Elements of Electrical engineering (EEC)

Microproject

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Topic of Microproject - Transformers

TRANSFORMERS

Content

Transformers

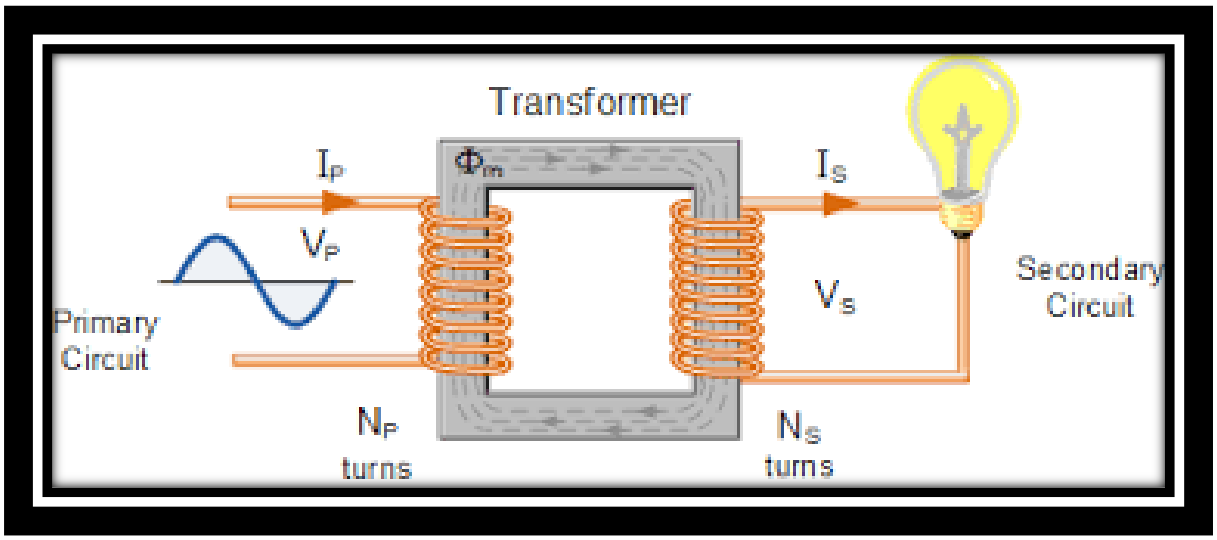
A transformer is a passive component that transfers electrical energy from one electrical circuit to another circuit, or multiple circuits. A varying current in any one coil of the transformer produces a varying magnetic flux in the transformer's core, which induces a varying electromotive force across any other coils wound around the same core. Electrical energy can be transferred between separate coils without a metallic (conductive) connection between the two circuits. Faraday's law of induction, discovered in 1831, describes the induced voltage effect in any coil due to a changing magnetic flux encircled by the coil.

Transformers are most commonly used for increasing low AC voltages at high current (a step-up transformer) or decreasing high AC voltages at low current (a step-down transformer) in electric power applications, and for coupling the stages of signal-processing circuits. Transformers can also be used for isolation, where the voltage in equals the voltage out, with separate coils not electrically bonded to one another. Since the invention of the first constant-potential transformer in 1885, transformers have become essential for the transmission, distribution, and utilization of alternating current electric power.

