
EXPERIMENT NO: 05

Aim: To design and verify the truth table of different logic gates using NAND gate.

Objectives:

- i. Use of universal gate.
- ii. Realization of various gates using NAND gate

Apparatus Required: IC 7400 (NAND Gate), Bread Board, Power Supply, Connecting Wires, LED.

Theory:

Logic Gates: A logic gate is an elementary building block of a digital circuit. most logic gates have two inputs and one output. at any given moment, every terminal is in one of the two binary conditions: LOW (0) or HIGH (1), represented by different voltage levels. In most logic gates, the low state is approximately zero volts (0 V), while the high state is approximately five volts positive (+5 V).

AND, OR and NOT are basic gates. XOR and XNOR are derived gates. NAND and NOR gate are universal gates as any logic can be implemented using only NAND or only NOR.

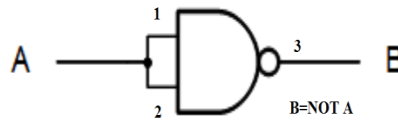


Figure 5.1: NOT Gate using NAND Gate

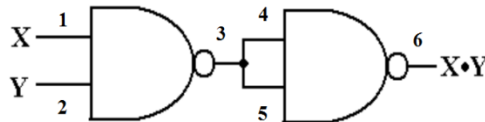


Figure 5.2: AND Gate using NAND Gate

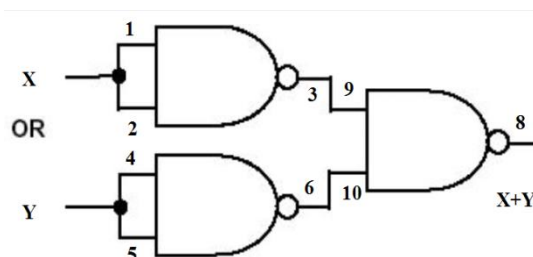


Figure 5.3: OR Gate using NAND Gate

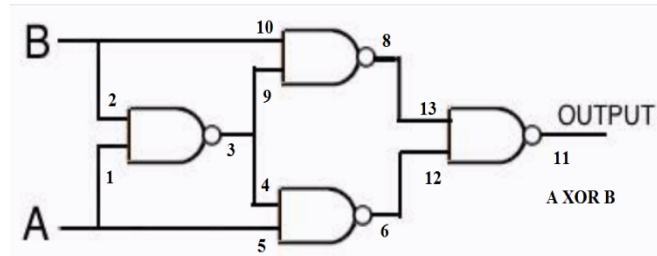


Figure 5.3: XOR Gate using NAND Gate

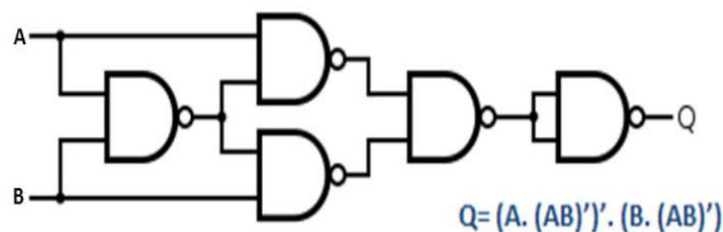


FIGURE 5.4: XNOR GATE USING NAND GATE

Experimental Procedure:

1. Turn the power (Trainer Kit) off during circuit implementation.
2. Connect the +5V and ground (GND) leads of the power supply to the power and ground bus strips on your breadboard.
3. Point all the chips in the same direction with pin 1 at the upper-left corner on breadboard. (Pin 1 is often identified by a dot or a notch next to it on the chip package).
4. Select a connection and place a piece of hook-up wire between corresponding pins of the chips on breadboard. It is better to make the short connections before the longer ones. Mark each connection of schematic in steps, so as not to try to make the same connection again at a larger stage.
5. If an error is made and not spotted before you turn the power on, turn the power off immediately before reconstructing the circuit.
6. Verify the truth table of given circuit.

Result: The truth tables of all gates AND, OR, NOT, XOR, XNOR, NAND and NOR gates have been verified. all gates have been realized by universal gates (NAND and NOR).

Result Analysis & Discussion: This section should be written individually by each student.

Inferences & Conclusion: This section should be written individually by each student.

Learning Outcomes:

1. Depth knowledge of basic gates ICs.
2. Learning the pin description of ICs.

Applications:

1. NOT gates are used in oscillators to generate clock signals.
2. AND gate is used in the measurement of frequency of a pulsed waveform.
3. EX-OR gates are used in parity generation, checking units and comparators.

Precautions:

1. Turn the power off before making any connection.
2. Make connections carefully.