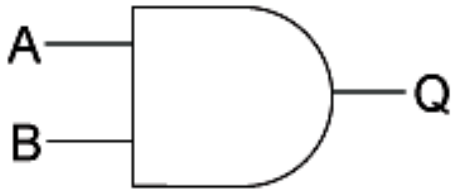
Project Report

Project Name : AND GATE



Submitted To:

Submitted By:

Aim: To Design and simulate the AND Gate circuit.

Components: Two Ideal p-n diodes, resistance R and a battery E.

Theory and Construction:

Gate

A digital circuit, which either allows a signal to pass through or stops it, is called a gate. Such gate allows the signal to pass through only when some logical conditions are satisfied. Hence, they are called logic gates. The logic gates are the building blocks of a digital system.

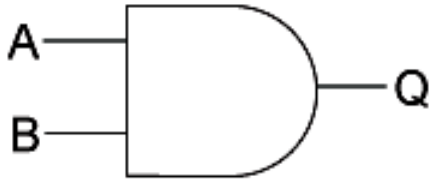
Truth Table

It is a table that shows all possible input combinations and the corresponding output combinations for a logic gate. It is also called a table of combinations.

Boolean expression

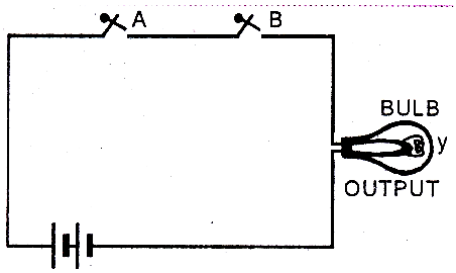
George Boole invented a kind of algebra, which deals with logical statements that have only two values, namely either true or a false value. The logical statements are called Boolean variables. The true of a Boolean variable is denoted by 1 and the false value by 0. It is to be noted that the symbols 1 and 0 have nothing to do with numerical values 1 and 0.

Symbol of AND gate :



Analogue Circuit of AND gate

The analogue circuit having function similar to the AND gate is shown in the figure.



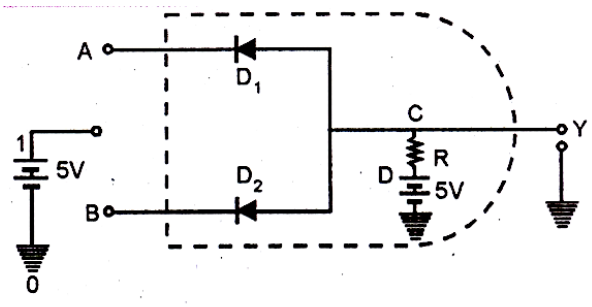
In this arrangement, off (or open) corresponds to 0 and on (or closed) corresponds to 1. The *inputs are introduced through the switches A and B. The lighting of the bulb is the output.* Here we find that the bulb glows (i.e. output is 1) only when both the switches A and B are closed. The bulb remains off (i.e. output is zero) when either switch A or switch B or both are open.

Boolean Expression for AND gate :

Y = A.B

Circuit Diagram of AND gate :

The AND gate is a device which has two or more inputs and one output. The AND gate can be realized by the electronic circuit by using two ideal p-n junction diodes D1 and D2 as shown in the figure.



Truth Table of AND gate :

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

Working:

The resistance R is connected to the positive terminal of a 5V battery permanently. The output y is the voltage at C w.r.t. earth.

(i) ***When both A and B are connected to earth (i.e. A = 0 and B = 0)*** both the diodes D_1 and D_2 get forward biased and hence conduct. The diodes being ideal, no voltage drop takes place across either diode. Therefore, a voltage drop of 5V takes place across R, with C at zero potential w.r.t. earth. Thus the output y (which is the voltage at C) is 0 (in level).

(ii) ***When A is earthed and B is connected to positive terminal of the battery 5V (i.e. A = 0 and B = 1),*** the diode D_1 will conduct while D_2 will not conduct. Since diode D_1 is ideal, no voltage drop takes place across D_1. Therefore a voltage drop of 5V takes place across R, having D at + 5V and C at zero volt w.r.t. earth. Now the output y is (0 in level).

(iii) ***When A is connected to positive terminal of battery 5V and B is earthed (i.e. A = 1 and B = 0),*** the diode D_2 will conduct while D_1 will not conduct. Since D_2 is ideal no voltage drop takes place across D_2. Therefore, a voltage drop of 5V takes place across R, having terminal D at +5V and C at zero volt w.r.t. earth. Now the output y is 0 (in level).

(iv) ***When A and B both are connected to positive terminal of battery 5V (i.e. A = 1 and B = 1)*** none of the diodes will conduct. There will be no current through R. Now, the potential at C is equal to the potential at D, which is equal to +5V w.r.t. earth. Hence the output y is 1 (in level).