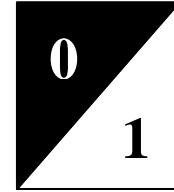




**ISTANBUL TECHNICAL  
UNIVERSITY**



**COMPUTER ENGINEERING**

**DIGITAL CIRCUITS LABORATORY  
EXPERIMENT REPORT**

**EXPERIMENT NO: 1**

**EXPERIMENT NAME: BOOLEAN ALGEBRA**

**EXPERIMENT DATE : 01.03.2013**

**GROUP NO: 6**

**STUDENTS WHO DID THE EXPERIMENT:**

| Student no | Name    | Surname |
|------------|---------|---------|
| 040100113  | MUSTAFA | UÇAR    |
| 040100117  | TUĞRUL  | YATAĞAN |
| 040100124  | EMRE    | GÖKREM  |

**ASSISTANT NAME WHO ASSISTED THE  
EXPERIMENT: NAGEHAN İLHAN**

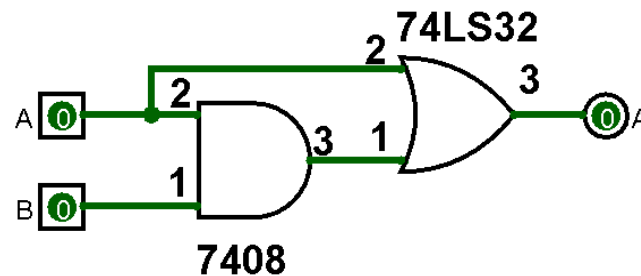
**Aim:** Proving the axioms and theorems of Boolean algebra is the goal of the experiment.

## Conclusion:

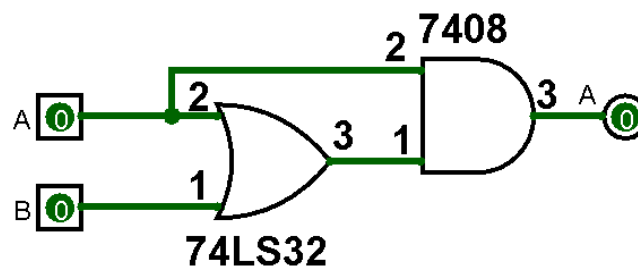
### Experiment #1

From equation  $A + A \cdot B = A$ , it is expected that output will be only depend on input A. Input B won't change the output value. Here is the result table from this experiment;

| A | B | Output |
|---|---|--------|
| 0 | 0 | 0      |
| 0 | 1 | 0      |
| 1 | 0 | 1      |
| 1 | 1 | 1      |



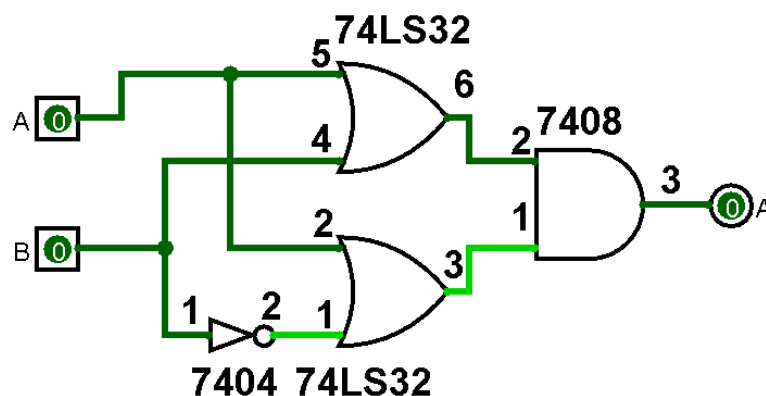
From equation  $(A+B) \cdot (A+B') = A$ , same results are expected and obtained.



