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Examining the Principle Operation of a Stepup Transformer with Multiple Output

[1]A. A Shehu, [2]A. N Sabiyel, & [3]M. K Umar
[1*]*Department of Remedial Studies Waziri Umaru Federal Polytechnic Birnin Kebbi P.M.B 1034*
[2,3]*Department of Physics Kebbi State University of Science and Technology Aliero*

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ABSTRACT
In this project work the construction was made and was tested successfully, the transformer increases the output voltage in each outlet of the output. The test of the transformer is then been recorded twice and in two different locations in Aliero in other to get average values for the test of the current and voltage for the record precision to be more accurate, more so the step-up transformer is then cased in a casing of a scrub stabilizer for it to be portable, it solve the problem of low electric voltage and increase the voltage of a specific desire.
Keywords: Voltage; Current;

I. INTRODUCTION

A transformer is a magnetically coupled coil used in transmission of an electric power,

This coil may be electrically link, but not electrically linked as in two winding transformer, It consist of primary and secondary winding which the number of winding turns varies depending on the type of transformer. Transformer are operated by the principle of mutual inductance between two separate coils wound on the same core According to Cochiagha, et.al,(2005) that transformer as a magnetically couple coil, and in electrical power transmission. It consists of ideal transformer and the real transformer. Furthermore Transformers is a static device that is used in electrical or electronic circuit to change the voltage in an alternating current (AC) electrical supply.

There are step up and step down transformers. This work is on the design and construction of a step up transformer. This Step up transformer is a transformer that consists of only one winding port for both the primary winding and secondary winding coil.

From the theory of an auto transformer and its operation is similar to that of two winding transformer, it has high efficiency where cheat (because it use less copper wire) it is applicable where transformer ratio is little differ from unity.

A step up transformer transforms electrical energy from one circuit to another with the help of the mutual induction between the primary and the secondary winding of the coil.

Typically the voltage can be increased or decreased depending on the need of the output needed.

A clear understanding of how a transformer work is necessary in other to wire it properly in an electrical system. Transformer initially raises the generated voltage for efficient transmission over long distance and there after decrease the system voltage for local destruction and utilization. (Edward, 2003).

It is important to remember that transformers do not generate electrical power; they transfer electrical power from one AC circuit to another using magnetic coupling. A defective transformer is not far from failure and remedial action required to keep it in service. A failed transformer requires a repair before it can be return to service. (Abdelmalik, 2013)

The core of the transformer is used to provide a controlled path for the magnetic flux generated in the transformer by the current flowing through the windings, which are also known as coils. There are four primary parts to the basic transformer. The parts include the Input Connection, the Output Connection, the Windings or Coils and the Core. (Forest, 2000).

Input Connections - The input side of a transformer is called the primary side because the main electrical power to be changed is connected at this point.

II. METHODOLOGY

Below are the lists of the materials to be used in this research

- Plastic transformer core
- Copper (Coil)

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- Wire silver
- Testing bulb and lamp holder
- Insulating paper
- Multimeter
- Casing
- Ravisher
- Insulating Tape
- Connector
- Bolt and Screw
- Laminated Iron Core(I and E core)
- Socket.

However, the step-up transformer and step – down transformer were used in constructing the device. But in this context emphasis will be lay on the step – up auto transformer. The design of transformer begins with the function requirement contained in a user specification given both mechanical and electrical requirement.

The electrical requirement in designing a transformer includes the core types and the standard wire budge (SWG) of the primary turns and secondary winding of the coil of 20 and 22. These are based on the type of transformer to design to determine the size of the core, But 5% tolerance where added to compensate losses. In this project metal casings are used to cover the transformer.

The transformer plastic core to be wired was placed on a permanent base, insulated with insulating paper and the coil is then wound on it. The first winding was powered vanished and allowed to solidify so as to hold the base firmly. And the other was wound closely on it to the desire number. As the winding was finished then the vanishier was powered again to prevent air-gap between the winding coils. Meanwhile, at various point tapping are made for different voltage range. Since the transformer was a step-up transformer auto-transformer, the secondary winding was only tapped from the primary winding. More so, the number of turns varies directly to the required voltage.

