BOOLEAN ALGEBRA

OBJECTIVE:

- To verify experimentally some of the Boolean theorems.

THEORY:

Boolean algebra is the mathematics we use to analyze digital gates and circuits. We can use these "Laws of Boolean" to both reduce and simplify a complex Boolean expression in an attempt to reduce the number of logic gates required. *Boolean algebra* is therefore a system of mathematics based on logic that has its own set of rules or laws which are used to define and reduce Boolean expressions. The combinational logic circuits do not have the ability to memorize their past. The result is that combinational logic circuits have no feedback and any changes to the signals being applied to their inputs will immediately have an effect at the output.

PROCEDURE:

Boolean Theorems: Following Boolean theorems table mount a *7404 IC*, a 7408 IC, and a 7432 IC on the circuit board. Connect *VCC* to *+5 V* and GND to power ground on each IC. To verify each theorem, connect the circuit for that theorem. Monitor the output with logic probe and also with LED.

EQUIPMENT / REQUIREMENT:

- 7404IC
- 7408 IC
- 7432 IC
- LED
- 0-5 VOLT DC Power Supply.

BOOLEAN THEORAM:

Idem potency	X + X = X X • X = X
Redundancy Law	*X+X.Y*
Double negation	$\bar{\bar{X}}$ = X
Commutative Law	X + Y = Y+X
Associative laws	X + (Y + Z) = (X + Y) + Z
Distributive laws	X (Y + Z) = XY + XZ
Absorption	X + XY = X

De Morgan's theorem	(X1 + X2 + X3…..) = X1 • X2 • X3……. (X1 • X2 • X3…..) = X1 + X2 + X3…….

RULES OF BOOLEAN ALGEBRA

1. $X+0=X$
2. $X+1=1$
3. $X.0=0$
4. $X.1=1$
5. $X+X=X$
6. $X+\overline{X}= X$
7. $X.X=X$
8. $X.\overline{X}= 0$
9. $\overline{\overline{X}}.X=X$
10. $X+XB=A$
11. $X+X\overline{B}=X+B$
12. $(X+B)(X+C)=X+BC$

Verify circuit by using IC's on breadboard.

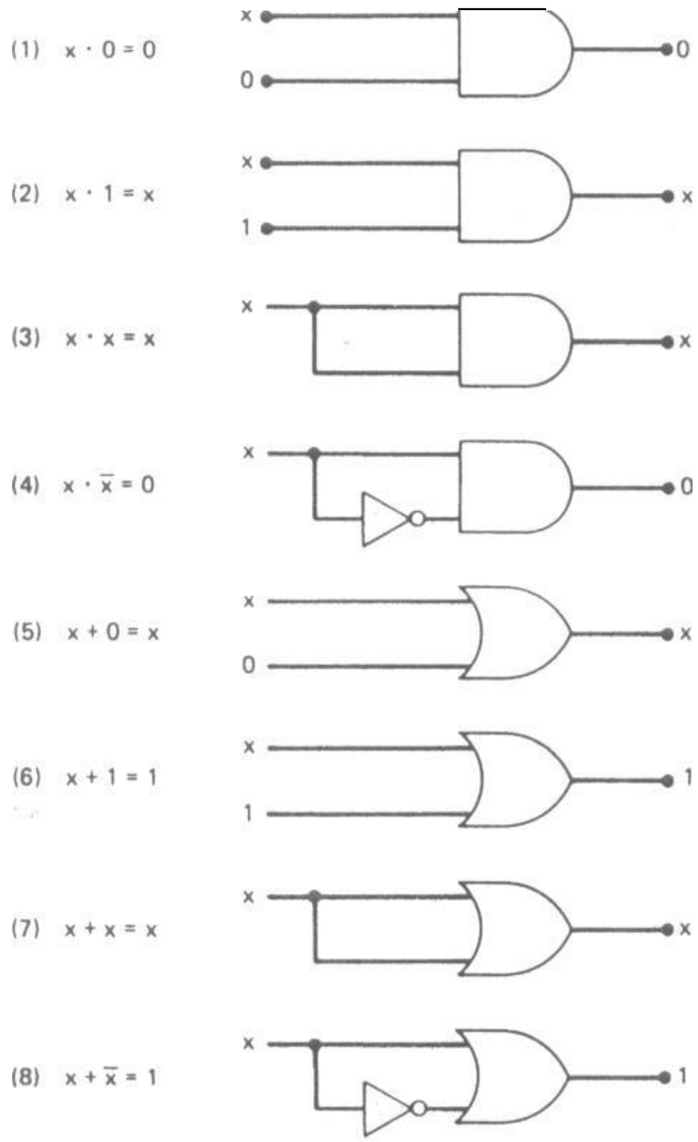
X	X+0	X+1=1	X.0=0	X.1=1	X+X=X	X+X= X	X.X= X	X.X= 0
0	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**
1	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**0**

