

# RENEWABLE ENERGY POWER PLANTS.

21ME652

## ASSIGNMENT - 02

SUDHANVA HP

1JT21CS108

VI 'B'

28 | June | 2024

① What is Wind energy? Also Explain the availability of Wind energy in India.

ANS:- Wind energy :- Wind energy is a form of renewable energy generated by converting Wind flow into Mechanical Power using Wind turbines.

### AVAILABILITY OF WIND ENERGY IN INDIA.

1. INSTALLED CAPACITY :- As of recent data, India is among the top countries in the World in terms of installed Wind power capacity.

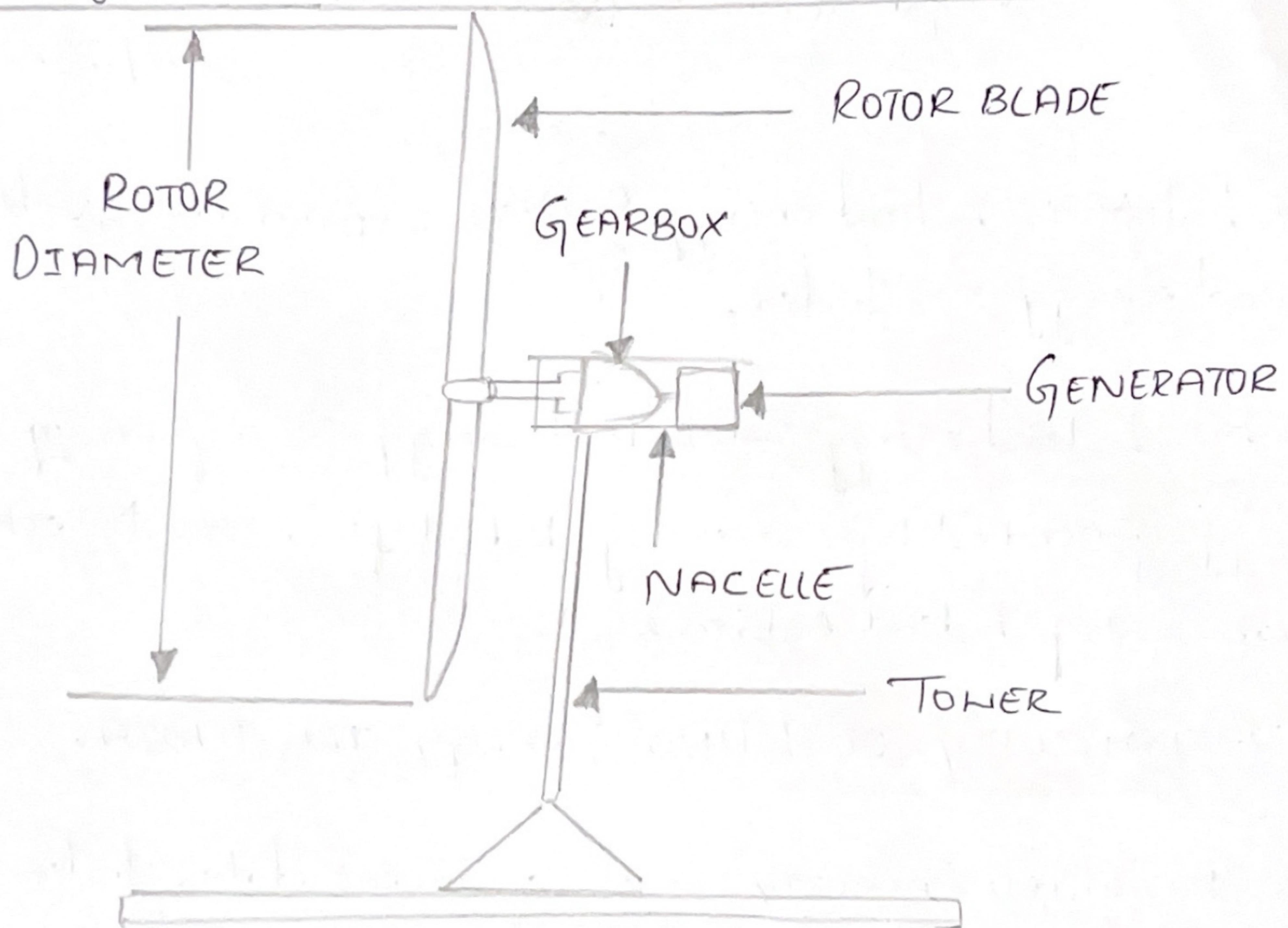
2. GEOGRAPHICAL DISTRIBUTION :- The primary states with high Wind energy potential are Tamil Nadu, Gujarat, Maharashtra, Karnataka and Rajasthan.

