EXPERIMENT - 6

OBJECTIVE

Study of Demorgon's Theorem

THEORY

There are actually two theorems that were put forward by De-Morgon. On the basis of De-Morgon's laws much boolean algebra are solved. Solving these types of algebra with De-Morgons theorem has a major application in the field of digital electronics. De-Morgons theorem can be stated as follows:-

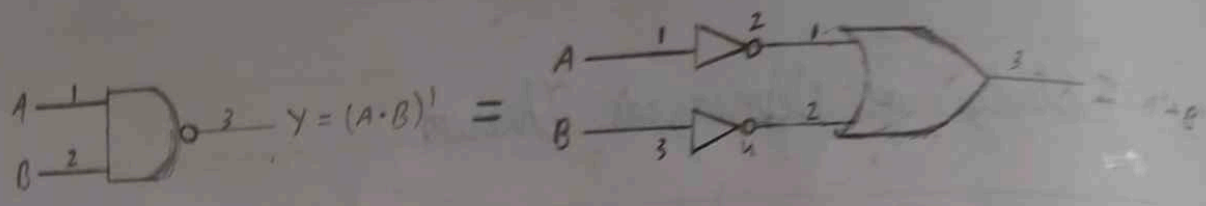
Theorem 1:
The compliment of the product of two variables is equal to the sum of the compliment of each variable.
Thus according to De-Morgans laws or De-Morgon's theorem if A & B are the two variables or boolean numbers. Then accordingly

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

Theorem 2:
The complement of the sum of two variables is equal to the product of the complement of each variable.
Thus according to De-Morgon's theorem if A & B are the two variables then

$$(A+B)' = A' \cdot B'$$

Theorem-1: $(A \cdot B)' = A' + B'$



LHS: $(A \cdot B)'$

A	B	A·B	Y = (A·B)'
0	0	0	1
0	1	0	1
1	0	0	1
1	1	1	0

RHS : $(A' + B')$

A	B	A'	B'	Z = A'+B'
0	0	1	1	1
0	1	1	0	1
1	0	0	1	1
1	1	0	0	0

EQUIPMENT NEEDED:

Component	Quantity
① IC 7400 2 input NAND gate	1
② IC 7432 2 input OR gate	1
③ IC 7404 NOT gate	1
④ IC 7402 2 input NOR gate	1
⑤ IC 7408 2 input AND gate	1

PROCEDURE:

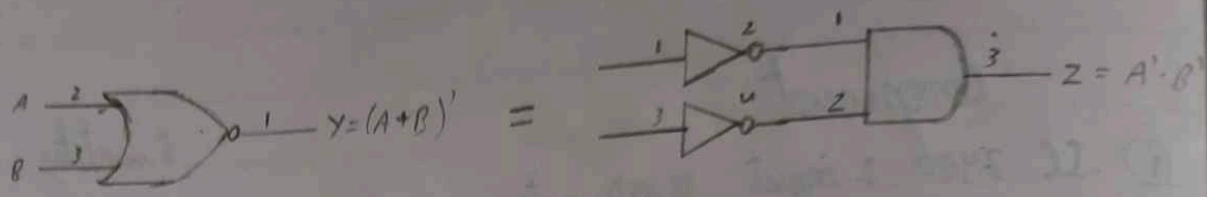
When switch is pressed it indicate switch is in HIGH position.
When switch is uppressed it indicate switch is in LOW position.

Theorem 1: $(A.B)' = A' + B'$

Left Hand Side: $(A.B)'$

1) Make connections on bread board as shown in figure
2) Connect +5v to pin 14 & GND to pin 7
3) Connect inputs A & B (i.e pin 1 & 2) to I0 & I1 of IO input switches.
4) Set the input switches S0 & S1 initially to LOW position
5) Connect output Y (i.e pin 3) to O0 of IO output LED indicator
6) Switch ON the power supply
7) Observe output on LED LO of 10 output LED indicator
8) Observe the output for different input combinations.

Theorem-2 : $(A+B)' = A' \cdot B'$



LHS : $(A+B)'$

A	B	A+B	Y=(A+B)'
0	0	0	1
0	1	1	0
1	0	1	0
1	1	1	0

RHS : $A' \cdot B'$

A	B	A'	B'	Z = A'·B'
0	0	1	1	1
0	1	1	0	0
1	0	0	1	0
1	1	0	0	0

Right Hand Side: $(A' + B')$

1) Make connections on bread board as shown in figure
2) Connect +5V to pin 14 & GND to pin 7
3) Connect inputs A & B (i.e pin 1 & 3) to I2 & I3 of IO input switches, respectively
4) Set the input switches S2 & S3 initially to LOW position.
5) Connect output Z (pin 3 of IC 7432) to O1 of IO output LED indicator.
6) Switch ON the power supply
7) Observe output on LED L1 of IO output LED indicator
8) Observe the output for different input combinations o

CONCLUSION:

From the truth tables, it is clear that Y=Z & hence De-Morgans Theorem 1 is verified.

PROCEDURE

When switch is pressed it indicate switch is in HIGH position
When switch is unpressed it indicates switch is on LOW position

Theorem-2: $(A+B)' = A' \cdot B'$

Left Hand Side: $(A+B)'$

1) Make connections on bread board as shown in figure
2) Connect +5V to pin 14 & GND to pin 7
3) Connect inputs A & B (i.e pin 2 & 3) to I0 & I1 of IO input switches, respectively.

4) Set the input switches S0 & S1 initially to LOW position
5) Connect output Y (i.e pin 1) to O0 of IO output LED indicator
6) Switch on power supply
7) Observe output on LED LO of IO output LED indicator.
8) Observe the output for different input combinations.

Right Hand Side: $(A' \cdot B')$

1) Make connections on bread board as shown in figure
2) Connect +5V to pin 14 & GND to pin 7
3) Connect inputs A & B (i.e I2 & I3) to I2 & I3 of IO input switches, respectively
4) Set the input switches S2 & S3 initially to LOW position
5) Connect output 2 (i.e pin 3) to O2 of IO output LED indicator.
6) Switch ON the power supply.
7) Observe output on LED L2 of IO output LED indicator.
8) Observe the output for different input combinations

CONCLUSION:

From the truth tables, it is clear that, Y=Z & hence De-Morgans Theorem 2 is verified.

Conclusion :

1) From the truth tables it is clear, that Y = Z & Demorgans theorem 1 is confirmed.

2) From the truth tables it is clear, that Y = Z & De-Morgans theorem 2 is confirmed.

Assessment of the Experiment / Assignment :

Timely Submission (07)	Presentation (06)	Understanding (12)	Total (25)	Signature of Teacher with date
07	06	11	24	14/10/24