Table 4.1

x	y	Z	X + (Y + Z)	X + XY	*X+X.Y*	x (x + y)
0	**0**	**0**	**0**	**0**	**0**	**0**
0	**1**	**0**	**1**	**0**	**0**	**0**
1	**0**	**1**	**1**	**1**	**1**	**1**
1	**1**	**1**	**1**	**1**	**1**	**1**

Table 4.2

CIRCUIT IMPLEMENTATION:



Task#1: Construct Circuit for Redundancy Law

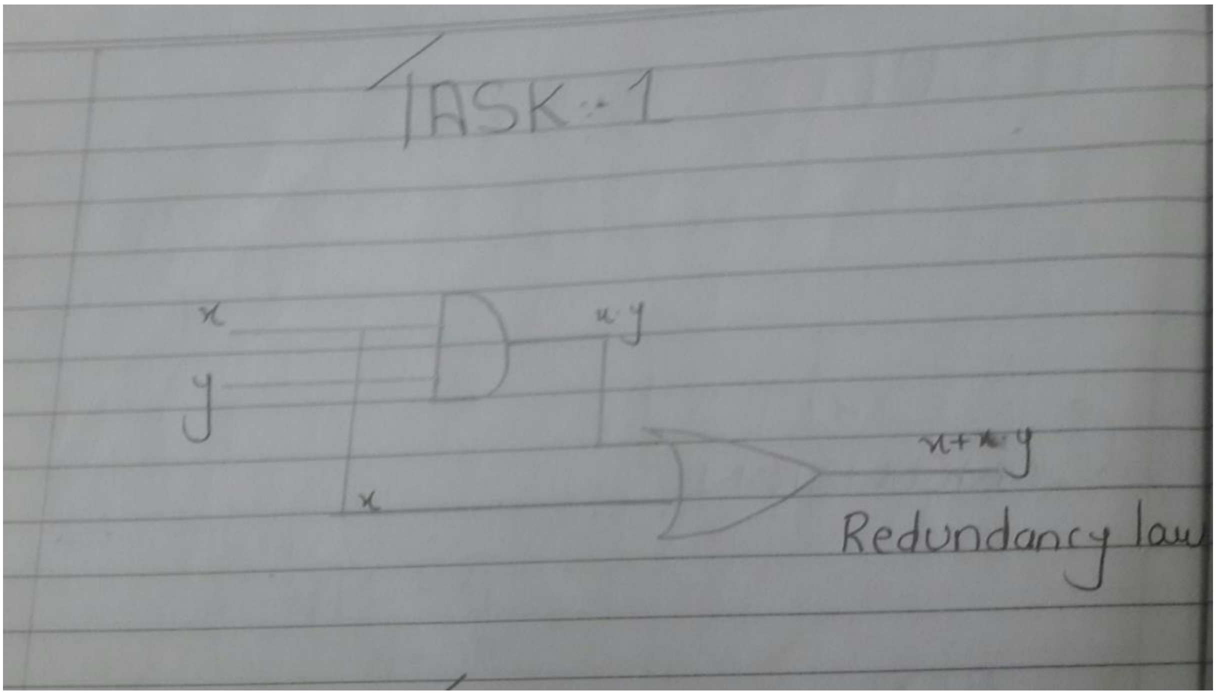
Task#2: Draw logic diagram for x (x + y) and also find out the output x (x + y) =?

Task#3: Construct the circuit for Associative & Absorption theorems and observe the Output.