Construction of Transformer

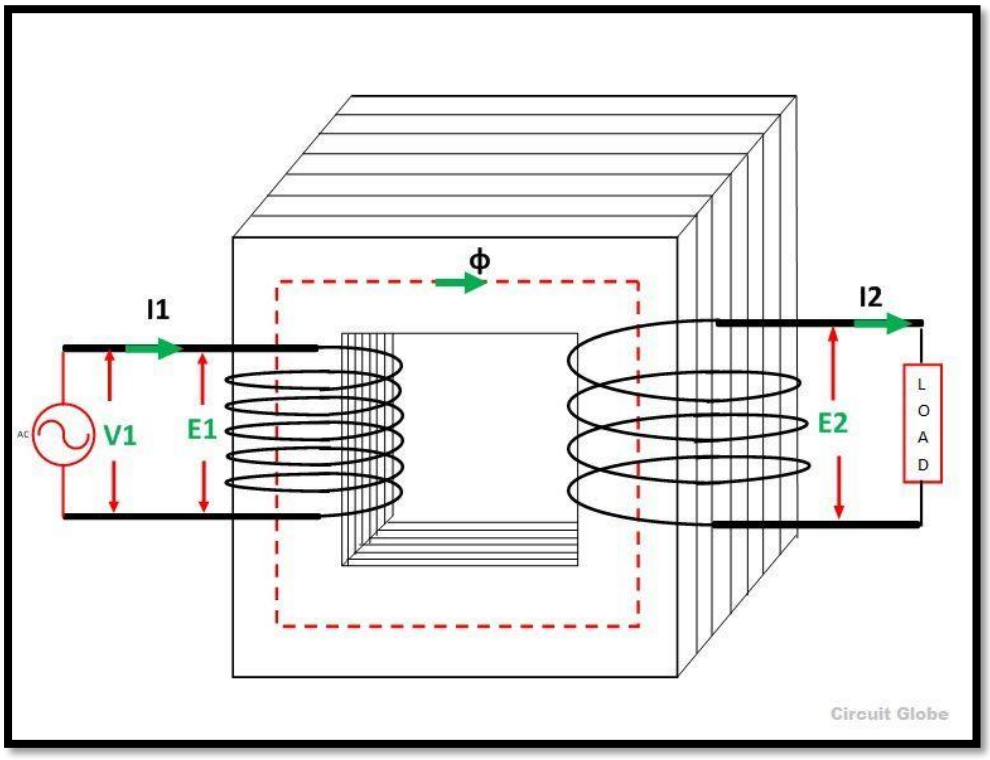
The construction of transformer is of iron core laminated with steel bands. Core laminations are constructed from insulated metal thin metal strips. These laminations are separated and wound around the limb using a sheet of coat or parchment. The winding consists of two types, main and secondary winding. These windings are isolated from each other and are made by an electric coil. The principal feature of the core is to facilitate the winding of the magnetic flow and to provide a low reticence direction with a useful flow.
The construction of transformer parts is as follows:

1. Magnetic circuit
2. Electric circuit
3. Core Type Construction
4. Shell Type Construction
5. Dielectric Circuit
6. Conservator
7. Breather
8. Explosion Vent
9. Radiator



Working of Transformer

The basic principle on which the transformer works is **Faraday's Law of Electromagnetic Induction** or mutual induction between the two coils. The working of the transformer is explained below. The transformer consists of two separate windings placed over the laminated silicon steel core. The winding to which AC supply is connected is called primary winding and to which load is connected is called secondary winding as shown in the figure below. It works on the **alternating current only** because an alternating flux is required for mutual induction between the two windings.



When voltage is introduced to one coil, called the primary, it magnetizes the iron core. A voltage is then induced in the other coil, called the secondary or output coil. The change of voltage (or voltage ratio) between the primary and secondary depends on the turns ratio of the two coils.

EMF Equation

EMF Equation of transformer can be evaluated in a very simple method. One alternating electric supply is operated practically on the main winding in the electrical power transformer, and according to this, magnetizing flow within the basic winding which generating alternative flux in the base of the transformer. This flux influences both secondary and primary windings. There should be enough value of change in flux because this flux is alternating.

