Name of Experiment: Implementation of Half Subtractor.

Objective: - To understand the design and implementation of a half subtractor using logic gates and verify the truth table.

Apparatus required:- The following electronics components are required.
- AND Gate (IC-7408)
- NOT Gate(IC-7404)
- XOR Gate (IC-7486)
- Digital IC Trainer KIT
- Breadboard
- Connecting wires

Description:-
Half Subtractor is a combinational circuit that performs subtraction of two bits and has two inputs and two outputs. The two inputs denoted by A and B represents minuend and subtrahend. The two outputs are the difference "D" and the borrow bit "B". The borrow output specifies that a 1 must be borrowed from the next significant bit as the minuend is smaller than the subtrahend.

Logic Circuit:-
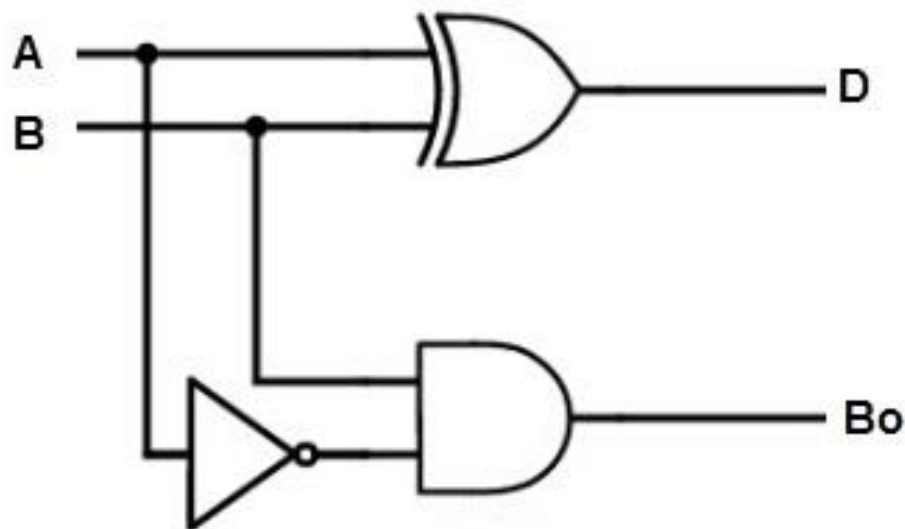
A	B	Difference (D)	Borrow(B_0)
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

Boolean Expression: -

If inputs are A and B then expression of half subtractor then the expression will be

Difference = $A \oplus B$

Borrow = $\overline{A}.B$

Procedure to Perform:-

❖ Take Digital Trainer KIT with IC-7408, 7486, 7404 and connecting leads.
❖ Insert three ICs on the Breadboard.
❖ According to pin configuration of IC perform the connections.
❖ Connect Vcc(+5V) to pin no-14 and Connect Pin no-7 to GND of three ICs.
❖ Connect the XOR Gate input connection to the input switched D0 and D1 to the Digital Trainer KIT (Inputs are pin no (1,2),(4,5),(8,9),(11,12) and Outputs are pin no 3, 6, 10, 13).
❖ Connect the XOR output with a output LED.
❖ Connect input D0 with a NOT gate (Inputs are pin no 1,3,5,9,11,13 and Outputs are pin no 2,4,6,8,10,12).
❖ Connect the output of NOT gate and input D1 through a AND Gate(Inputs are pin no (1,2),(4,5),(8,9),(11,12) and Outputs are pin no 3, 6, 10, 13).
❖ Connect the AND output with a output LED.
❖ Switch On the Digital IC Trainer KIT.
❖ Apply the various combination of Truth table and verify the output at LED's.
❖ If output LED glows RED it shows logic HIGH or 1.
❖ If output LED glows GREEN it shows logic LOW or 0.
❖ Switch off the Digital Trainer KIT after performing the Experiment.
❖ Disconnect Output from the LED and note down the corresponding multi-meter voltage reading for various combinations of inputs (not required).

Conclusion: - All the output is verified according to the result of the truth table.

Precaution in lab:-
•All the connections should be tight and proper.
•Handle the ICs carefully.
•Check the connection once again before Switching on the Digital Trainer KIT.
•Switch off the Trainer Kit after performing the Experiment.