3. GOVERNMENT POLICIES :- The Indian government has implemented various policies like Financial incentives, including tax benefits, National Wind-Solar hybrid policy to encourage the installation of Combined Wind, Setting ambitious targets for renewable energy capacity as part of its broader energy policy goals.

Q. Explain types of Wind Machine and also its characteristics?

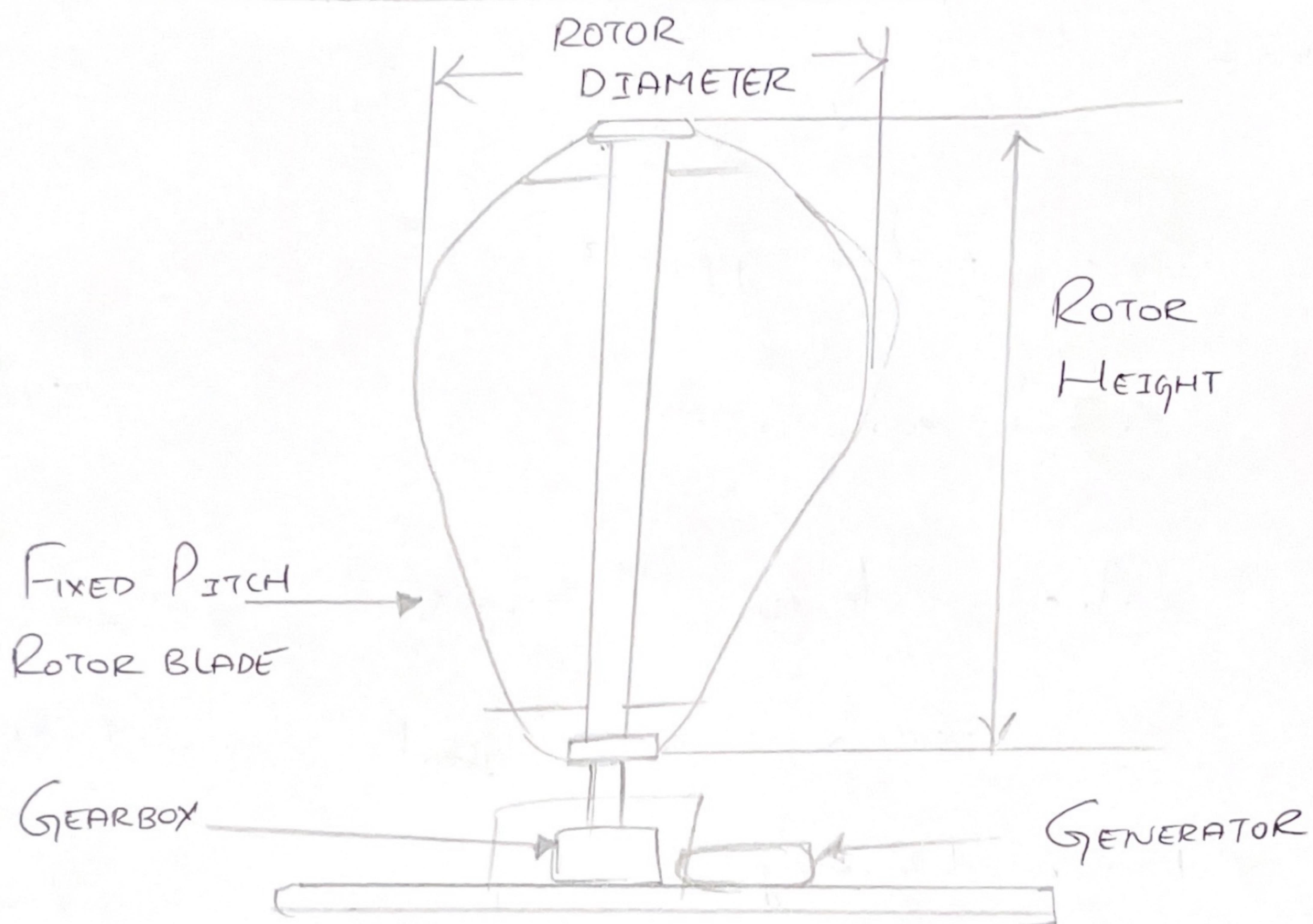
Ans:- TYPES OF WIND MACHINE :-

1. Horizontal-Axis Wind Turbines (HAWTs) -



- ↳ Rotor orientation :- The rotor shaft is oriented horizontally, parallel to the ground.
