

EXPERIMENT #02

Implementation of Boolean Functions

Objective

The objective of this lab is to implement Boolean Functions using basic logic gates.

Apparatus/Software

- Logic Trainer
- Logic ICs
- 74LS04 (Not Gate)
- 74LS08 (AND Gate)
- 74LS32 (OR Gate)

Theory

This experiment consists of two parts to achieve the set objectives. All these parts strive to accomplish the functionality described by the following Boolean equation,

$$F = \overline{A}BC + A\overline{B}C + AB\overline{C}$$

In the first part of the experiment, you will use basic AND, OR and NOT gate ICs to implement this function as is. A careful examination of this function reveals that the last two terms can be combined to yield a simpler version of the same function.

$$F = \overline{A}BC + AB$$

The second part of the experiment would ask you to implement this function and verify not only this implementation gives the same results as the first one, but at the same time it requires lesser number of gates/chips than that required in the first part.

Procedure

1. Connect the logic Trainer to 220V AC power supply.
2. Turn on the Trainer and verify the DC voltage by using voltmeter. Install the IC chip under experiment, on the trainer's breadboard.
3. Connect the +V_{CC} (pin # 14) and Ground (pin # 7) pins of the IC to +5V and Ground supply of the trainer board.
4. Make the appropriate circuit connections as shown in Fig.3.1 Use the trainer's logic switches to provide "0" and "1" at the input and use the trainer's LEDs to display the

outputs. Note that there are more than one gates in each IC chip, so you can use any one of these gates to make your connections for the pin numbers corresponding to each gate in that particular chip.

