Questions:

What is a transformer

A transformer is an Ac device, it converts one ac voltage value into another higher or lower.

Suggest why a transformer cannot work with a dc supply

For a transformer to operate there must be a continuous change in the cutting effect. This change requires an ac supply and therefore the transformer cannot operate with direct current.

Explain the working of a transformer (3m)

The alternating voltage in the primary coil produces a changing magnetic field. These field lines cut with with the secondary coil. Based on Faradays law a change in cutting effect induces voltage in the secondary coil.

Suggest why the structure of a transformer is constructed around iron

Since iron is a magnetic material therefore once it gets magnetised, it allows all the field lines originating from the primary coil to cut with the secondary coil, this helps to improve the efficiency of the transformer

Types of transformers

- *Step up transformer*

· Suggest what happens when the switch is closed.

· The voltmeter gives a reading briefly in one direction and this reading quickly returns to zero.

· Suggest what happens when the switch is open

- A reading is again observed in the opposite direction for a brief moment and this reading quickly returns to 0

Types of transformers

- *Step up transformer*

this arrangement is shown above. It contains more number of turns in the secondary coil. This causes the voltage in the secondary coil to increase. According to the formula P=IV, if the power is constant (assuming 100% efficiency), then we can conclude that in a transformer, current and voltage follows an inverse relationship, that is, as the outward voltage increases the outward current must decrease

- *step down transformer*

In this transformer there are less number of turns in the secondary coil. This causes the voltage in the secondary coil to decrease. Since current and voltage follows an inverse relationship in a transformer, therefore as the outward voltage decreases, the outward current must increase by the same ratio.

Where are tranaformers used:

- transformers are used to transmit electricity over long distances. One such arrangement is shown below
- We prefer to transmit electricity at high voltages using step up transformers. These transformers will cause the voltage to increase and the corresponding current to decrease
- Since powerloss is given by the formula P=I^2 R, therefore as current gets reduced power loss gets minimized.
- When we get close to the city, for the last two kilometres we have to use step down transformers so that the high voltage during transmission can be reduced to 240 V which is safe for house hold appliances.

high voltage transmission also have the following economic and environmental advantages:

- scientific advantage: power lost gets minimised
- Economic advantage: reduced current therefore loss heating effect in the cable, hence the cables can last for a longer duration of time
- Environmental advantage: reduced current therefore less heating effect, hence less contribution towards global warming