- ↳ BLADES : Typically has two or three blades, which are aerodynamically shaped to maximize efficiency.
- ↳ TOWER HEIGHT : Mounted on tall towers to capture stronger winds at higher altitudes.
- ↳ YAW MECHANISM : Equipped with a yaw mechanism to turn the rotor into the wind, ensuring optimal wind capture.

## 2. VERTICAL - Axis Wind Turbines :-



→ ROTOR ORIENTATION : - The rotor shaft is oriented vertically, perpendicular to the ground.

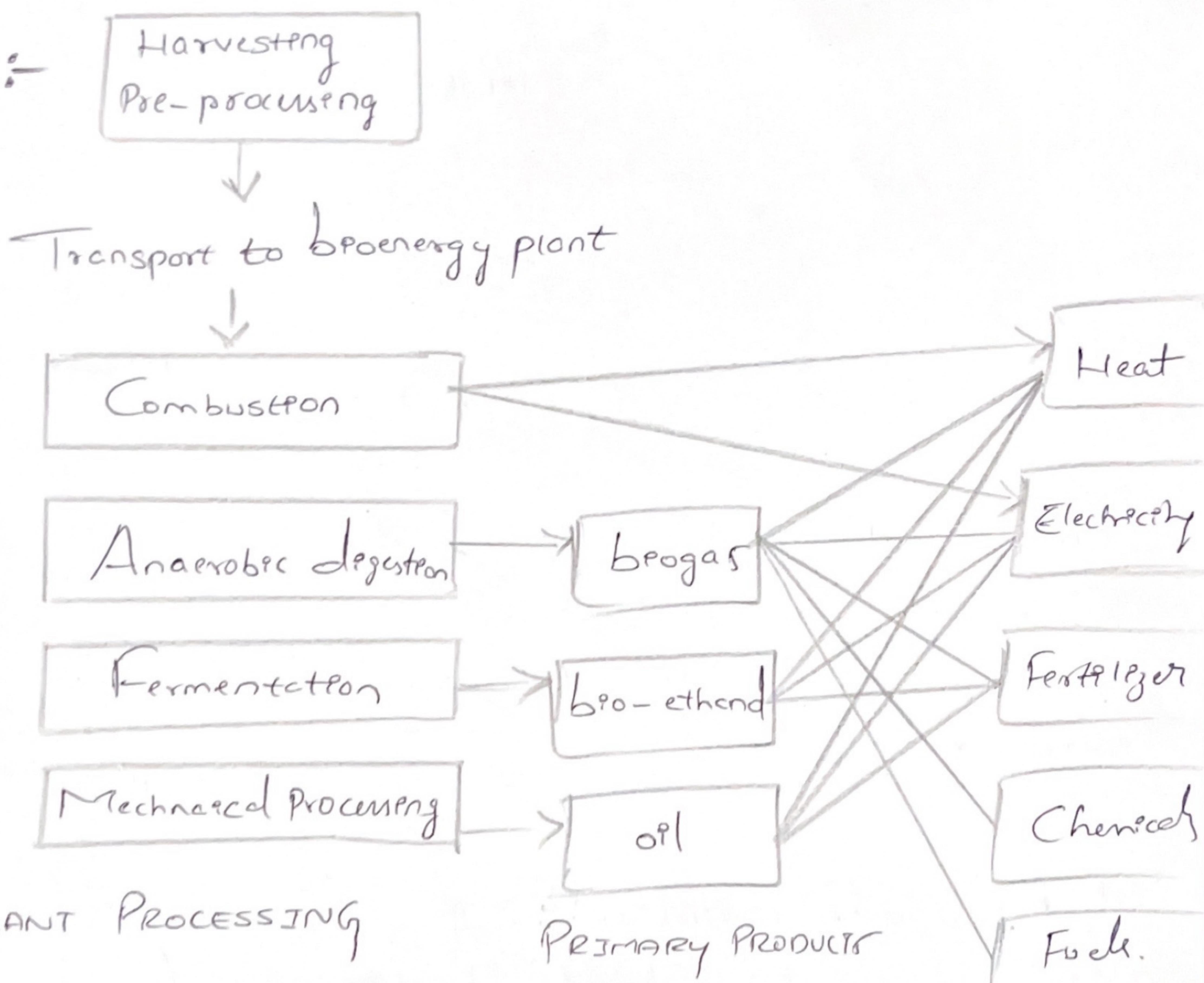
→ BLADES : Can have various blade shapes & Configuration.

