

1. A. Describe **function** of the following devices in electrical power generation.(2.0 Marks)
a. Generator

It converts mechanical energy into electrical energy

- b. Prime mover

It converts an input energy into mechanical energy and supplies it to the generator to be converted into electrical energy.

1. B. **Compare** the main sources (water, fuel and nuclear) of electrical energy in terms of **Environmental Effect**. (1.0 Mark)

The minimum pollution is for hydroelectric power plants.

Fuel sources are highly polluting and Nuclear have danger of radiation

1. C. List **any four** main parts of a Gas Turbine Power Plant (1.0 Mark)

Air compressor

Combustion chamber

Gas turbine

Alternator

Starting device

2. A. With the help of given schematic diagram, explain working of a Steam Turbine Power Plant. (2.0 Marks)

The combustion of the fuel takes place inside the boiler furnace releasing thermal energy.

The Boiler drum stores feed water and saturated steam

The saturated steam flows to the super heater, where its temperature increases to a very high values storing thermal energy into it and saturated steam changes into superheated steam

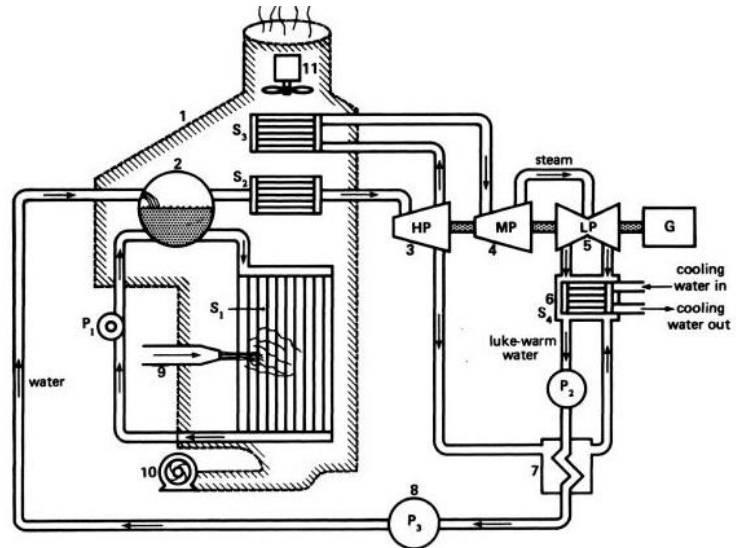
The super heated steam carries the stored energy to the steam turbine.

The steam expands inside the steam turbine in a controlled way releasing energy which is converted by the turbine into mechanical energy

The Generator converts mechanical energy into electrical energy, when properly excited.

Condenser convert it back into liquid water by cooling it with the help of raw water flowing in from a large body of water or cooling towers.

The feed water is pumped back to the boiler drum by a feed water pump



2. B. What is the function of **Heat Recovery Boiler** in a Combined Cycle Power Plant?

(1.0 Mark)

The function of HRB in a CCPP is to produce steam by using the heat of exhaust gas from the GAS turbine cycle.

3. A. What is the function of **Fuel system** in a Diesel Engine Power Plant? (1.0 Marks)

To supply the correct amount of fuel to each cylinder in advance of the working or expansion stroke at proper time even with varying load conditions.

3. B. Describe the function of following parts in a Nuclear Power Plant (2.0 Marks)

a. Heat Exchanger

The heat exchanger receives feed water, which is heated by the coolant and changes into high temperature, high pressure steam.

b. Moderator

Moderator is a material used to slow down or moderate the fast neutrons produced in fission.

3. C. List *any four* main parts of a Storage based Hydro-electric Power Plant (1.0 Mark)

- *Dam*
- *Conduits, Penstocks, and Scroll-Case*
- *Turbine*
- *Draft Tube and Tailrace*
- *Powerhouse*

4. A. What is meant by **Peak Load** power plant? Give **two** examples. (1.0 Mark)

Peak load Power Plants are the plant which deliver power during peak load (for short periods of time).

Gas turbine power plants, diesel engine power plants and pumped storage hydroelectric power plants are very suitable for this application

4. B. Write the conditions to be satisfied to connect an Alternator to an Infinite bus.

(2.0 Marks)

- 1. The shape of voltage wave produced by alternator to be approximately the same shape as the voltage wave of the bus.*
- 2. The terminal voltage of the alternator must be equal to the voltage across the bus.*
- 3. The frequency of the output voltage must be equal to that of the bus voltage.*
- 4. With reference to the load, the voltage of the alternator must be in phase with the bus voltage.*
- 5. The phase sequence of the alternator and the bus must be the same*

4. C. List *any two* advantages of Inter-connected power system

(1.0 Mark)

- It improves the overall stability*
- It provides better continuity of service*
- It is more economical*