Lab 2
Logic Circuits (EET 241)
Total Points: 100

Objective: Demonstrate experimentally the truth tables for NOT, AND, and OR gate.

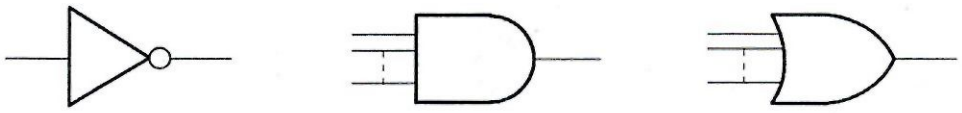
Materials Needed:

7404 Hex Single-Input NOT Gate – 1piece
7408 Quad 2-Input AND Gate – 1 piece
7432 Quad 2-Input OR Gate – 1 piece
330-ohm register – 2 pieces
Light Emitting Diodes (LEDs) – 2 pieces
DC Power Supply

Theory: Many situations and processes that you encounter in your daily life can be expressed in the form of propositional or logic functions. Since such functions are true/false or yes/no statements, digital circuits with their two-state characteristics are applicable.

- For example, the prepositional statement "The light is on" will be true if "The bulb is burned out" is true and if "The switch is on" is true.
- Prepositional statement can be made as: *The light is on only if the bulb is not burned out and the switch is on.*

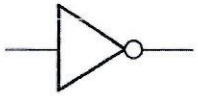
Three basic logic functions (NOT, AND, and, OR) are indicated by standard distinctive shape symbols as shown in Figure. The lines connected to each symbol are the inputs and outputs. The inputs are on the left of each symbol and output is on the right. A circuit that performs a specified logic function (AND, OR) is called a logic gate. AND and OR gates can have any number of inputs as indicated by dashes in the figure.



NOT AND OR

NOT Gate

The NOT function changes one logic level to the opposite logic level, as indicated on Figure. When the input is HIGH (1), the output is LOW (0). When the input is LOW (0), the output is HIGH (1). The NOT function is implemented by a logic circuit known as an inverter (NOT gate).



Input	Output
A	X
0	1
1	0

AND Gate

The AND function produces a HIGH output only when all the inputs are HIGH as indicated in Figure. When all the inputs are HIGH, then the output is HIGH. The AND function is implemented by a logic circuit known as an AND gate.

Inputs		Output
A	B	X
0	0	0
0	1	0
1	0	0
1	1	1

OR Gate

The OR function produces a HIGH output only when one or more inputs are HIGH as indicated in Figure. The OR function is implemented by a logic circuit known as an OR gate.

Inputs		Output
A	B	X
0	0	0
0	1	1
1	0	1
1	1	1

Procedure:

1.

a) Find the pin diagram for the 7404 Hex Single-Input NOT Gate (pin diagram has been provided). Configure the breadboard according to Figure 1. Apply V_{cc} and ground to the appropriate pins (Connect pin 7 to ground (0V) and pin 14 to V_{cc} =+5V).

b) You need to connect output pin to a 330-ohm register, and the other end of the 330-ohm register will be connected to the positive terminal of LED. Finally, the negative terminal of the LED will be connected to ground (OV). If the output is logic 1, LED will turn ON and if the output is logic 0, LED will turn OFF.

a) Test NOT gate by connecting all possible combinations of inputs, as listed in Table 1 of the report. Apply a logic 1 by connecting to V_{cc} and a logic 0 by connecting directly to ground. Use digital multimeter (DMM) to measure the output voltage. Tabulate your results in Table 1.

2.

b) Find the pin diagram for the 7408 quad 2 input AND gate (Pin diagram has been provided). Configure the breadboard according to Figure 2. Apply V_{cc} and ground to the appropriate pins (Connect pin 7 to ground (0V) and pin 14 to V_{cc} =+5V).

c) You need to connect output pin to a 330-ohm register, and the other end of the 330-ohm register will be connected to the positive terminal of LED. Finally, the negative terminal of the LED will be connected to ground (OV). If the output is logic 1, LED will turn ON and if the output is logic 0, LED will turn OFF.

d) Then test AND gate by connecting all possible combinations of inputs, as listed in Table 2 of the report. Apply a logic 1 by connecting to V_{cc} and a logic 0 by connecting directly to ground. Use digital multimeter (DMM) to measure the output voltage. Tabulate your results in Table 2.