→ ROTOR HEIGHT : - Typically shorter than HAWT.  
With the generator located at the base.

→ WIND DIRECTION : - Can capture wind from any direction without the need for a yaw mechanism.

③ Briefly explain biomass energy Conversion System.

Ans:-



#### → Combustion -

- When wood is burned, the chemical energy in biomass is released as heat & light energy.
- The heat energy being released boils water to form steam, which turns a generator.

SECONDARY  
PRODUCTS.

#### → ANAEROBIC DIGESTION -

- Anaerobic digestion is the process where microorganisms break down into sugars & then into various acids.
- Large-scale digesters for household use are commonly made of concrete blocks, metal, fibreglass.

## → FERMENTATION:-

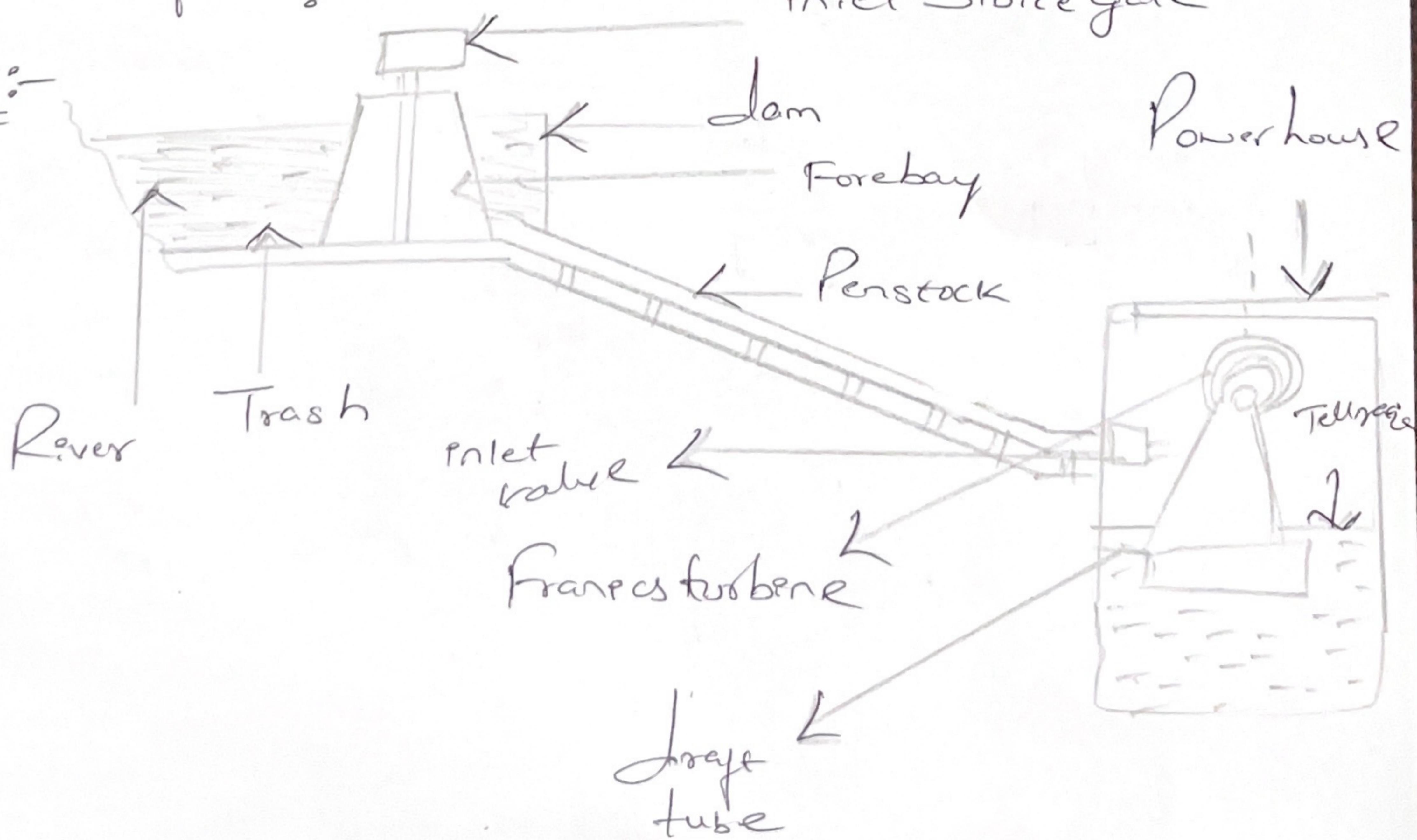
- First and Second-generation Crops like maize, Sugar Cane and Sweet Sorghum bagasse can be converted into fuel or gas.
- Through fermentation, Maize & Sugar cane are converted through 1. ethanol, 2. methane - a gas.

