Practical No 2

Simplify Given Boolean Expression and Realize It.

Aim: To Simplify given Boolean expression and realize it

Theory:

To implement any logic circuit, we have a logic expression. These logical expressions are available from the truth table.

By using Boolean logic, we can reduce the logic expression, so that we require minimum number of gates for the same design.

For reducing the Boolean expression, we must know the laws and rules of Boolean algebra, the following table shows some of the laws of Boolean algebra which can be used to reduce the Boolean expression and subsequently the number of gates while designing the circuit.

SR. No.	Laws	ANDing	ORing
1	Identity	1.A=A	0+A=A
2	Null	0.A=0	1+A=1
3	Idempotent	A.A=A	A+A=A
4	Inverse	A.A’=0	A+A’=1
5	Commutative	A.B=B.A	A+B=B+A
6	Associative	A.(B.C)=(A.B).C	A+(B+C)=(A+B)+C
7	Distributive	A+(B.C)=A.B+A.C	A.(B+C)=(A.B)+(A.C)
8	DeMorgan’s	(A.B)’=A’+B’	(A+B)’=A’.B’

Using the above laws many expressions can be reduced, we now use the simulator to verify the following identities.

$\bar{A}$

1) $A + \bar{A}.B = A + B$
2) (A + B).(A+C) = A + B . C

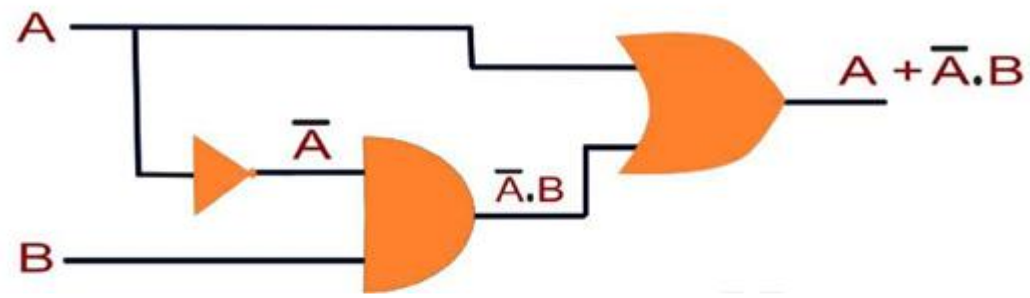
In the first expression, the LHS requires 3 gates for circuit realization using Boolean algebra this expression gets reduced, the equivalent expression on the RHS requires only one gate.

The LHS of second expression requires 3 gates, while the equivalent expression on the RHS requires only 2 gates for circuit realization.

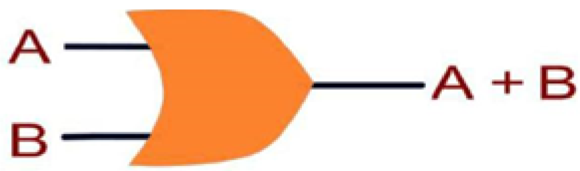
We use a simulator to verify both the above expressions.

Expression – 1: $\mathbf{A + \bar{A}.B = A + B}$

LHS Circuit:



RHS Circuit:



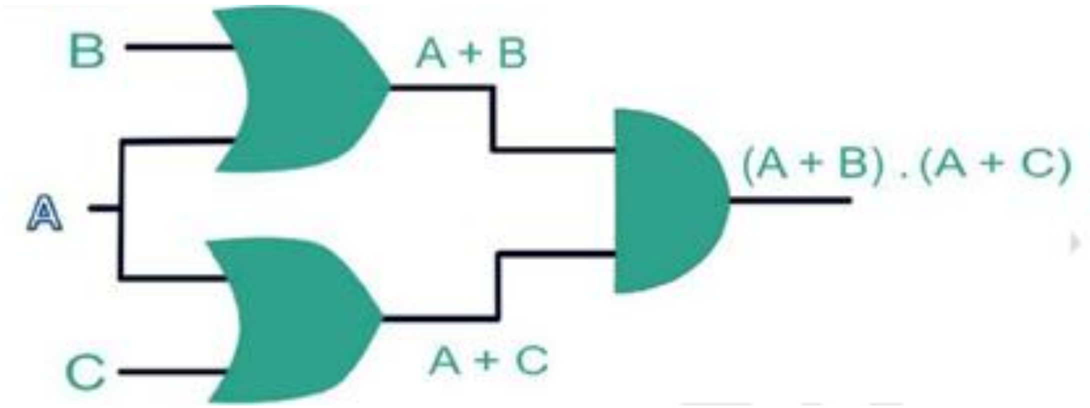
Truth table Verification:

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

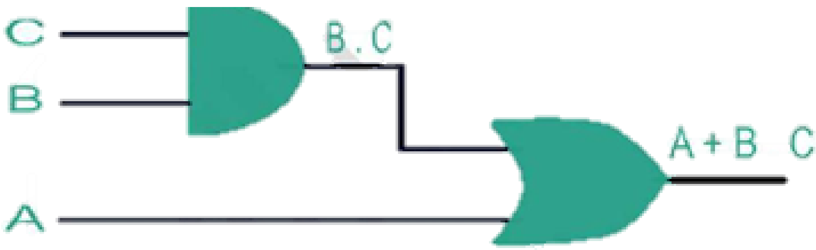
Hence the given expression is verified and proves the equivalence.

<u>Expression – 1:</u> **(A + B) . (A+C) = A + B . C**

LHS Circuit:



RHS Circuit:



Truth table Verification:

A	B	C	LHS (A + B) . (A + C)	RHS A + B . C
0	0	0	0	0
0	0	1	0	0
0	1	0	0	0
0	1	1	1	1
1	0	0	1	1
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

Hence the given expression is verified and proves the equivalence.