



Rajshahi University of Engineering and Technology

Department of Electrical & Computer Engineering

Lab Report

Experiment Name: Three phase sequence test using 6-phase induction motor

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Submitted By:	Submitted To:
Name : Somya Disha Roll No. : 2210044 Registration : 1098 Session : 2022-23 Department of ECE, RUET	Oishi Jyoti Assistant Professor Department of Electrical and Computer Engineering RUET

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4.1 Experiment No: 04

4.2 Experiment Name: Three phase sequence test using 6-phase induction motor.

4.3 Objectives:

- To determine the phase sequence in a 3-phase system using a 6-phase induction motor.
- To observe the effect of changing the phase sequence on the direction of rotation of a 6-phase induction motor.
- To understand the principles of phase sequence in higher phase systems and how it impacts motor operation.

4.4 Theory:

In a multi-phase system like the 6-phase induction motor, the phase sequence refers to the order in which the voltages reach their peak values. For three-phase motors, this sequence is important for determining the direction of rotation, and the same applies to 6-phase motors.

There are two common phase sequences in any three-phase system: **ABC** and **ACB**.

- **ABC Sequence (Positive Sequence):** In this sequence, the phase voltages appear in the order A, B, and C. This is known as the forward or positive sequence. When this sequence is applied to the motor, the magnetic field inside the motor rotates in a specific direction, typically causing the motor to rotate clockwise. This is the expected and normal operating condition for most motors.
- **ACB Sequence (Negative Sequence):** In this reverse sequence, the phases appear in the order A, C, and B. This is known as the reverse or negative sequence. When this sequence is applied, the magnetic field inside the motor rotates in the opposite direction compared to the ABC sequence, causing the motor to rotate counterclockwise. Reversing the sequence essentially reverses the motor's direction of rotation.

For a 6-phase motor, the principle is similar. The motor can rotate in two directions, depending on the sequence applied to the stator windings. If the sequence is ABC, the motor will rotate in the intended direction, while an ACB sequence will reverse the rotation. Identifying the correct sequence is crucial for ensuring that the motor runs as expected, especially in applications where the direction of motion is critical, such as pumps, fans, and conveyor systems.

Verifying the phase sequence in such systems helps to avoid potential damage and ensures that the motor operates safely and efficiently.

4.5 Required Apparatus:

- AC source
- 6-phase induction motor
- Phase sequence indicator
- Multimeter
- Connecting Wires

4.6 Diagram:

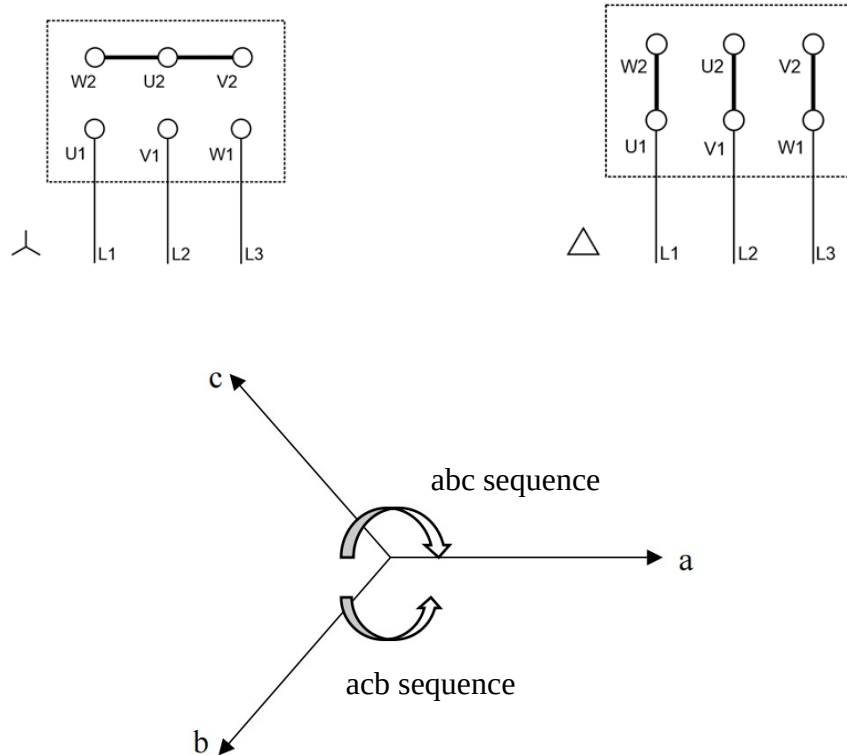


Figure 4.1: 3-phase sequence test using 6-phase induction motor

4.7 Result:

The 6-phase induction motor rotated clockwise when the phase sequence was positive, indicating a correct phase sequence. When the sequence was reversed to negative, the motor's direction of rotation changed to counterclockwise. This confirmed the relationship between phase sequence and motor rotation in a 6-phase system.

4.8 Discussion:

The experiment successfully demonstrated the effect of phase sequence on a 6-phase induction motor's direction of rotation. As expected, changing the phase sequence from positive to negative reversed the motor's direction. This is similar to what occurs in 3-phase systems, but with a 6-phase motor, the system provides smoother operation due to the increased number of phases, which reduces torque ripple and improves performance. This method of phase sequence testing is practical for high-phase systems, offering a reliable way to verify sequence without requiring advanced equipment.

4.9 Precautions:

- All electrical connections were verified to be tight and insulated to avoid electrical hazards.
- The motor was carefully handled to prevent mechanical and electrical damage.
- The load was kept constant to ensure accurate testing of phase sequence.

4.10 Reference:

- Charles K. Alexander and Matthew N. O. Sadiku, “Fundamentals of Electric Circuit”, 5th Edition, 1221 Avenue of the Americas, New York
- Wikipedia