

EEET 242

## 1 Objective

The objective of this lab is to experimentally look at the wiring and measurement of values in three phase transformer circuits.

## 2 Specifications

You will need to use the 208/120 volt supply. You will also need to use three (3) transformers. Due to the number of transformers needed, you may need to organize yourselves in larger groups. Look at the equipment and make sure you have divided yourselves evenly. Again, remember that the rated voltage is 120VAC for each coil and the rated current is 0.5 A in each coil of each transformer. For this experiment, you will be using terminals 1 and 2 as the high side or primary (120V) and terminals 9 and 5 as the low side (60V). Use 600 ohm resistors for each load unless indicated otherwise.

## 3 Pre-Lab Work

Prepare circuit diagrams for each circuit, complete with the ratings of the voltmeters and ammeters to be used. It is suggested that you use the variable AC supply.

## 4 Procedure

### 4.1 Delta-Wye transformer configuration:

- a Connect the primary side of the transformers in a delta configuration. Jumper terminals #2 of each transformer to #1 of the next. Use **120VAC** on each coil (120V on terminals 1 & 2) of each transformer.
- b Connect the secondary side (Terminals 5 & 9 of each transformer) in a Wye configuration. This will connect the Terminal #5 from each together (as a neutral). Connect the load resistor across each coil (phase). This will be across Terminals 5 & 9 for each transformer.
- c Measure the primary side phase voltage (should be 120VAC) and phase current for each of the three phases.
- d Measure the primary side line voltage (should be 120VAC) and line current for each of the three lines and/or phases.
- e Measure the secondary side phase voltage and phase current for each of the three phases.
- f Measure the secondary side line voltage and line current for each of the three lines and/or phases.
- g Determine the turns ratio for each of the three phases of the transformer.
- h Determine the load resistor value reflected to the primary side of each phase and verify the results.
- i Determine the total power into the primary side of the three phase transformer and to the load(s) on the secondary and verify the results.
- j Report thoughts – consider the results for all values and show that they match the calculated values.

## 4.2 Delta- Delta transformer configuration:

- a** Connect the primary side of the transformers in a delta configuration. Jumper terminals #2 of each transformer to #1 of the next. Use **120VAC** on each coil (120V on terminals 1 & 2) of each transformer.
- b** Connect the secondary side (Terminals 5 & 9 of each transformer) in a Delta configuration. This will Jumper terminals #9 of each transformer to #5 of the next. Connect the load resistor across each coil (phase). This will be across Terminals 5 & 9 for each transformer.
- c** Measure the primary side phase voltage (should be 120VAC) and phase current for each of the three phases.
- d** Measure the primary side line voltage (should be 120VAC) and line current for each of the three lines and/or phases.
- e** Measure the secondary side phase voltage and phase current for each of the three phases.
- f** Measure the secondary side line voltage and line current for each of the three lines and/or phases.
- g** Determine the turns ratio for each of the three phases of the transformer.
- h** Determine the load resistor value reflected to the primary side of each phase and verify the results.
- i** Determine the total power into the primary side of the three phase transformer and to the load(s) on the secondary and verify the results.
- j** Report thoughts – consider the results for all values and show that they match the calculated values.

### 4.3 Delta- Delta with split phase transformer configuration:

- a** Connect the primary side of the transformers in a delta configuration. Jumper terminals #2 of each transformer to #1 of the next. Use **120VAC** on each coil (120V on terminals 1 & 2) of each transformer.
- b** Connect the secondary side (Terminals 5 & 6 of each transformer) in a Delta configuration. This will Jumper terminals #6 of each transformer to #5 of the next. Connect the load resistor across each coil (phase). This will be across Terminals 5 & 6 for each transformer.
- c** Use the center tap (Terminal #9) of ONE transformer on the secondary side as a neutral. This will be your single phase source for loads. Connect an additional set of 300 ohm resistors from the phases on this transformer to the neutral. Important – these are phases A and C (neutral is between phase A and C). Do not connect this neutral to anything else.
- d** Measure the primary side phase voltage (should be 120VAC) and phase current for each of the three phases.
- e** Measure the primary side line voltage (should be 120VAC) and line current for each of the three lines and/or phases.
- f** Measure the secondary side phase voltage and phase current for each of the three phases. Remember that you will have two currents and two voltages for the phase between A and C.
- g** Measure the secondary side line voltage and line current for each of the three lines (the connection to the resistors). Remember you have five line currents and five line voltages since you have five loads (resistors).
- h** Measure the voltage from each secondary phase to the neutral you created above.
- i** Determine the turns ratio for each of the three phases of the transformer.
- j** Determine the load resistor value reflected to the primary side of each phase and verify the results.
- k** Determine the total power into the primary side of the three phase transformer and to the load(s) on the secondary and verify the results. Hint: They should match!
- l** Report thoughts – consider the results for all values and show that they match the calculated values.

#### **4.4 Delta- Delta with split phase transformer - unbalanced configuration:**

- a** Connect the circuit in the previous section.
- b** Remove the 600 ohm load resistor from Phase A to Phase B.
- c** Remove the 300 ohm load resistor from Phase C to the neutral you created.
- d** Measure the primary side phase voltage (should be 120VAC) and phase current for each of the three phases.
- e** Measure the primary side line voltage (should be 120VAC) and line current for each of the three lines and/or phases.
- f** Measure the secondary side phase voltage and phase current for each of the three phases. Remember that you will have two currents and two voltages for the phase between A and C.
- g** Measure the secondary side line voltage and line current for each of the three lines (the connection to the resistors). Remember you have three line currents and three line voltages since you have five loads (resistors).
- h** Measure the voltage from each secondary phase to the neutral you created above.
- i** Determine the turns ratio for each of the three phases of the transformer.
- j** Determine the total power into the primary side of the three phase transformer and to the load(s) on the secondary and verify the results. Hint: They should match!
- k** Report thoughts – consider the results for all values and show that they match the calculated values.