

EX: NO: 1**DATE:****Implementation of Boolean expression using logic gates.****AIM:**

To verify the following Boolean expression using digital logic gates.

Apparatus Required:

SI. No.	COMPONENT	SPECIFICATION	QTY
1.	NOT GATE	IC 7404	1
2.	AND GATE	IC 7408	1
3.	OR GATE	IC 7432	1
4.	NAND GATE	IC 7400	1
5.	NOR GATE	IC 7402	1
6.	DIGITAL IC TRAINER KIT	-	1
7.	PATCH CORD	-	-

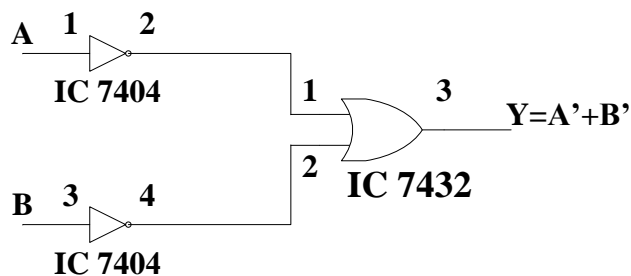
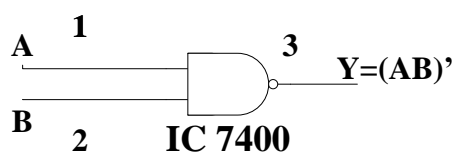
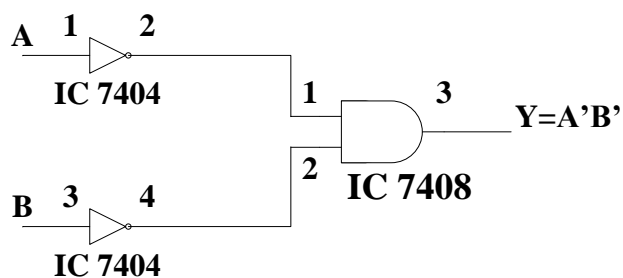
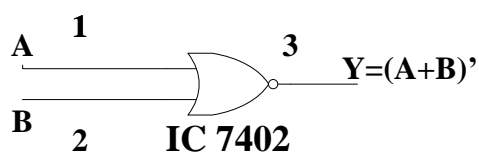
Theory:**Boolean expression****DeMorgan's Theorem:**

a) $\underline{AB' = A' + B'}:$

The complement of a product of the variables is equal to the sum of complements of the variables.

b) $\underline{(A+B)' = A'B'}:$

The complement of a sum of the variables is equal to the product of complements of the variables.

Logic Diagram:**Verification of DeMorgans Theorem:** **$(AB)' = A' + B'$:** **$(A+B)' = A'B'$:****Truth Table for $(AB)' = A' + B'$:**

A	B	$(AB)'$	$A' + B'$
0	0	1	1
0	1	1	1
1	0	1	1
1	1	0	0

Truth Table for $(A+B)' = A'B'$:

