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FACULTY OF ENGINEERING & TECHNOLOGY

Electrical Machine-1

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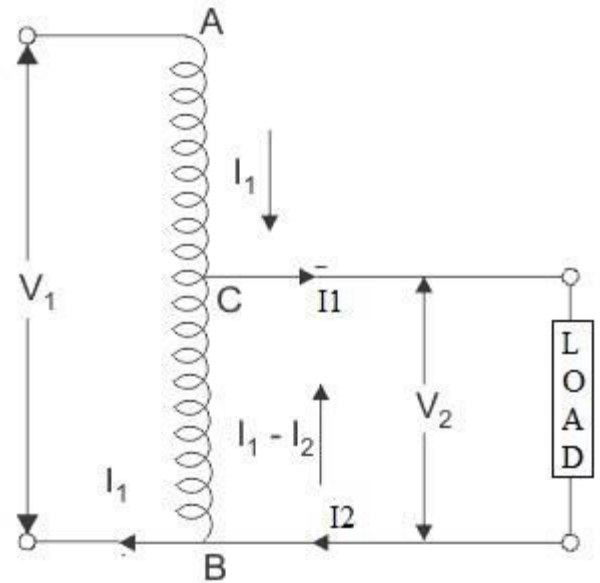
SINGLE PHASE TRANSFORMER

Auto Transformer

A transformer that has a single winding is known as an Auto Transformer. The term 'auto' is taken from a Greek word and the meaning of this is single coil works alone. The working principle of the autotransformer is similar to a 2-winding transformer but the only difference is, the portions of the single winding in this transformer will work at both sides of the windings like primary & secondary

Auto Transformer Construction & working

in autotransformer, a single winding is used like both the windings There are two types of autotransformer based on construction. In one type of transformer, there is continuous winding with the taps brought out at convenient points determined by the desired secondary voltage. However, in another type of autotransformer, there are two or more distinct coils that are electrically connected to form a continuous winding. The construction of Autotransformer is shown in the figure below. The primary winding AB from which a tapping at 'C' is taken, such that CB acts as a secondary winding. The supply voltage is applied across AB, and the load is connected across CB. Here, the tapping may be fixed or variable. When an AC voltage V_1 is applied across AB, an alternating flux is set up in the core, as a result, an emf E_1 is induced in the winding AB. A part of this induced emf is taken in the secondary circuit.



auto-transformer-construction

SINGLE PHASE TRANSFORMER

In the diagram, the winding is represented as 'AB' whereas the total turns 'N1' is considered as the primary winding. In the above winding, from the 'C' point it is tapped as well as the 'BC' section can be considered like secondary winding. Assume the number of turns among the points B&C is 'N2'. If the voltage 'V1' is applied across the winding AC, then the voltage for each turn within the winding will be $V1/N1$.

Therefore, the voltage across the BC section of the winding will be **$(V1/N1)*N2$**

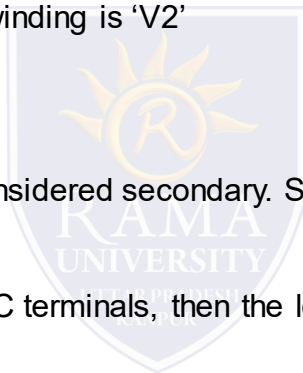
From the above construction, voltage for this BC winding is 'V2'

Therefore **$(V1/N1)*N2 = V2$**

$V2/V1 = N2/N1 = K$

When the BC section in the AB winding can be considered secondary. So 'K' is the constant value, it is nothing but the ratio of voltage or turns in the transformer.

Whenever the load is connected in between the BC terminals, then the load current like 'I2' will starts flowing.



SINGLE PHASE TRANSFORMER

Applications of Autotransformers

The following are the applications of autotransformers.

1. Autotransformers are used for starting induction motors
2. Auto Transformers are used for voltage regulation
3. Autotransformers are used for laboratory purposes.
4. Autotransformers are used in many industrial applications like paper mills, factories, etc.

