

INDIAN INSTITUTE OF TECHNOLOGY
ROORKEE

DEPARTMENT OF PHYSICS



LAB MANUAL

**TO VERIFY DE-MORGAN'S
LAW**

De-Morgan's Laws

OBJECTIVES:

- To Verify De-Morgan's laws

Required Components and Equipment:

- IC numbers 7400, 7402, 7404, 7408, 7432
- BreadBoard.
- Connecting Wires

De-Morgan's Laws

Boolean algebra has postulates and identities. We can often use these laws to reduce expressions or put expressions in to a more desirable form. One of these laws is the De- Morgan's law.

De-Morgan's law has two conditions, or conversely, there are two laws called De-Morgan's Laws.

First Condition or First law:

The compliment of the product of two variables is equal to the sum of the compliment of each variable.

Thus according to De-Morgan's laws or De-Morgan's theorem if A and B are the two variables or Boolean numbers. Then accordingly

$$\overline{A \cdot B} = \overline{A} + \overline{B}$$

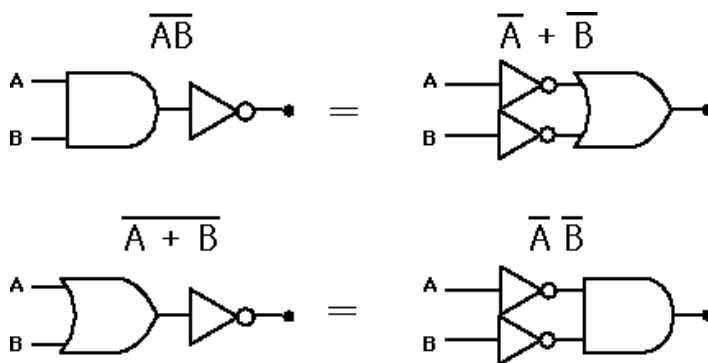
Second Condition or Second law:

The compliment of the sum of two variables is equal to the product of the compliment of each variable.

Thus according to De Morgan's theorem if A and B are the two variables then.

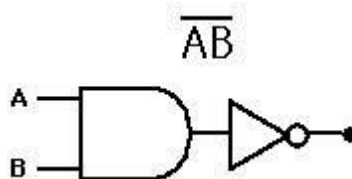
$$\overline{A + B} = \overline{A} \cdot \overline{B}$$

Logic Diagram:

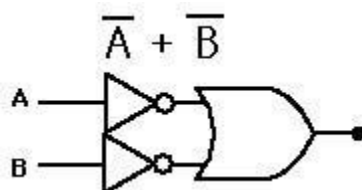


First Condition:

Left Hand Side:

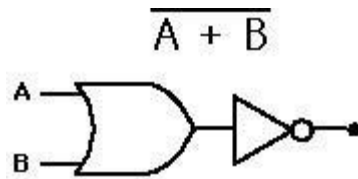


Right Hand Side:

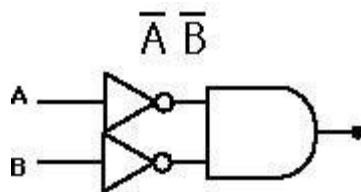


Second Condition:

Left Hand Side:



Right Hand Side:



PROCEDURE:

1. Patch the left hand side circuit for the first condition of De-Morgan's Law on the Digital electronics trainer. Connect the inputs to the input switches and output to the LED and verify the truth table for all the combinations
2. Similarly, patch the right hand side circuit for the first condition of De-Morgan's Law on the Digital electronics trainer. Connect the inputs to the input switches and output to the LED and verify the truth table for all the combinations. Both the truth tables should be similar.
3. Repeat steps 1 and 2 for the second condition of De-Morgan's Law.
4. Get it checked by the instructor.

Truth table for the first condition:

A	B	Y = A.B	Y = A + \bar{B}
0	0		
0	1		
1	0		
1	1		

Truth table For the second condition:

A	B	$Y = A+B$	$Y = \bar{A}.\bar{B}$
0	0		
0	1		
1	0		
1	1		

