

Experiment No. 03

Name of the experiment: Simplification of Boolean function.

Objectives: To simplify the Boolean expression and to build the logic circuit. Given a Truth table to derive the Boolean expressions and build the logic circuit to realize it.

Components Required:

IC 7400, IC 7408, IC 7432, IC 7406, IC 7402, IC 7404, IC 7486

Theory:

Canonical Forms (Normal Forms): Any Boolean function can be written in disjunctive normal form (sum of min-terms) or conjunctive normal form (product of max-terms). A Boolean function can be represented by a Karnaugh map in which each cell corresponds to a min-term. The cells are arranged in such a way that any two immediately adjacent cells correspond to two min-terms of distance 1. There is more than one way to construct a map with this property.

Truth Table:

1) $Y = \bar{A}\bar{B}C\bar{D} + \bar{A}BC\bar{D} + ABC\bar{D} + A\bar{B}C\bar{D} + A\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}D + A\bar{B}CD$

AB

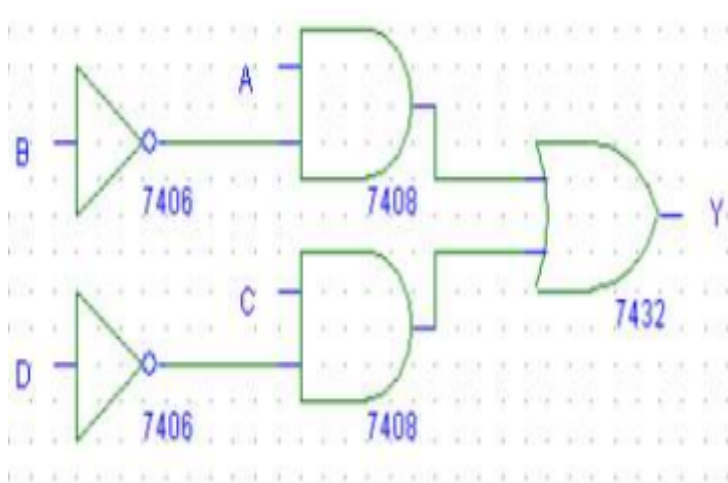
			1
			1
			1
1		1	1

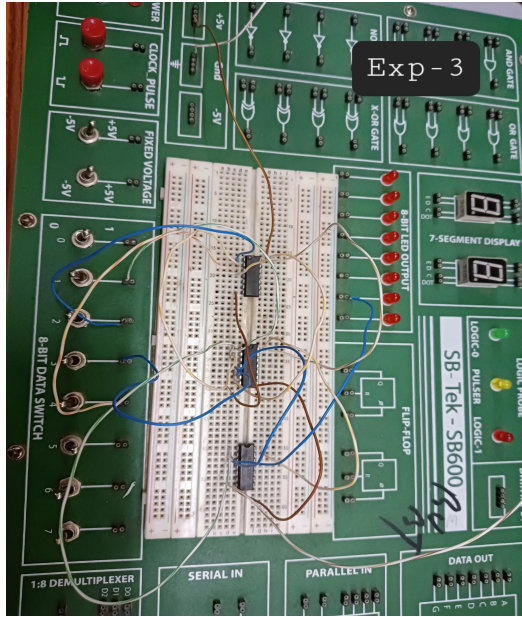
After simplifying using K-Map method we get $Y = A\bar{B} + C\bar{D}$

A	B	C	D	Y
0	0	0	0	0
0	0	0	1	0
0	0	1	0	1
0	0	1	1	0
0	1	0	0	0

0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0

Logic Diagram:





Procedure:

1. Check the components for their working.
2. Insert the appropriate IC into the IC base.
3. Make connections as shown in the circuit diagram.
4. Provide the input data via the input switches and observe the output on output LEDs

Discussion & Conclusion:

In this experiment, there are many topics to be learned. The first is how different Boolean Expressions can affect the outcome of a circuit. This lab also demonstrated that one can use Boolean Algebra to solve and predict the circuit outcomes. It is verified when the circuit is measured since the expected and prediction almost always are exactly the same.