UNIT II

⇒ STEAM / THERMAL POWER STATION

A generating station which converts heat energy of coal combustion into electrical energy is known as steam power station. It works basically on the principle of rankine cycle.

Advantages:

1. The feel (coal) used is quite cheap
2. Less initial cost compared to other generating station
3. It can be installed at any place irrespective of the existence of coal.
4. It requires less ~~place~~ space as compared to hydroelectric power station.
5. The cost of generation is lesser than that of Diesel power station.

Disadvantages

1. It pollutes the atmosphere due to the large production of smoke and fumes.
2. It is costlier in running cost as compared to hydroelectric power plant

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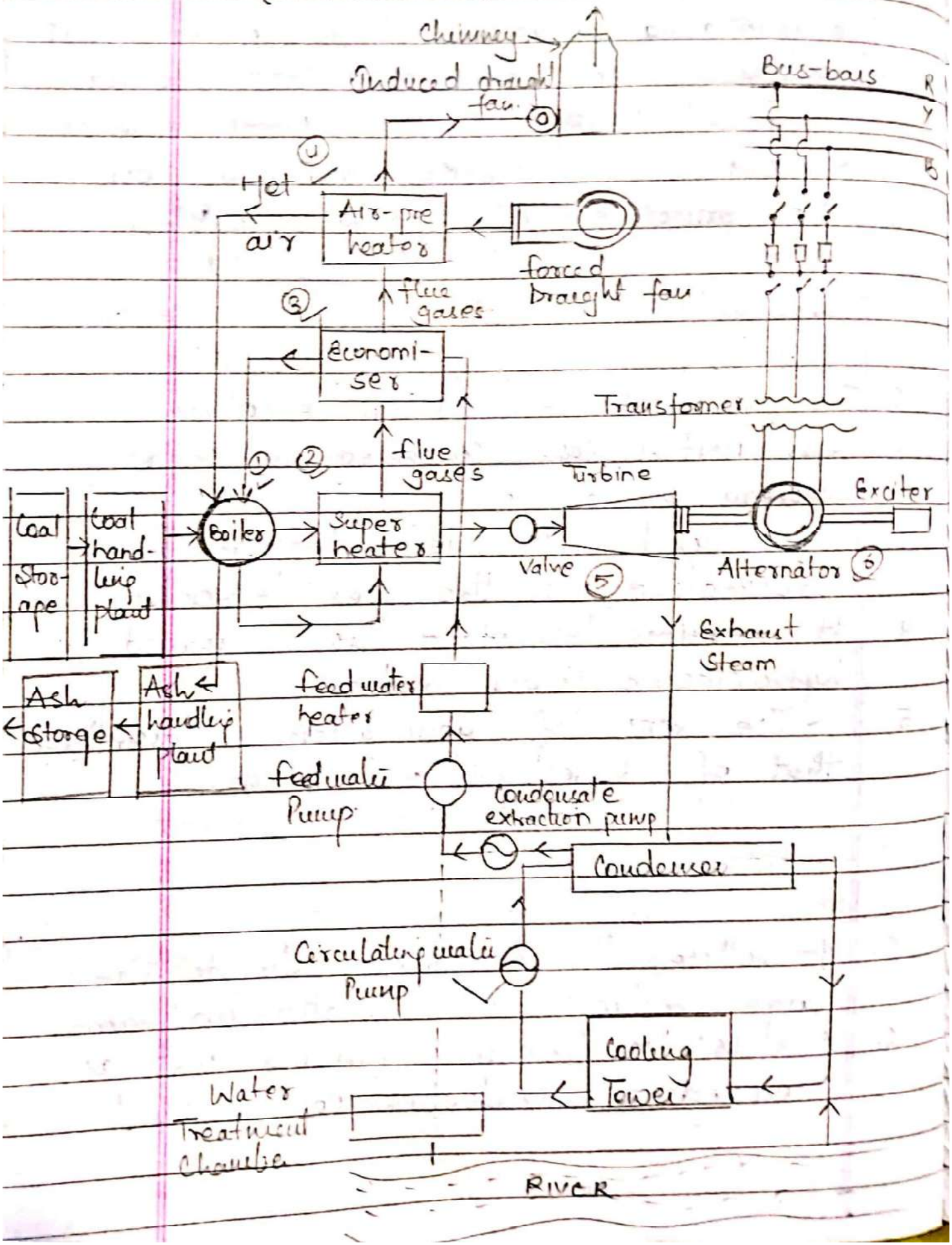
Schematic arrangement of steam Power station



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BOILER

The heat of combustion of coal in the boiler is utilised to convert water into steam at high temp. and pressure.

SUPERHEATER

The steam produced in the boiler is wet and is passed through a superheater where it is dried and superheated.

ECONOMISER

An economiser is essentially a feedwater heater which derives heat from the flue gases to heat the water which is feeding to the boiler.

AIR PREHEATER

An air preheater decreases the temp. of supplied by coal

Air is drawn from the atmosphere by the forced draught fan and is passed through air preheater before supplying to the boiler furnace.