- Record your observations in table 3.1

(a) Schematic diagram for $F = \bar{A}BC + A\bar{B}C + A\bar{B}\bar{C}$

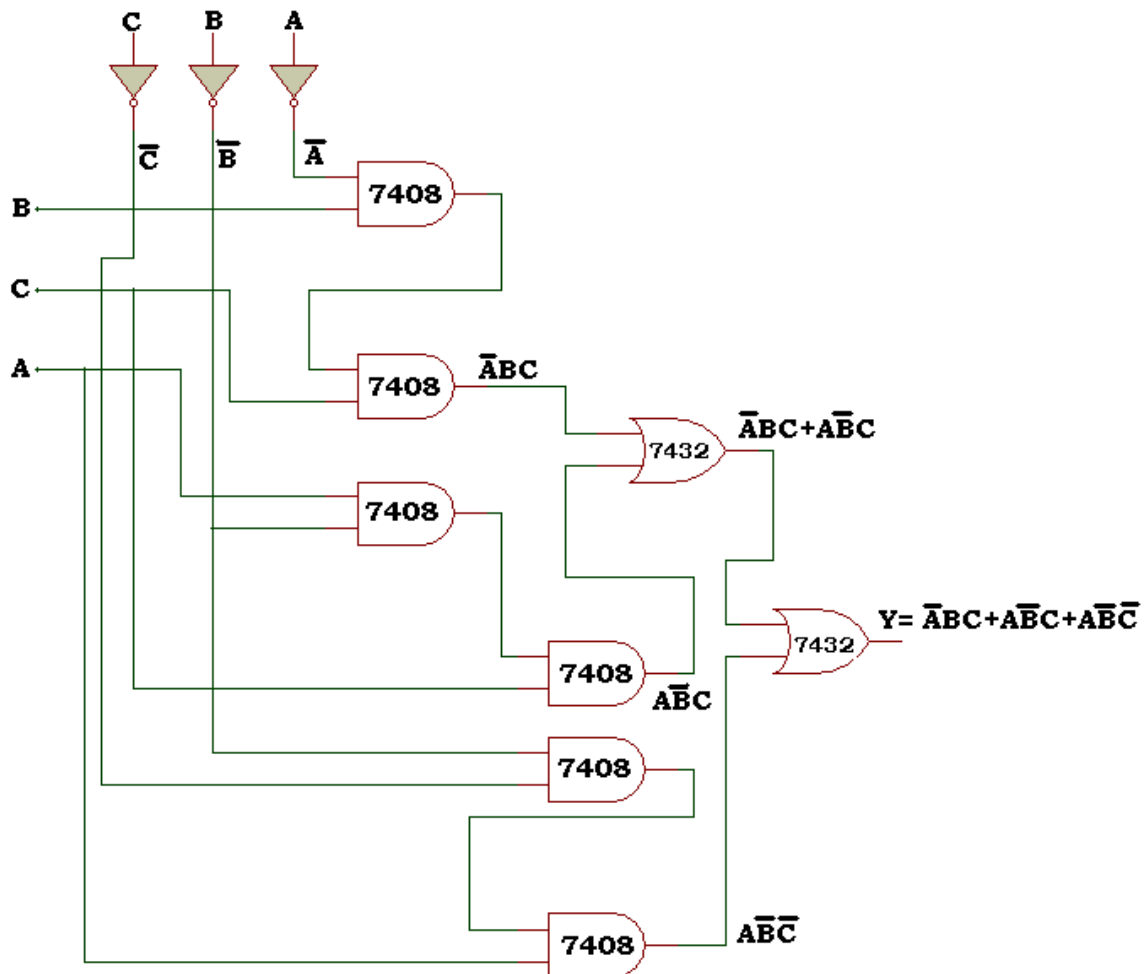


Figure 1: SCHEMATIC DIAGRAM

(b) Schematic diagram for $F = \bar{A}BC + A\bar{B}$

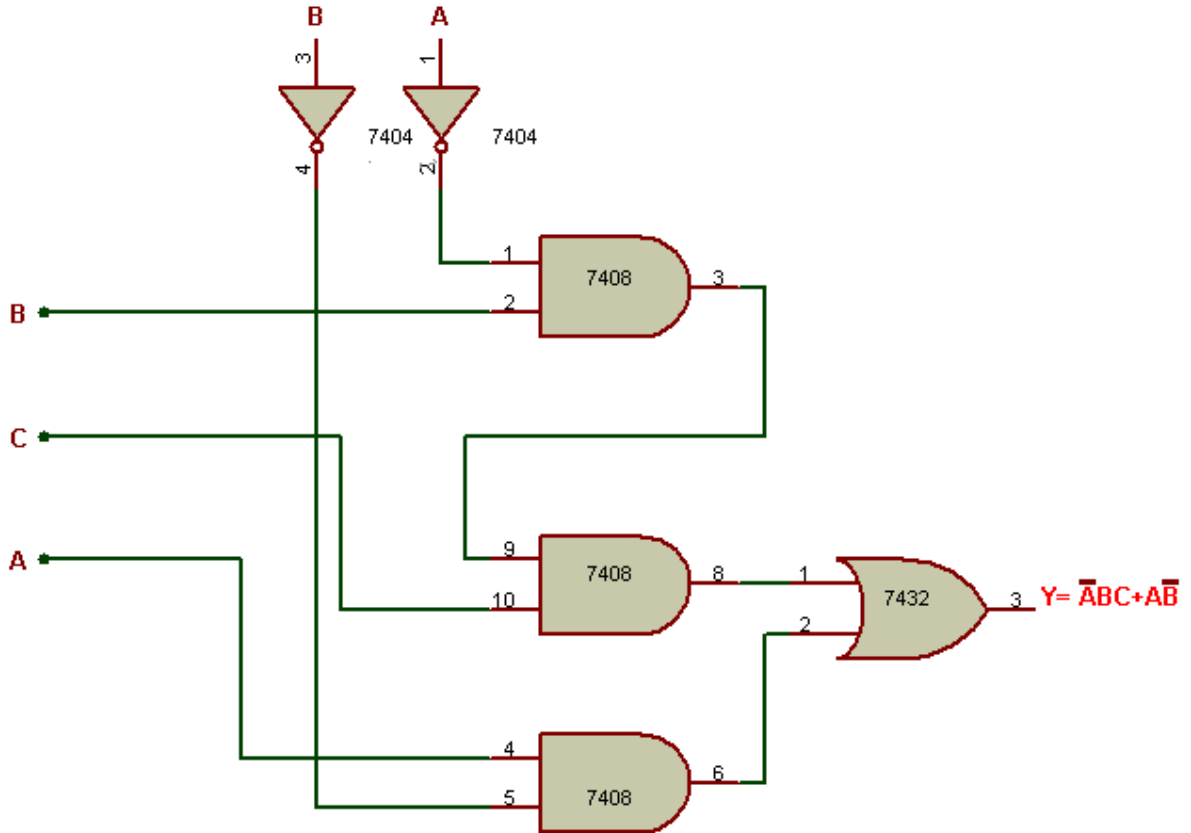


Figure 2: SCHEMATIC DIAGRAM

Experimental Results

(a) Truth Table for

$$F = \bar{A}BC + A\bar{B}C + A\bar{B}\bar{C}$$

Table 1 (a) FUNCTION

INPUTS			OUTPUT
A	B	C	$F = \bar{A}BC + A\bar{B}C + A\bar{B}\bar{C}$
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	

1	1	0	
1	1	1	

(b) Truth Table for

$$F = \overline{A}BC + A\overline{B}$$

Table 2 (b) FUNCTION

INPUTS			OUTPUT
A	B	C	$F = \overline{A}BC + A\overline{B}$
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

In case of trouble

1. Check the power supply.
2. Check the Vcc and GND at pin number 14 and 7 of the IC under test.
3. Check all the wire connections and remove the breaks.
4. Check the IC under test using truth table.

Conclusion:

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