The core material is made up of 'E' type and the 'I' type was first fixed at the window of the former in and alternative form. There after place 'I' type on top of the each 'E' type. The iron core was stack firmly and screws were also used to hold the iron core lamination very tight to prevent vibration of the core thereby humming

2.2 PRECAUTIONS DURING CONSTRUCTION

The following precautions is been taken while assembled the transformer. Care must be taken in counting the number of turn in each winding.

Proper varnishing and baking was done to obtain a winding with minimum air gap. The coils were check properly and ensure that it is well insulted before winding. The core was ensured that it is tight and the tapping were properly insulated every connector were properly insulated. The coils were wound carefully to prevent twisting which might result to short/open circuiting. A tolerance of about 5% of winding was added to compensate for losses.

The laminated transformer when it has been insulated, the transformer was constructed successfully with four output terminals and it was cased using a scrub stabilizer cover, it was mounted successfully.

Plate 2.1: Assembling of Constructed Step-up Transformer.

The above figure shows the process of assembling constructed transformer using scrub stabilizer cover.

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Figure 2.2: Assembled Constructed Step-up Transformer

The above figures show the assembling of a constructed transformer with four output terminals and one input terminal with a switch and it was tested and it worked successfully.

2.3 Measurement and Testing

Two different areas in Aliero town (Bodiga and Sabon Gari) were used for the testing of the constructed transformer. Bodiga area (area A), 81 volts was used in an input voltage of a transformer and also in Sabon Gari area (area B), 212 volts was used as input voltage of the transformer. Table 2.1 and 2.2 shows the value of input and output voltages and currents in area A and B respectively.

III. RESULTS

Table 3.1: Area A input and output voltage and current

Input voltage A = 81 V

Number of output	OUTPUT VOLTAGE	OUTPUT CURRENT
1	102V	0.051A
2	126V	0.065A
3	143V	0.072A
4	156V	0.078A

Table 3.2: Area B input and output voltage and current

Input voltage B =212V

NUMBER OF OUTPUT	OUTPUT VOULTAGE	OUTPUT CURRENT
1	250V	0.13A
2	314V	0.16A
3	350V	0.18A
4	380V	0.19A

3.3 AVERAGE VALUE OF VOLTAGE AND CURRENT

Average input voltage = 146.5V equation 4.1

Average table = V_{AV} = equation 4.2

A = Area A (Bodiga Area)

B = Area B (Sabon Gari Area)

The Table 3.3 below summarizes the Average voltage and current calculated

Table 3.3; Average Value of Voltage and Current calculated.

NUMBER OF OUTPUT	OUTPUT VOLTAGE	OUTPUT CURENT
1	172v	0.13A
2	220v	0.16A
3	247v	0.18A
4	269v	0.19A

Table 3.3 was used to plot a Graph of Voltage against Current

Therefore the slope of the graph is the resistance =1Ω

IV.

V. DISCUSSION

The step-up transformer was successfully constructed using local available materials and it was found working successfully it was tested in two different locations in Aliero town which is labeled above as (Area A and B). In Aliero town the first area it has the input of 81 volts and the second area it has the input of 212 volts. The Transformer was able to step-up the voltage into four different outputs in area A we have output of 102volts, 126 volts, 143 volts, 156 volts. And in area B we have the output of 250 volts, 314 volts, 350 volts and 380 volts. Table 4.3 summarizes the average value of the current and voltage calculated from the main values of the constructed transformer. The Resistance of the constructed Transformer is then being calculated from the slope of the above graph 4.1 and it was found to be the value of 1Ω.

VI. CONCLUTION

The step-up Transformer was successfully constructed using locally available materials with four output terminals. It was tested and found to be working with each output value different from the other. The Resistance of the constructed Transformer was found to be 1.0kΩ. conclutsion

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