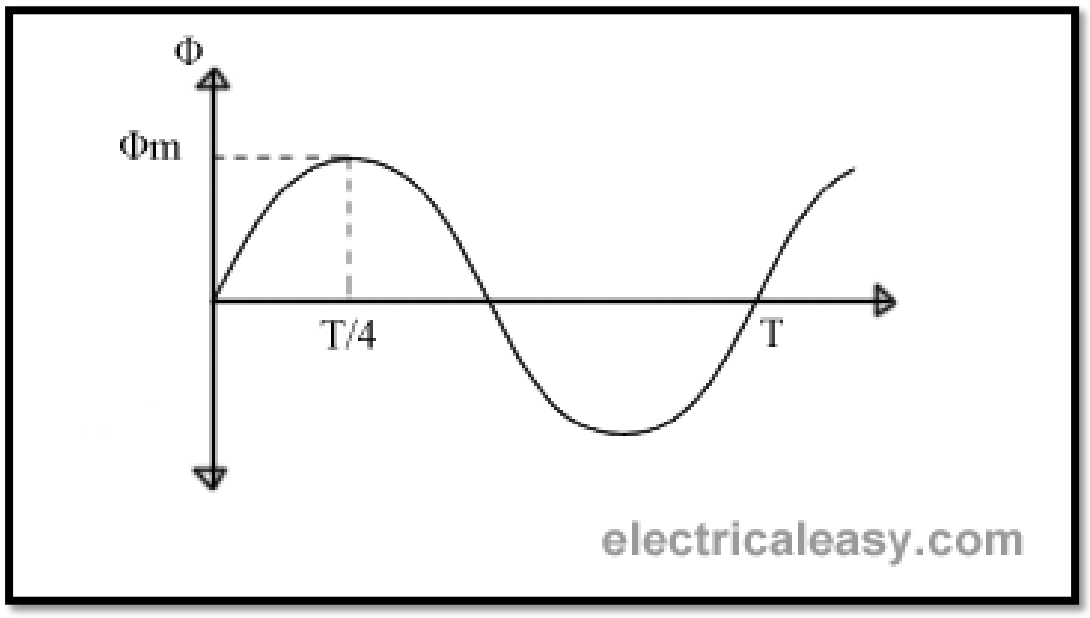
In a transformer, source of alternating current is applied to the primary winding. Due to this, the current in the primary winding (called as magnetizing current) produces alternating flux in the core of transformer. This alternating flux gets linked with the secondary winding, and because of the phenomenon of mutual induction an emf gets induced in the secondary winding. Magnitude of this induced emf can be found by using the following **EMF equation of the transformer**.

E=W/Q

E=Electromotive force

W=Work Done

Q = Current



Advantages and Disadvantages of Transformers

Advantages

1) Transformers are very much useful for the Transmission of the Power It becomes very much easier for transmitting the power through the Transformer
2) Transformers work Non- Stop means it works continuously and transmits the flow of power through itself.
3) The Cost of Maintenance of the Transformer is also not much expensive i.e. It needs Less money for maintaining its condition.
4) It has no such starting time as it is always I the working condition and it never stops working
5) Transformers are also efficient for use

Disadvantages

1) Transformers always require some of the other cooling system as it gets heated faster and becomes to much hot so cooling system is must in the transformers (so it becomes more costly)
2) Transformers becomes too bulky for use.
3) Transformers only work on AC (Alternating Current) that means Transformers are not suitable or not working for DC (Direct Current)

Voltage, Current and Transformation Ratio

1)Voltage Ratio

The ratio of primary to secondary terminal voltage is known as voltage ratio.

$$E_1/E_2=V_1/V_2=N_1/N_2$$

2)Current Ratio

The ratio that transformer transfers electrical power from one circuit to another circuit very efficiently with negligible power loss is called as Current ratio

$$I_1/I_2=V_2/V_1$$

3)Transformation Ratio

The ratio of the secondary voltage to the primary voltage is known as the transformation ratio and denoted by the letter K.

$$K=V_2/V_1=E_2/E_1=N_2/N_1$$

Conclusion

It is Concluded from the above microproject of that A transformer is a passive component that transfers electrical energy from one electrical circuit to another circuit, or multiple circuits. From the above microproject we also get the information about the Construction and Working of the transformer. We also get to know about the EMF Equation which is being related to the Transformer. Advantages and Disadvantages of the transformers is also being mentioned in the above microproject. Ratios of Current, Voltage and Transformers is also known to us with the help of this Microproject.

Thank You