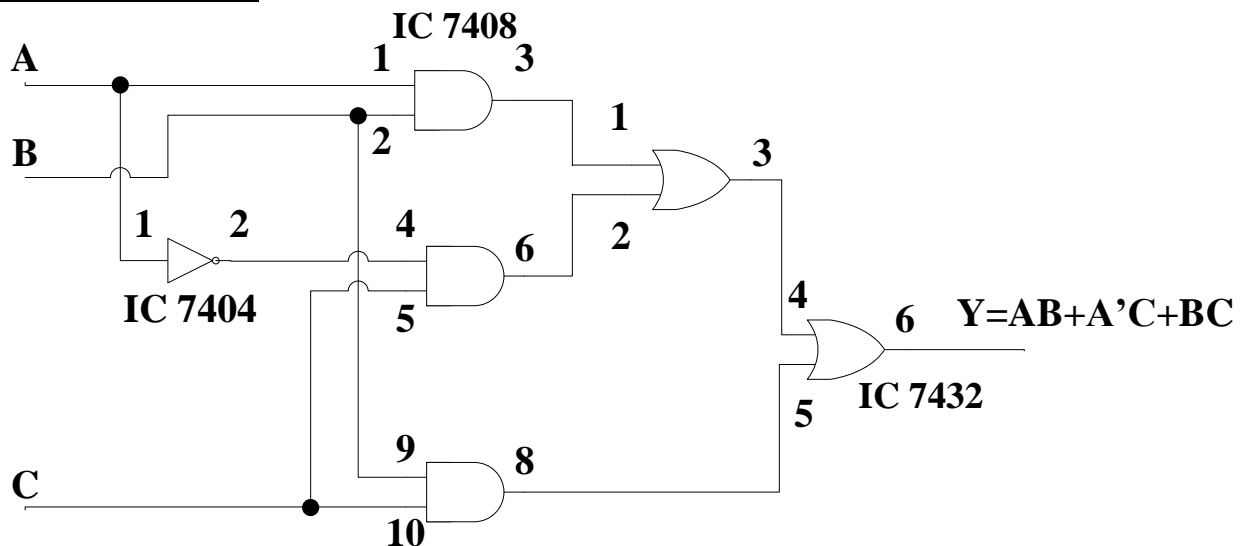
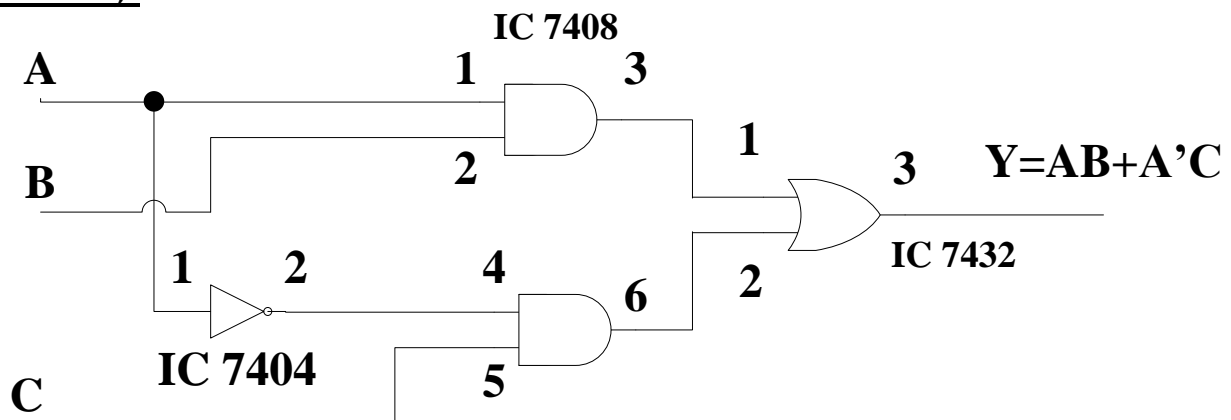
A	B	$(A+B)'$	$A'B'$
0	0	1	1
0	1	0	0
1	0	0	0
1	1	0	0

Consensus Theorem:

In the simplification of Boolean expression, an expression of the form $AB+A'C+BC$ the term BC is redundant and can be eliminated to form the equivalent expression $AB+A'C$. By consensus theorem,

$$AB+A'C+BC = AB+A'C$$

The key to recognize the consensus term is to first find a pair of terms, one of which contains a variable and the other contains its complement. Now we have to find the third term which should contain the remaining variables from pair of terms eliminating selected variable and its complement.

Logic Diagram:**Consensus Theorem - $(AB + A'C + BC) = (AB+A'C)$:** **$(AB + A'C + BC)$:** **$(AB+A'C)$:**

Truth Table for $(AB + A'C + BC) = (AB+A'C)$:

A	B	C	$(AB+A'C+BC)$	$(AB+A'C)$
0	0	0	0	0
0	0	1	1	1
0	1	0	0	0
0	1	1	1	1
1	0	0	0	0
1	0	1	0	0
1	1	0	1	1
1	1	1	1	1

Procedure:

1. Verify the gates.
2. Make the connections as per the circuit diagram.
3. Switch on VCC and apply various combinations of input according to truth table.
4. For all input combinations the outputs are verified with the truth table.

Result:

Thus the Boolean theorems are verified with its truth table using logic gates.