Experiment-4

Three-Phase PWM Inverter with MATLAB/Simulink

Objective:

This lab is all about learning and using a Three-Phase PWM Inverter with MATLAB/Simulink. We want to understand how it works, what equipment and software we need, and how to use them to simulate and control the inverter.

Equipment:

- MATLAB/Simulink Software
- Computer
- IGBTs
- Three-Phase AC Power Supply
- Multimeter
- Oscilloscope

Theory:

I. Three-Phase PWM Inverter:

A three-phase PWM inverter is an electronic device that converts direct current (DC) power into three-phase alternating current (AC) power. It typically consists of power electronic components such as transistors or insulated gate bipolar transistors (IGBTs) arranged in a configuration to generate a controlled output voltage with adjustable frequency and magnitude.Commonly used in motor drives, solar inverters, UPS, and industrial automation.

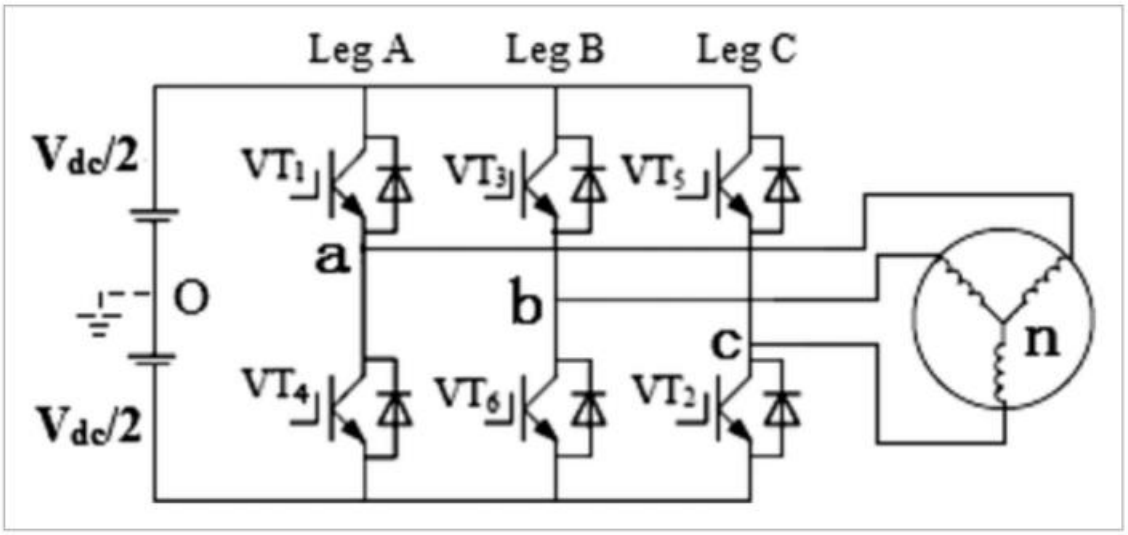
II. PWM (Pulse Width Modulation):

PWM, or Pulse Width Modulation, is a technique used to control the power delivered to electrical devices by varying the width of the pulse applied to the load. It involves rapidly switching a signal between fully on and fully off states at a constant frequency. By adjusting the width of the pulses, the average voltage or power

delivered to the load can be controlled. PWM is widely used in power electronics for applications such as motor speed control, voltage regulation, and inverter control.

III. MATLAB/Simulink:

Software for modeling, simulating, and analyzing dynamic systems. Used for designing and analyzing three-phase PWM inverters, enabling control algorithm design, circuit implementation, and real-time visualization. Widely utilized in academia, research, and industry for power electronics development.



LAB STEPS:

- **Set Up the Simulation:**
  - Open MATLAB and Simulink.
  - Create a new model in Simulink.
  - Drag and drop the necessary components for the inverter.

- **Adjust Settings:**
  - Define DC power strength, control method for AC power, and simulation speed.

- **Try Different PWM Techniques:**
  - Choose a method like Sinusoidal PWM and incorporate it into the Simulink model.
  - Experiment with settings to observe their impact on the output.

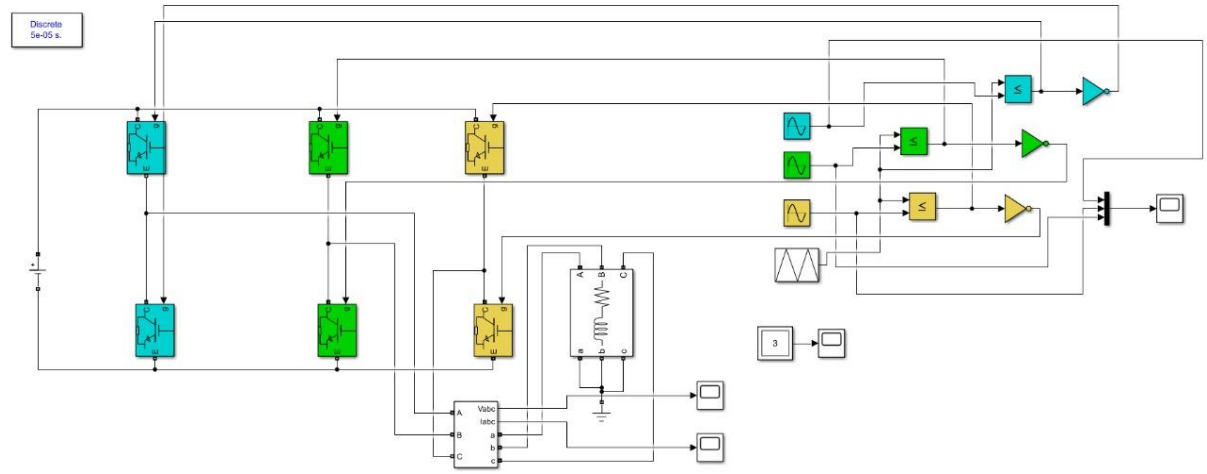
- **Run the Simulation and Look at the Results:**
  - Initiate the simulation and observe output using Simulink's oscilloscope.
  - Analyze power waveforms for any anomalies or issues.

