (b) ~~Bas~~ Radial flow Turbines :
Water flows perpendicular to the axis.
 - Example : Francis turbine.
- (c) Mixed flow Turbines :
Water flows in a combination of radial and axial directions.
 - Example : Modern Francis turbines.

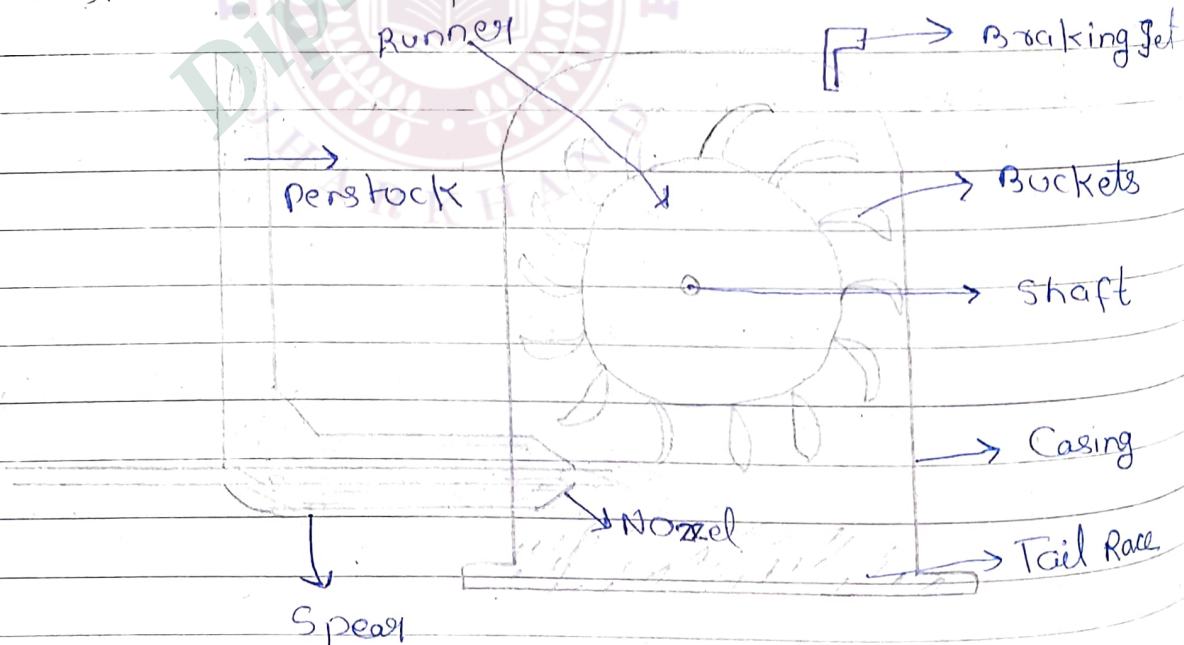
Impulse Turbine

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Impulse turbines operate on the principle of ~~no~~ Newton's Second law of motion. An impulse turbine is a type of hydraulic turbine that converts the kinetic energy of a high velocity fluid into mechanical energy, which is then harnessed to drive a generator or other mechanical devices. The energy transfer occurs entirely due to the kinetic energy of the water jet, with no pressure change across the blades.

Working principle :

An Impulse turbine uses the kinetic energy of a high-velocity fluid to generate mechanical energy. This mechanical energy is then used to drive a generator or other mechanical devices. The working principle of an impulse turbine is as follows.



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- **Nozzle :-**

A nozzle converts the available hydraulic energy into kinetic energy. The fluid expands and accelerates, leaving the nozzle at high velocity.

- **Buckets :**

The high-velocity fluid jet strikes a series of buckets or blades attached to the rim of a wheel. The buckets change the direction of the jet without changing its pressure.

- **Rotation**

The force of the jet causes the buckets to rotate, which transfer the energy to a shaft.

- **Mechanical energy :**

The change in momentum sets the buckets and wheel into rotary motion, making mechanical energy available at the turbine shaft.

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Applications of Impulse Turbines

1. **Hydroelectric power plants —**
Pelton turbines are widely used for generating electricity from high-head water sources.
2. **Industry**
To power mechanical equipment in factories using renewable energy.
3. **Marine Applications —**
Some steam turbines in ships use impulse stages for efficient propulsion.
4. **Aerospace and jet propulsion —**
Turbopumpers are used in aircrafts and spacecrafts for energy extraction.
5. **Steam power plant —**
Impulse stages are used in steam turbines to generate power in thermal power stations.