## → MECHANICAL PROCESSING:-

- biomass can be converted into liquid biofuels through mechanical processing and fermentation.
- Oil from these fuels are often more effective than wood.

(4) Layout of hydropower plant & components pts  
Classification

Ans:-



→ DAM - A dam is constructed on a large river to create a reservoir. This reservoir stores water, which can be released as needed to generate electricity.

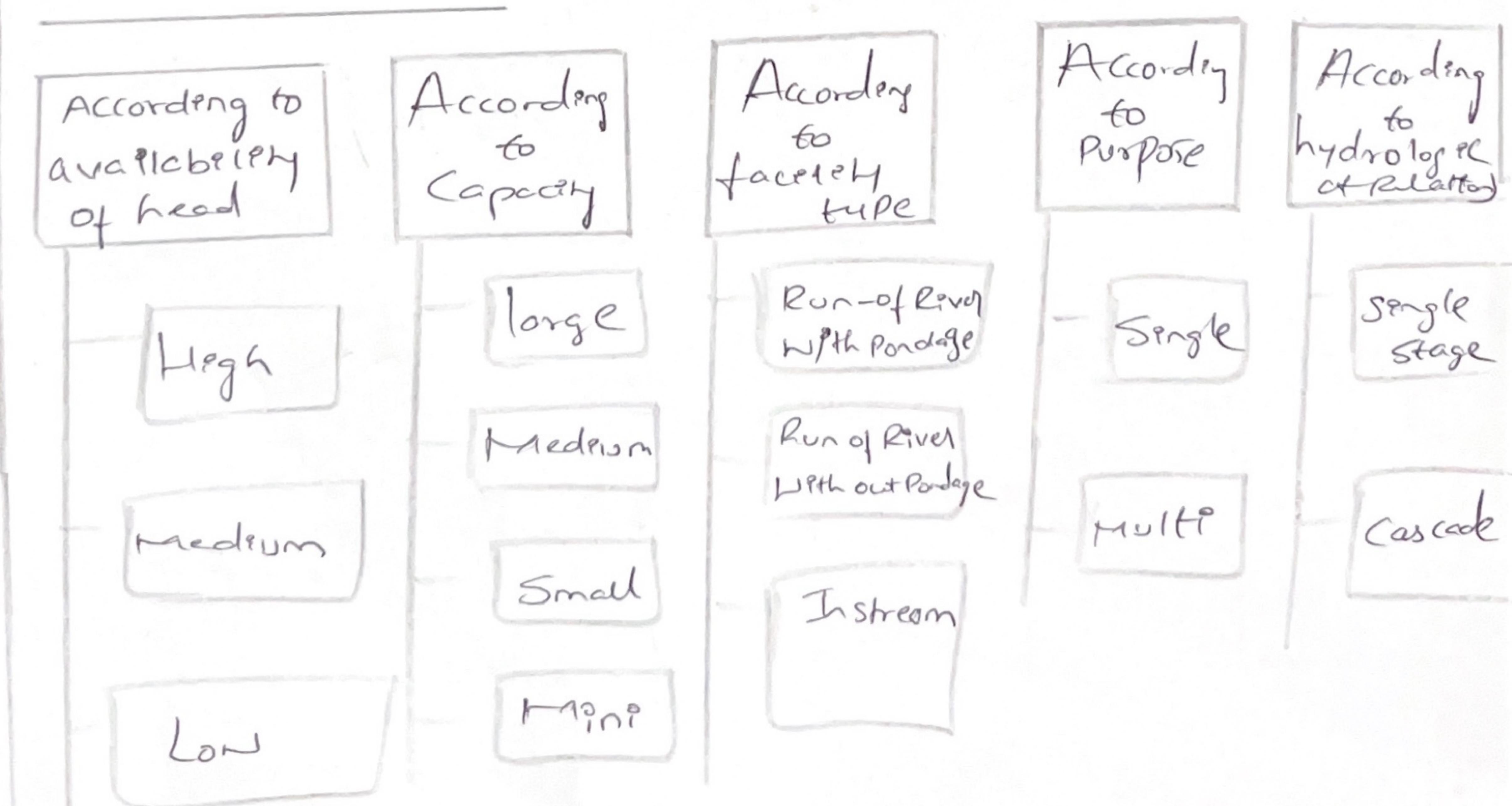
→ Reservoir - The reservoir stores water collected during periods of high flow.