- **Change the load and observe effects:**
  - Connect different loads to the inverter and observe its response.

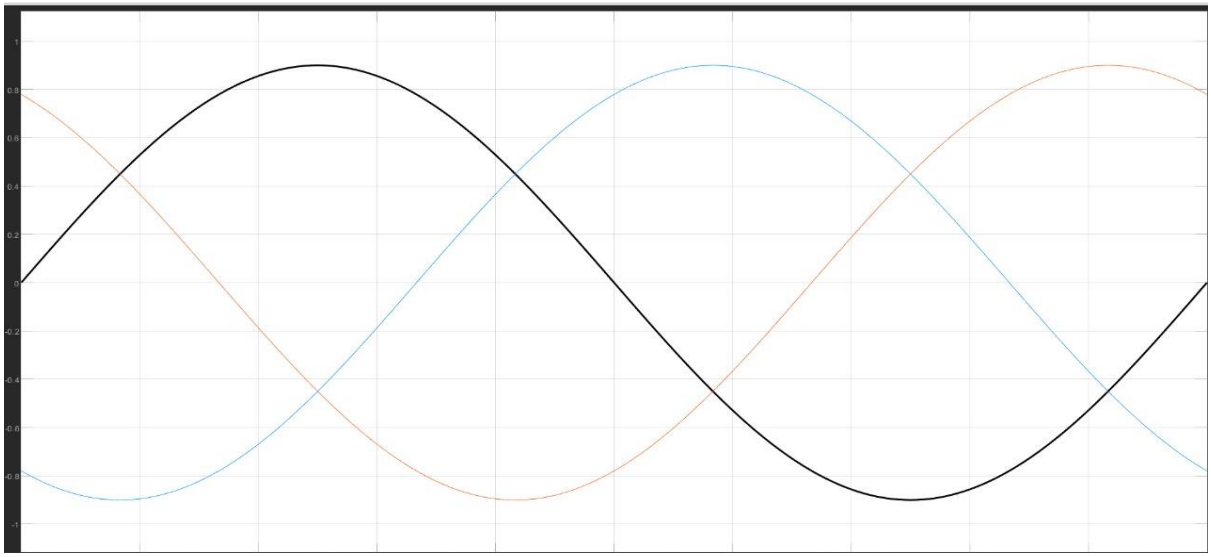
- **Troubleshoot and optimize:**
  - Identify and resolve any issues encountered during simulation.
  - Fine-tune parameters to enhance inverter performance.

RESULTS:

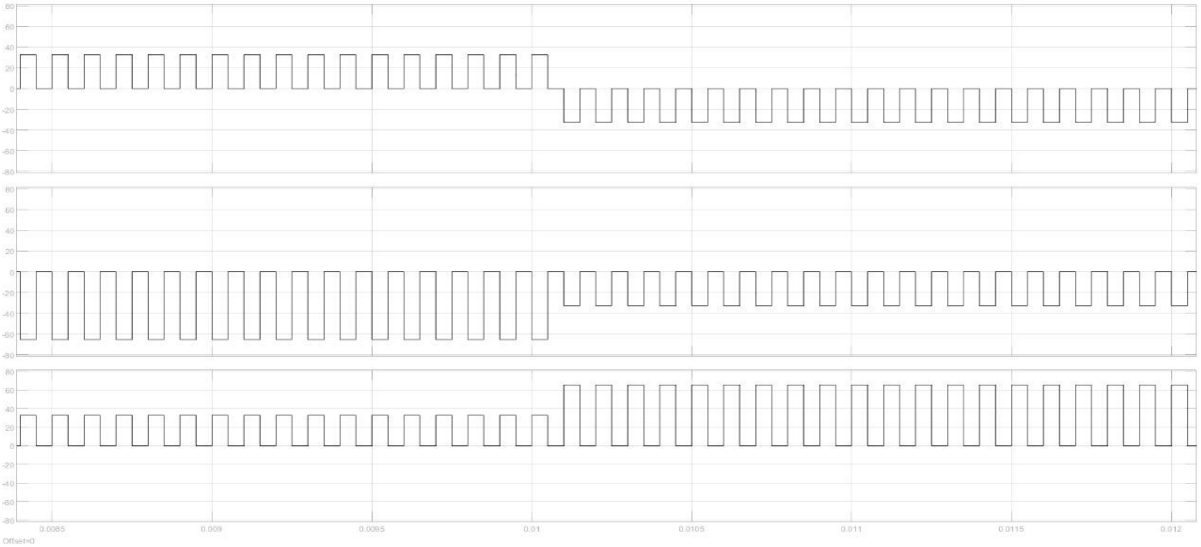
CIRCUIT:



INPUT:



OUTPUT:



CONCLUSION:

This lab is like playing with a virtual power box using MATLAB/Simulink. We learn how to make it work, what affects its performance, and how to fix things if they go wrong. It's a cool way to understand how these electronic gadgets do their job in the real world.