EEE-1212:Digital Logic Design Lab

1st Year 2nd Semester
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Experiment Number: 03

Name of the Experiment:

a)Verification of X-OR gate.
b)Realization of X-NOR gate using only basic gates

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Experiment name:

3. a) Verification of X-OR gate.

3. b) Realization of X-NOR gate using only basic gates

Objectives:

(a) The objective for this lab is to understand the X-OR and X-NOR gates . To study the truth tables of X-OR gate and X-NOR gates.

(b) To verify the X-NOR gate using only basic gates (OR,AND, NOT gates) . and compare the truth table of this circuit with the X-NOR gate.

Theory:

Logic gates are electronic circuits which perform logical functions on one or more inputs to produce one output. There are various kinds of logic gates. When all the input combinations of a logic gate are written in a series and their corresponding outputs written along them, then this input/ output combination is called Truth Table. AND ,OR , NOT Gates are called primary logic gates. These gates are called are primary gates because any kinds of gates can be implemented by these gates. NAND ,NOR gates are called secondary logic gates. Two special logic circuits that occur quite often in digital systems are called exclusive-OR(X-OR) and exclusive-NOR(X-NOR) circuits. These two gates can also be implemented by the basic gates.

AND Gate: The AND gate is an electronic circuit that gives a high output (1) only if all its inputs are high otherwise it gives low output(0). A dot (.) is used to show the AND operation i.e. A.B.

OR Gate: The OR gate is an electronic circuit that gives a high output (1) if **one or more** of its inputs are high otherwise it gives low output(0). A plus (+) is used to show the OR operation.

NOT Gate: The NOT gate is an electronic circuit that produces an inverted version of the input at its output. It is also known as an inverter. If the input variable is A, the output is known as NOT A. That means if it’s input is 1 it’s output is 0 ,if it’s input is 0 it’s output is 1.

X-OR Gate: The X-OR gate is an electronic circuit that produces a high output if two inputs are at different levels otherwise it produces a low output . A $\oplus$ sign is used to show the X-OR operation .

X-NOR Gate: The X-NOR gate is an electronic device that produces a high output whenever two inputs are at the same level otherwise it produces a low output. Actually it inverts the output of X-OR gate.

Instruments:

i) A trainer board
ii) IC(s) IC-7408,IC-7432,IC-7404,IC-7486
iii) Connecting wires.

Procedure (a):

i) At first we placed the integrated circuit with X-OR gate(IC-7486) on a breadboard properly. All of these components is placed across the gap in the center of the breadboard.
ii) Then we connected the inputs of the logic gate to the logic sources and its output to the logic indicator.
iii) And constructed the circuits, one at a time, on a breadboard with switches and an LED. Experimentally verified the truth tables for X-OR gate. A and B are switches. The output for each logic gate will be on an LED. (LED Off = 0, LED On = 1).
iv) Gave biasing to the ICs with the VCC(5 volt) and GND(0 volt), and do necessary connections according to the circuit diagram shown below.
v) For various input combinations we observe the output for each one is applied.

Procedure (b):

i) At first we placed the integrated circuit with NOT gate(IC-7400) then AND gate(IC-7408) and then OR gate(IC-7432) on a breadboard properly. All of these components is placed across the gap in the center of the breadboard.

ii) Then we connected the inputs of the logic gate to the logic sources and its output to the logic indicator.

iii) And constructed the circuits, one at a time, on a breadboard with switches and an LED. Experimentally verified the truth tables for X-OR gate. A and B are switches. The output for each logic gate will be on an LED. (LED Off = 0, LED On = 1).

iv) Gave biasing to the ICs with the VCC (5 volt) and GND(0 volt), and do necessary connections according to the circuit diagram shown below.

v) For various input combinations we observe the output for each one is applied.