→ Penstock - The Penstock is a large pipe that carries water from the reservoir to the turbines.

→ Turbine - Water from penstock flows into the turbine, causing it to spin. Converts kinetic energy of flowing water into mechanical energy.

→ Generator - The turbine is connected to generator. As turbine spins, it drives the generator, which converts mechanical energy into electrical energy.

### CLASSIFICATION :-



⑤ What is tidal energy? Mention its characteristics.  
How do you harness tidal energy?

Ans:- TIDAL ENERGY :- A form of hydro power that converts energy obtained from tides into useful forms of power.

### CHARACTERISTICS OF TIDAL ENERGY:-

1. PREDICTABILITY - Tidal cycles are highly predictable and occur with regularity making tidal energy a reliable and consistent source of energy.
2. ENVIRONMENTALLY FRIENDLY - Tidal energy is a clean and renewable source of energy that produces no greenhouse gases.
3. HIGH ENERGY DENSITY :- Tidal energy has a higher energy density compared to other renewable energy sources such as wind.

### HARNESS TIDAL ENERGY

1. TIDAL STREAM SYSTEMS - These systems use the kinetic energy of moving water to turn turbines, similar to how wind turbines use wind energy.

2. TIDAL RANGE SYSTEMS - Tidal barrages are dams built across the entrance of a tidal basin.

⑥ Explain Principle of Working of OTEC Power station?

Ans:-  $\rightarrow$  PRINCIPLE OF OTEC POWER STATION:-

- OTEC Power plant systems rely on the basic relationship between pressure ( $P$ ), temperature ( $T$ ) & volume ( $V$ )

$$\frac{PV}{T} = \text{a Constant.}$$

- Here pressure, temperature & volume of fluid can be closely controlled by manipulating other two variables.

- Hence the differential in temperature of fluid can be used to create an increase in pressure in another.

- Most of Sun's radiation is absorbed by sea waters.  
Thus warm water on ocean's surface flow from tropics towards poles.

- cold water circulates at ocean bottom from poles to the tropics.

- Hence, in tropical regions water temperature is around  $28^{\circ}\text{C}$  at a depth of 1000m.

- Thus, we can employ a closed Rankine cycle to generate power b/w these two steady temperatures.

- Such plants are called Ocean thermal energy conversion plants (OTEC).