3. Repeat step 2 for OR gate (Figure 3) and tabulate your results in Table 3.

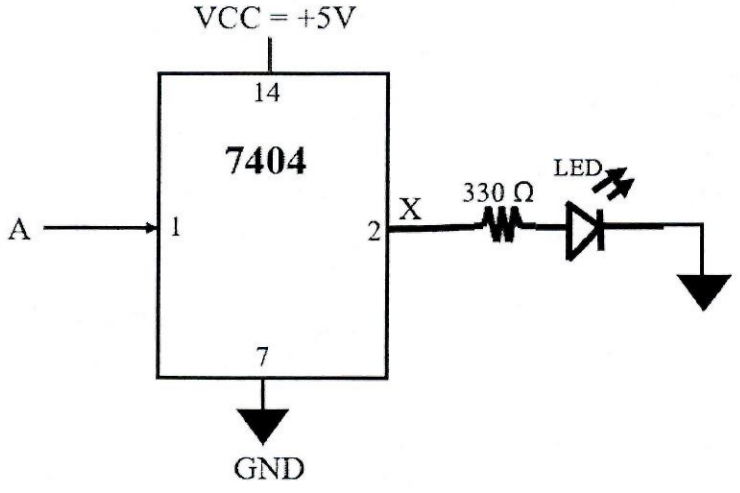


Figure 1. Breadboard connection diagram for Inverter

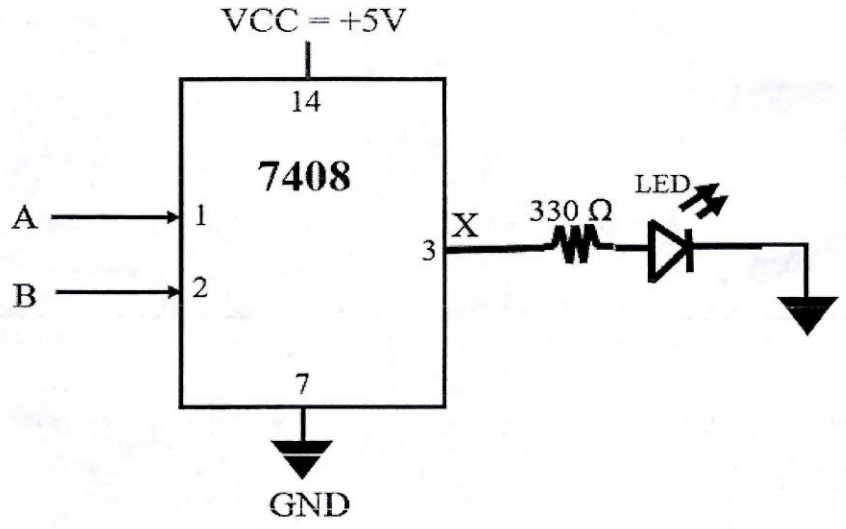


Figure 2. Breadboard connection diagram for AND gate

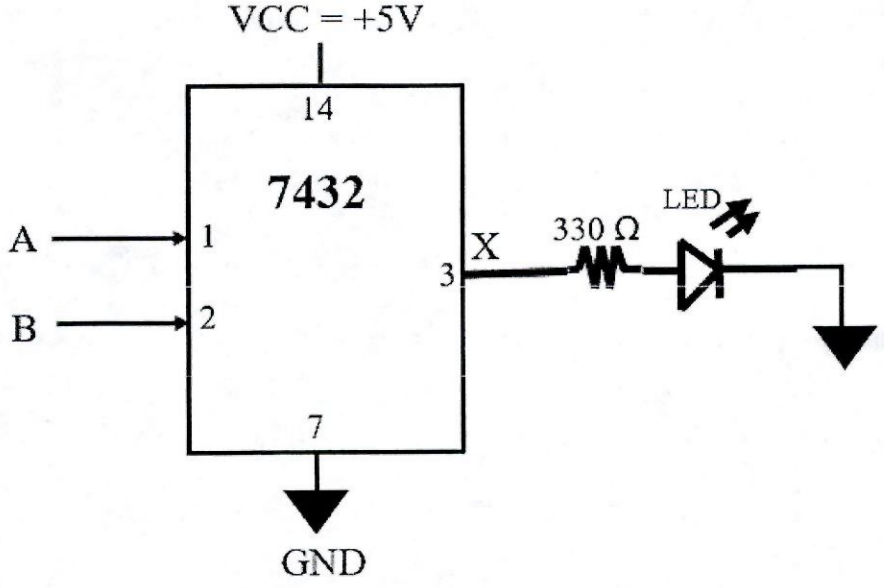


Figure 3. Breadboard connection diagram for OR gate

Note: The figures, text etc. included here are borrowed from books, websites, author pages and other internet sources such as: allaboutcircuits.com, tutorialspoint.com, sullystationtechnologies.com for academic purpose only. The author does not claim any originality.

