Practical 2

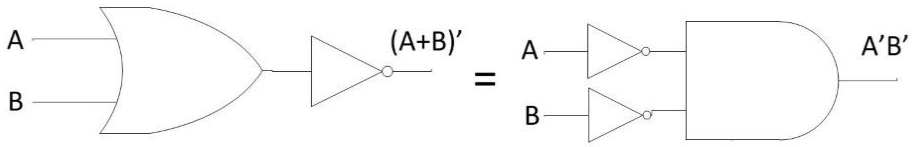
Aim: Implement the given Boolean expressions using minimum number of gates.

1. De-Morgan's Theorem:-

- **De-Morgan's Theorem 1:**

The complement of the sum of two or more variables is equal to the product of the complement of the variables.

(A+B)' = A'.B'

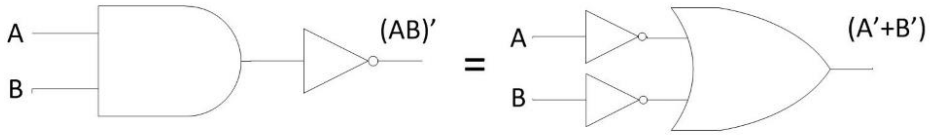


A	B	A + B	(A + B)'	A'	B'	A'.B'
0	0	0	1	1	1	1
0	1	1	0	1	0	0
1	0	1	0	0	1	0
1	1	1	0	0	0	0

- **De-Morgan's Theorem 2:**

The complement of the product of two or more variables is equal to the sum of the complements of the variables.

(A.B)' = A' + B'

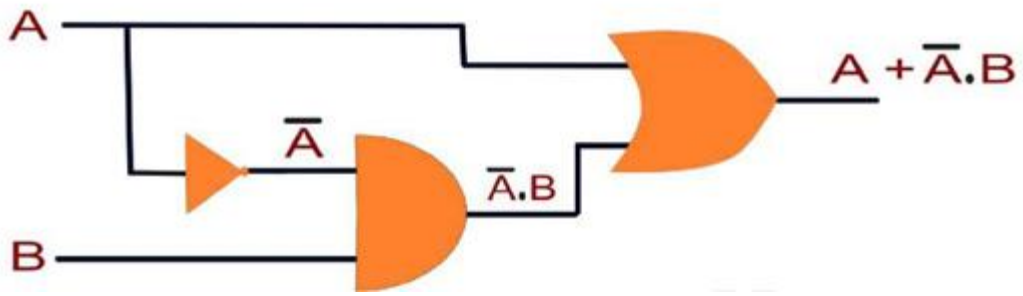


INPUTS		OUTPUTS				
B	A	A•B	$\overline{A \cdot B}$	$\overline{A}$	$\overline{B}$	$\overline{A} + \overline{B}$
0	0	0	1	1	1	1
0	1	0	1	0	1	1
1	0	0	1	1	0	1
1	1	1	0	0	0	0

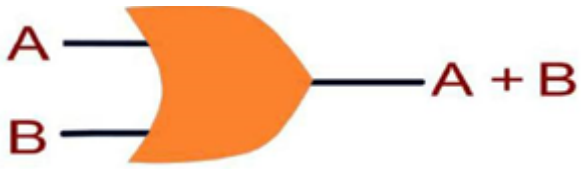
2. **Implement the given Expression using minimum number of gates:-**

Expression – 1: $A + A' . B = A + B$

LHS Circuit:



RHS Circuit:



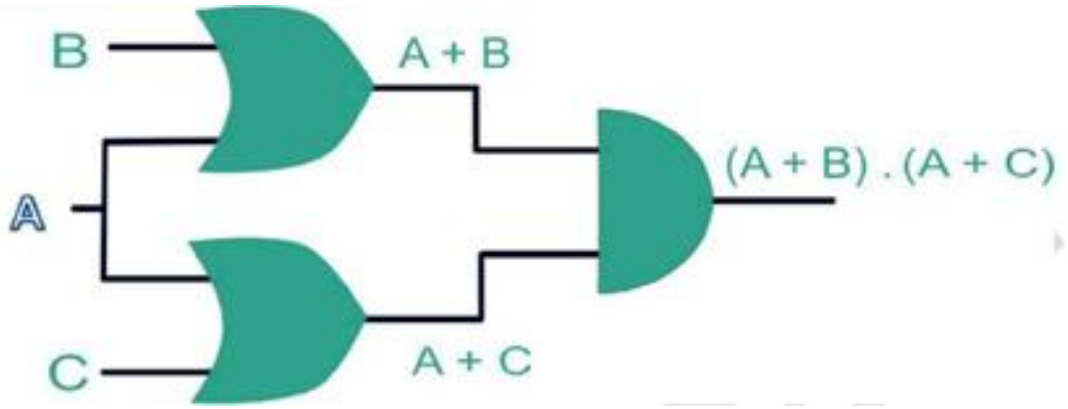
Truth table Verification:

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

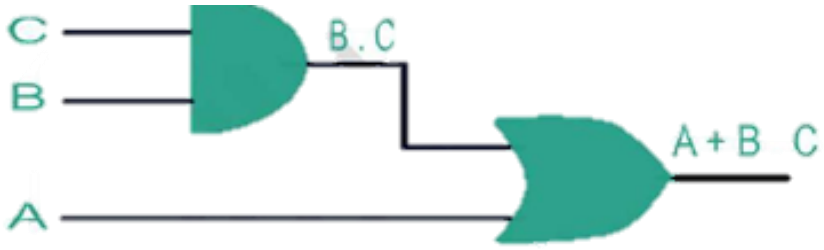
Hence the given expression is verified and proves the equivalence.

Expression – 2: (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.

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'