### Experiment #2

Dual of the equation  $A + A \cdot B = A$  is  $A \cdot (A + B) = A$ . Again, it is expected that output will be only depend on input A. Here is the result table from this experiment;

| A | B | Output |
|---|---|--------|
| 0 | 0 | 0      |
| 0 | 1 | 0      |
| 1 | 0 | 1      |
| 1 | 1 | 1      |

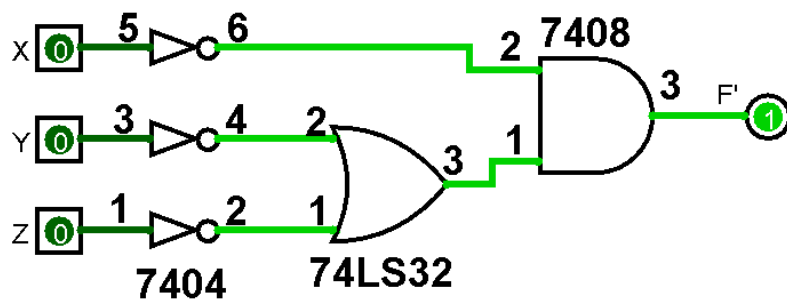
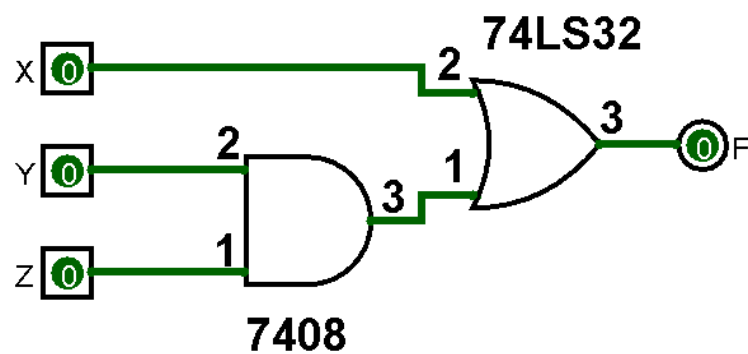


### Experiment #3

$F' = X' \cdot (Y' + Z')$  1 value from X input will make F automatically 0.

Otherwise output F will be depending on Y and Z values. Here is the result table from this experiment;

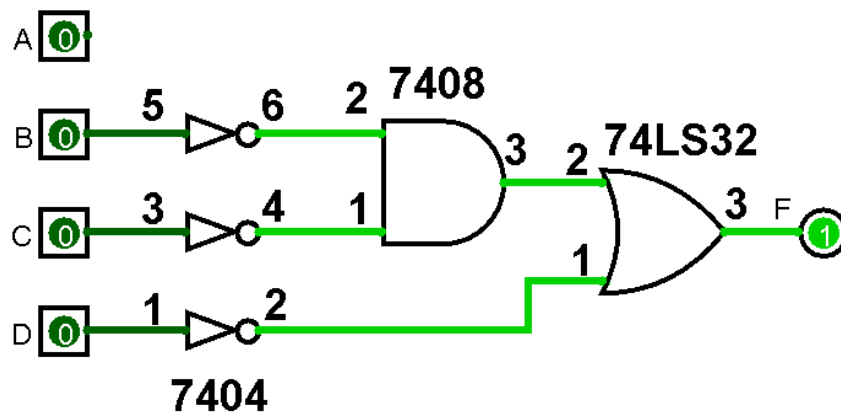
| X | Y | Z | F' |
|---|---|---|----|
| 0 | 0 | 0 | 1  |
| 0 | 0 | 1 | 1  |
| 0 | 1 | 0 | 1  |
| 0 | 1 | 1 | 0  |
| 1 | 0 | 0 | 0  |
| 1 | 0 | 1 | 0  |
| 1 | 1 | 0 | 0  |
| 1 | 1 | 1 | 0  |



## Experiment #4

$F(A,B,C,D) = A'.B'.D' + B.C'.D' + AB'D' + BC'D + BCD'$  is reduced to  
 $F(A,B,C,D) = D' + B'C'$  It shows that F is not affected by input A. Here is the truth table from this equation;

| A | B | C | F |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 0 |



## Answer of 3<sup>rd</sup> Question

This problem is caused by wrong usage of de Morgan's Law. Operation priority and parenthesis are used wrong.

The right way is:

$$F(A,B,C,D) = (A + (B.C) + D)'$$

$$F(A,B,C,D) = A'.(B.C)'.D'$$

$$F(A,B,C,D) = A'.(B' + C').D'$$