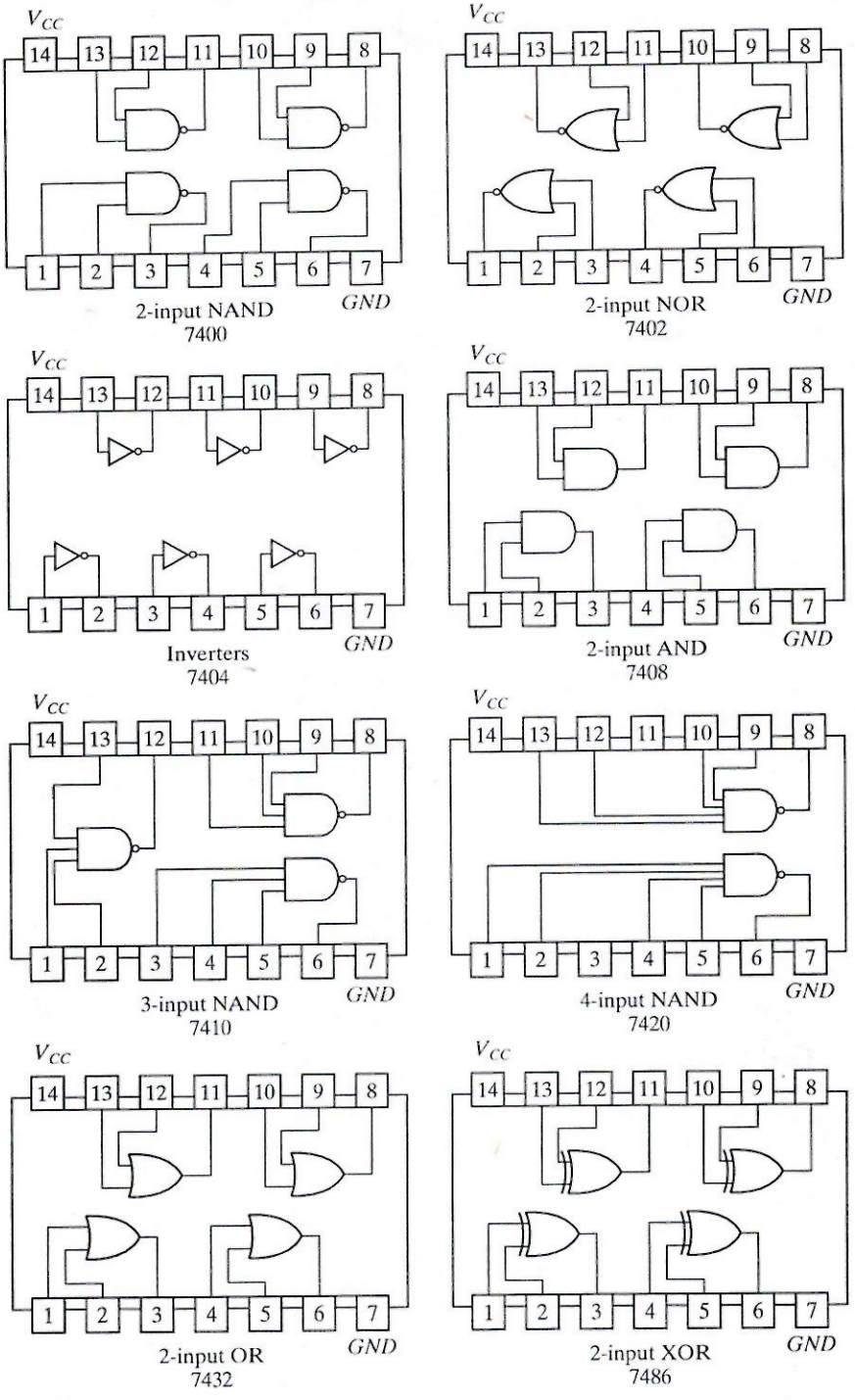


FIGURE 9.1
Digital gates in IC packages with identification numbers and pin assignments

Lab 2 Report

Name: Derek white

Data and Observations:

Table 1 NOT Gate

Inputs	Output	Measured Output voltage
A	X	
0	1	1.96V
1	0	0.25V

Table 2 AND Gate

Inputs		Output	Measured Output voltage
A	B	X	
0	0	0	0.006V
0	1	0	0.006V
1	0	0	0.006V
1	1	1	2.048V

Table 3 OR Gate

Inputs		Output	Measured Output voltage
A	B	X	
0	0	0	0.054
0	1	1	1.964
1	0	1	1.963
1	1	1	1.963

Submission Process

You do not need to submit tutorial or procedure. You just need to submit lab 2 report and screenshot of the circuit.

I would suggest you create a folder and name it as lab2 and copy your lab 2 report and screenshots. Then you will zip the Lab2 folder. Finally, upload the zipped Lab2 file on the canvas.