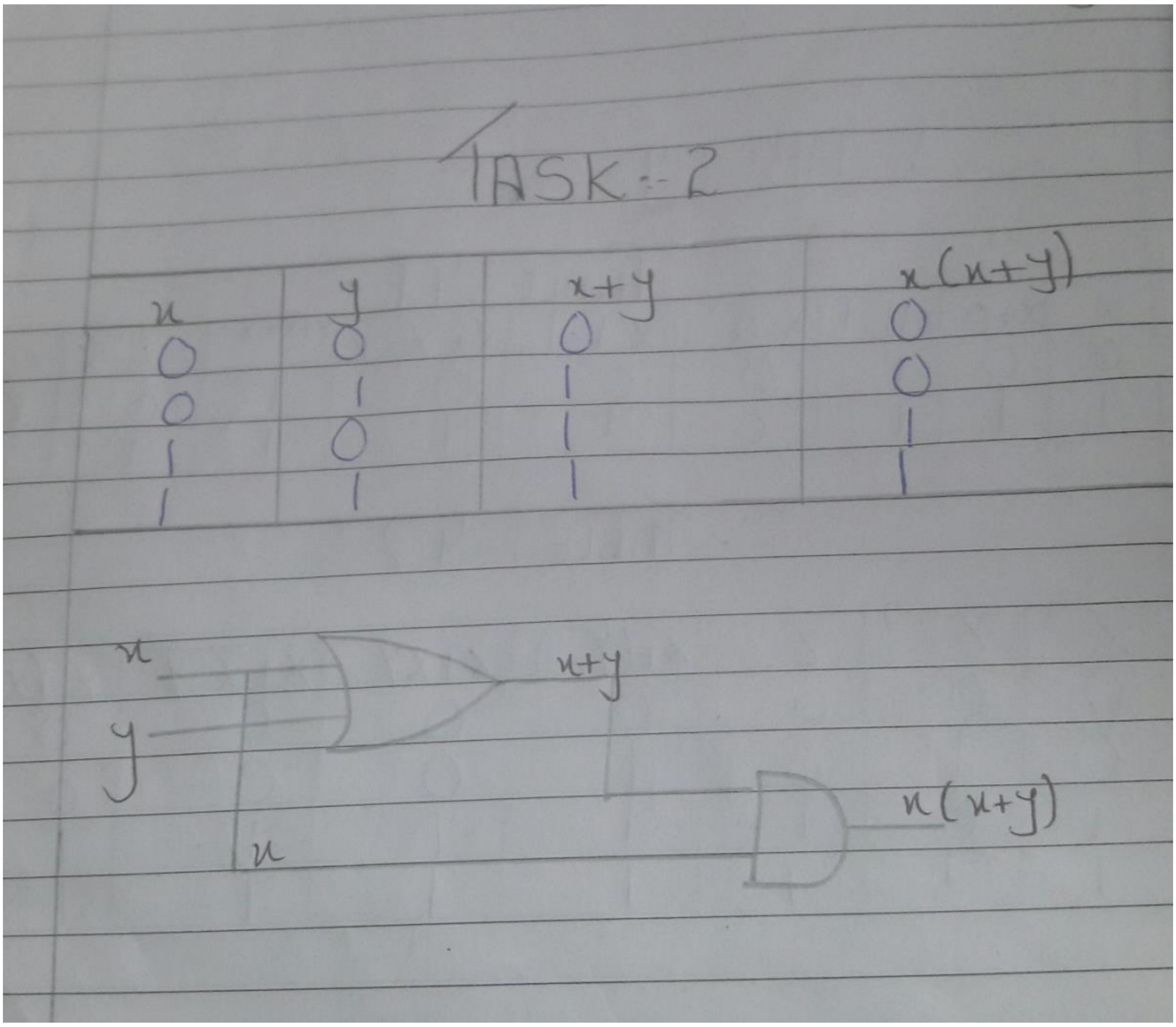
CONCLUSION:

BOOLEAN ALGEBRA IS A BRANCH OF ALGEBRA IN WHICH THE VALUES OF THE VARIABLES ARE THE TRUTH VALUES TRUE AND FALSE USUALLY DENOTED BY 1 AND 0 RESPECTIVELY

