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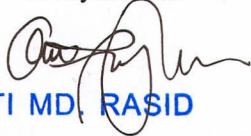

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SKEE 3732

BASIC POWER LABORATORY

THREE PHASE FOUR WIRE FEEDER SYSTEM

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EXPERIMENT: THREE PHASE FOUR WIRE FEEDER SYSTEM

LEARNING OBJECTIVES :

1. To observe the effect of connected neutral conductor for a Three Phase Four Wire System when supplying balanced and unbalanced three phase loads.
2. To observe the effect of an open circuited neutral conductor for a Three Phase Three Wire System when supplying balanced and unbalanced three phase loads.
3. To observe the role of neutral wire in Three Phase System supplying unbalanced three phase load for loss of one phase conductor.

INTRODUCTION :

A three-phase system is produced by a generator consisting of three sources having the same amplitude and frequency but out of phase with each other by 120° . Ideally the three phase load should be balanced, but in practice most of the loads are in unbalanced condition. It is very important to understand the concept of unbalanced three phase system.

You are required to study:

- (i) *Alexander & Sadiku*, 'Fundamental of Electric Circuit 5th edition', *McGraw Hill*, 2013.
- (ii) *Hughes*, Electrical and Electronic Technology, the 10th Edition, *Prentice Hall*, 2008.

EQUIPMENT :

Model No.	Item
DL 2108TAL	3 Phase Power Supply
DL 1017R	Resistive Load
DL 1017L	Inductive Load
	Multimeter

Precaution:

- 1) *Always ask supervisor or laboratory technician to check the experiment connection before SWITCHING ON the power supply.*
- 1) *Never use the ground connection for this experiment setup.*
- 2) *The multimeter function must be set before SWITCHING ON the power supply.*
- 3) *Never change the multimeter function while the circuit is energized.*

PROCEDURE:

Note that all loads are in STAR connection.

Always turn off main switch SW1 before changing the load.

EXPERIMENT 1

- 1) Assemble the circuit according to the **preliminary exercise 6)(i)** so that the 3-phase power supply is connected to resistive and inductive (R in series with L) loads.
- 2) Conduct the experiment for balanced and unbalanced load with neutral conductor.
- 3) Measure and record all currents and voltages at load terminal with 3 positions of loads (including the case considered in preliminary exercise 7).

EXPERIMENT 2

- 1) Assemble the circuit according to the **preliminary exercise 6)(ii)** so that the 3-phase power supply is connected to resistive and inductive (R in series with L) loads.
- 2) Conduct the experiment for balanced and unbalanced load without neutral conductor.
- 3) Measure and record all currents and voltages at load terminal with 3 positions of loads (including the case considered in preliminary exercise 7).

EXPERIMENT 3

- 1) Assemble the circuit according to the **preliminary exercise 6)(iii)** so that the 3-phase power supply is connected to resistive and inductive (R in series with L) loads.

- 2) Conduct the experiment for unbalanced load with loss of one phase conductor for Three Phase System with and without neutral conductor.
- 3) Measure and record all currents and voltages at load terminal with 3 positions of loads (including the case considered in preliminary exercise 7).

OBSERVATION AND CONCLUSIONS

1. From results of Experiment 1, 2 and 3:
 - (i) Examine and analyze the receiving end voltages and currents.
 - (ii) Examine and analyze the neutral current reading for balanced and unbalanced system.
 - (iii) Verify the results from experiment work using theoretical approaches (phasor diagram and three phase formula). Assume positive sequence with V_{RN} as a reference. Indicate percentage of error for every result.
2. Conclude the experiment.

LONG REPORT

You have to consider the following items in preparing your long report:

1. In your own words, explain the difference between single phase and three phase system.
2. Why the Y- Δ , Δ -Y, Y-Y or Δ - Δ combinations are required in electrical power system.
3. Project this experiment into a practical situation on the effect to the system due to a break of neutral conductor while the three-phase line was delivering balanced and unbalanced load.
4. Perform the analysis using **appropriate software** to validate your results of EXPERIMENT 1.