STEAM TURBINE

The heat energy of steam when passes over the blade of the turbine

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is converted into the mechanical energy after giving heat energy to the tur the heat energy is exhausted

ALTERNATOR

The alternator converts mechanical energy of a turbine into electrical energy.

Cylindrical Synchronous generator

EFFICIENCY OF STEAM POWER STATION.

Thermal efficiency

$$\eta_{thermal} = \frac{\text{Heat equivalent of Mech. energy transmitted to turbine (shaft}}{\text{Heat of Coal combustion}}$$

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HYDRO-ELECTRIC POWER STATION (Done)

A generating station which utilizes the P.E of water at a high level of generation of electrical energy is known as hydroelectric power station.

Advantages

i) It requires no fuel as water is used for generation of electrical energy

ii) It is quite neat and clean as no smoke or ash is produced.

iii) It is robust and has a longer life

iv) It is comparatively simple in construction and requires less maintenance.

v) It requires very small running charges as compared to TPP.

Disadvantages

i) It involves high capital cost due to construction of dam.

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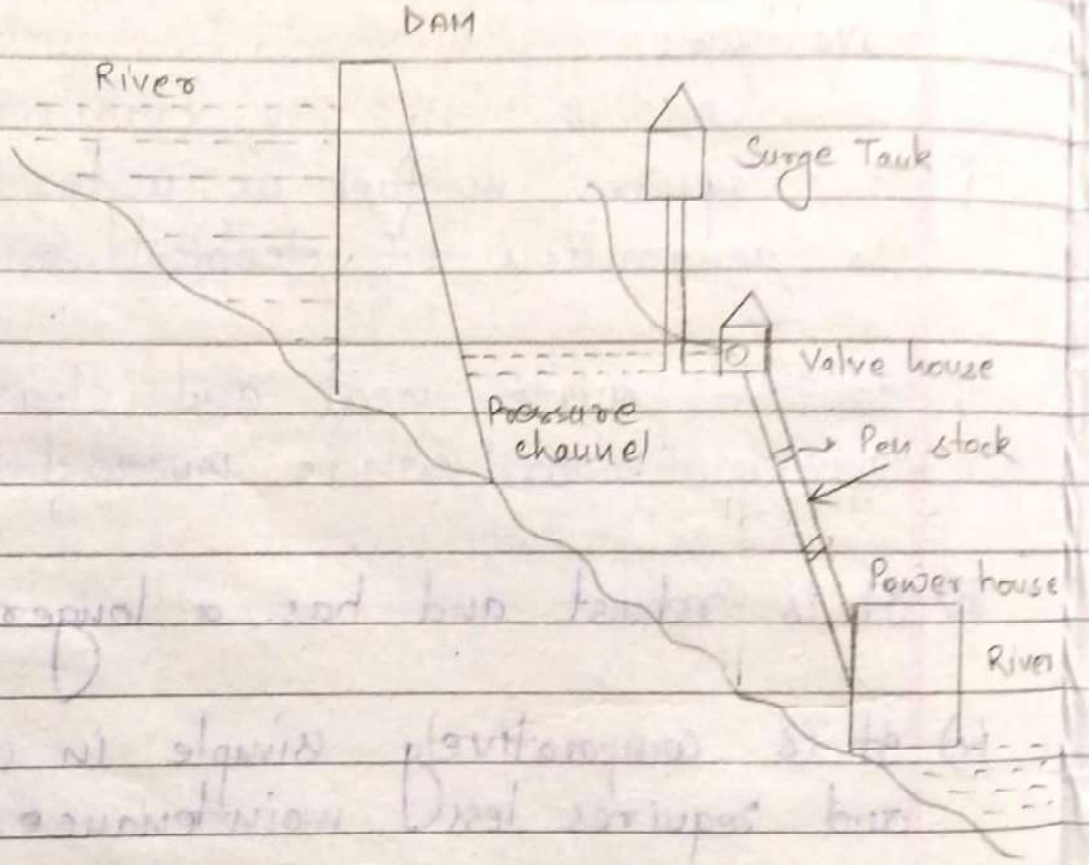
ii) Skilled and experienced hands are required to build the plant

iii) It requires high cost of transmission line. because plant is located away from the consumer.



1. Dam

A dam is a barrier which stores water and creates waterheads. Dams are build of concrete or stone masonry, earth or rock fill

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2. Spill ways

There are time when the river flow exceeds the storage capacity of the reservoir. Such a situation arises during heavy rainfall. Therefore spill ways are used to discharge the surplus water

3. Head works

It consist of a divergent structure at the head of an intake.

4. Surge tank

A surge tank is located near the beginning of the conduit. When the turbine is running at a steady load there are no surges in the flow of water through the conduit. Hence surge tank overcomes the abnormal pressure in the conduit.

5. Pen stocks

Pen stocks are open or close conduits which carry water to the turbine.

6. Water Turbines

They are used to convert energy of

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