Result (a):

IC and Truth Table:

IC No: 7486

Logic Gate:

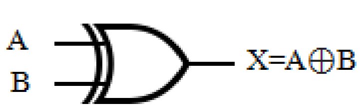

Fig: X-OR Gate

Truth table:

Input		Output
A	B	X
0	0	0
0	1	1
1	0	1
1	1	0

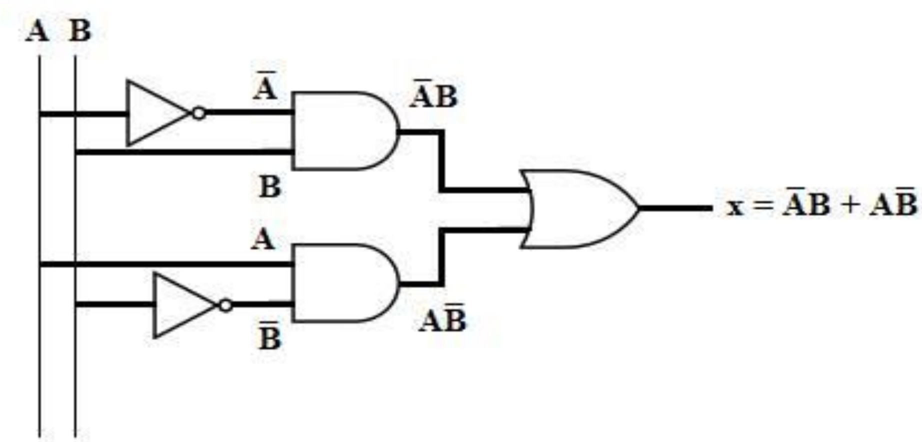

Fig: X-OR gate using only basic gates

Result(b):

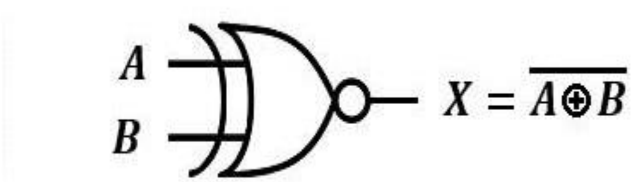

Fig: X-NOR Gate

Truth Table for X-NOR Gate

Input		Output
A	B	X
0	0	1
0	1	0
1	0	0
1	1	1

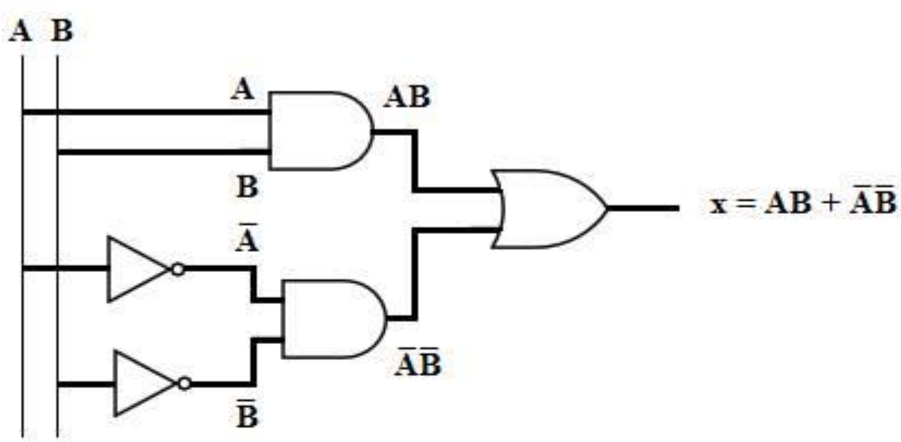

Fig: X-NOR Gate using only basic gates

Truth Table for the following circuit:

A	B	$\bar{A}$	$\bar{B}$	A.B	$\bar{A}.\bar{B}$	A.B+$\bar{A}.\bar{B}$
0	0	1	1	0	1	1
0	1	1	0	0	0	0
1	0	0	1	0	0	0
1	1	0	0	1	0	1

From the truth table we can see that the output of this truth table is same the output of the truth table of X-NOR gate.

Discussion:

In this experiment we worked with IC(s) and verified the truth table of X-OR gates and truth table of X-NOR gate by using only basic gates. But we faced some problems when we did the experiment. Some of them are as follow:

i) In this experiment we used three IC(s) at a time. So we need too many wires to connect this gates with each others. At first we faced some problems to do this work .
ii) Sometimes we were given some IC(s) whose aren't working properly. We know that IC-7408 has 4 AND gates. But two of them didn't give proper output. We can't find out the problem what is the problem with this gates. That's why we need a little bit more to complete the experiment.
iii) Besides this the breadboard we took was not working properly.

But we figured them out and completed the experiment successfully .