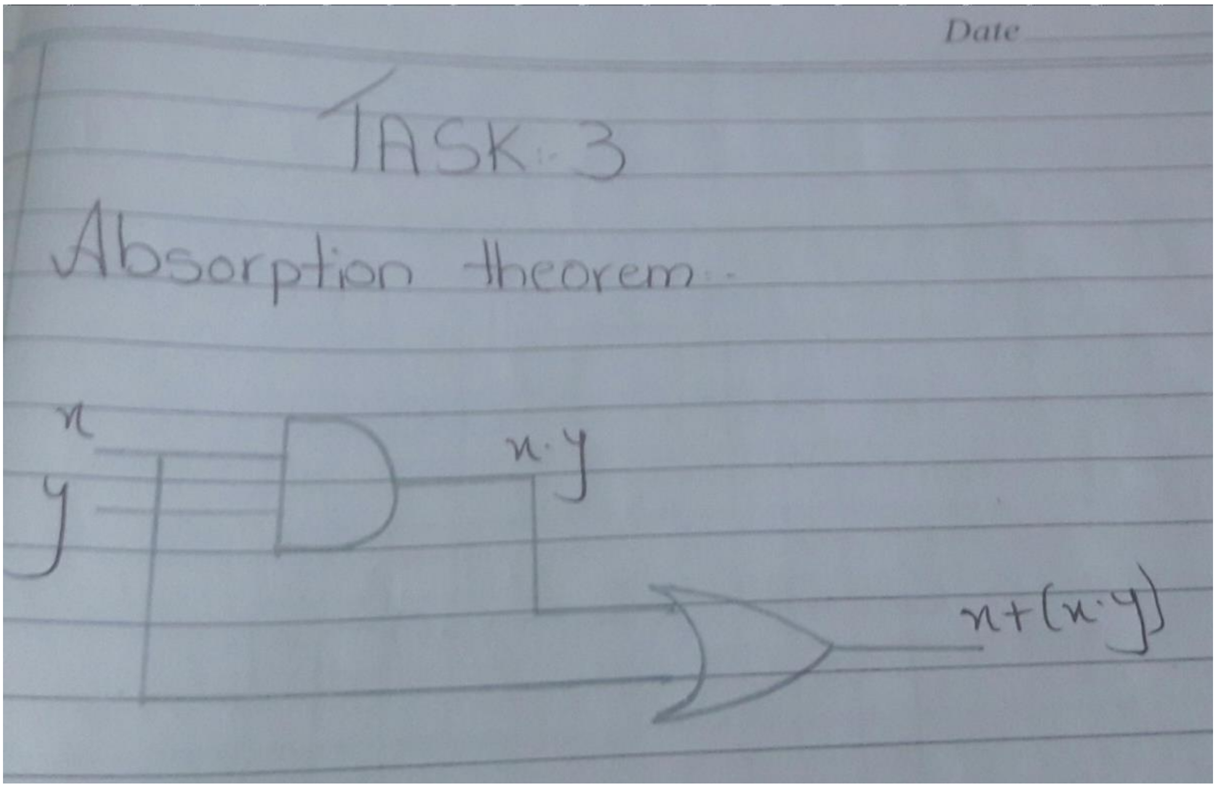
TASK 1:

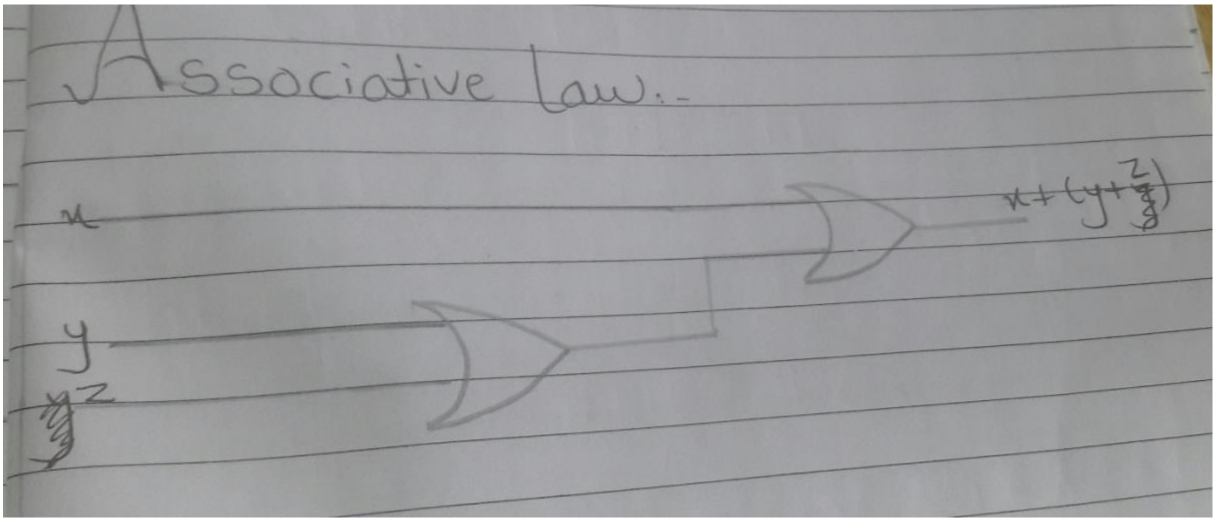


TASK 2:



TASK 3:




Associative law:-
x
y
z
x+(y+z)