Lab 3

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CS-2206

Lab experiment 3-1: AND gates
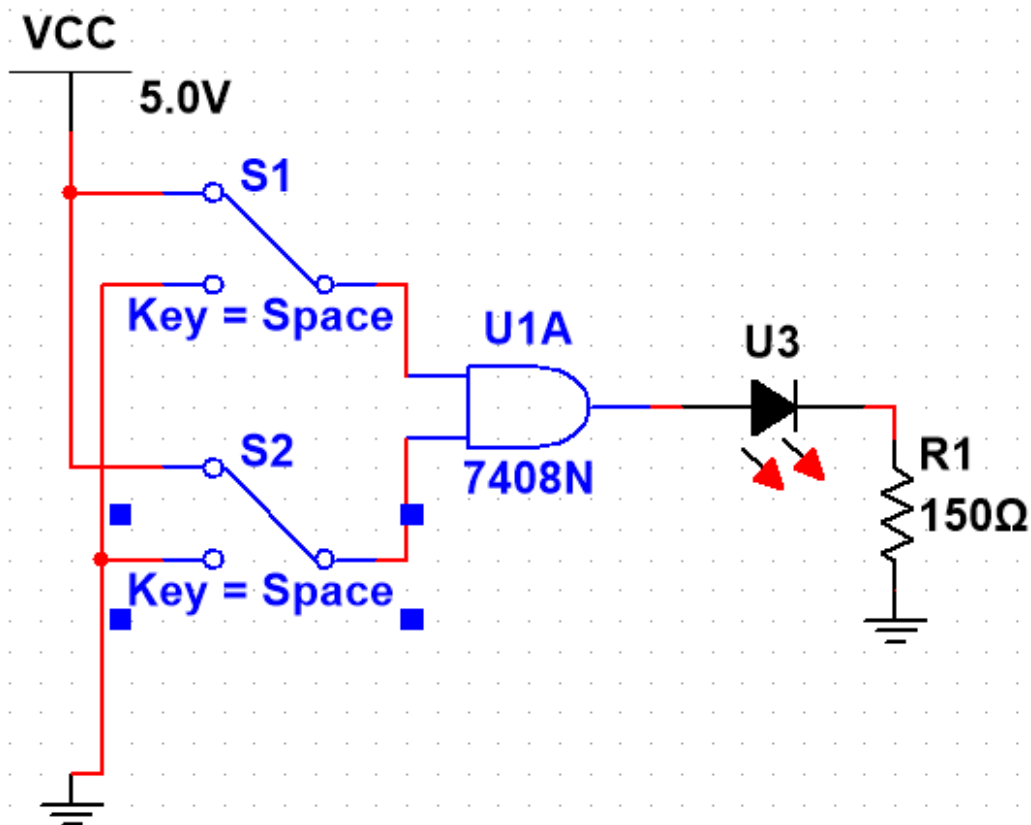
Objective of the experiment:

- To wire and operate a two-input AND gate;
- To wire and operate a three-input AND gate using a 7408 IC.

Components:

- 7408 two-input TTL AND gate IC
- LED indicator-light assembly
- V DC regulated power supply (VCC)
- Logic switches

Task description

You will construct a two-input AND function based on Figure 3-1 shown below

After finishing wiring of Figure 3-1, you will need to construct a three-input AND function given in Figure 3-2.
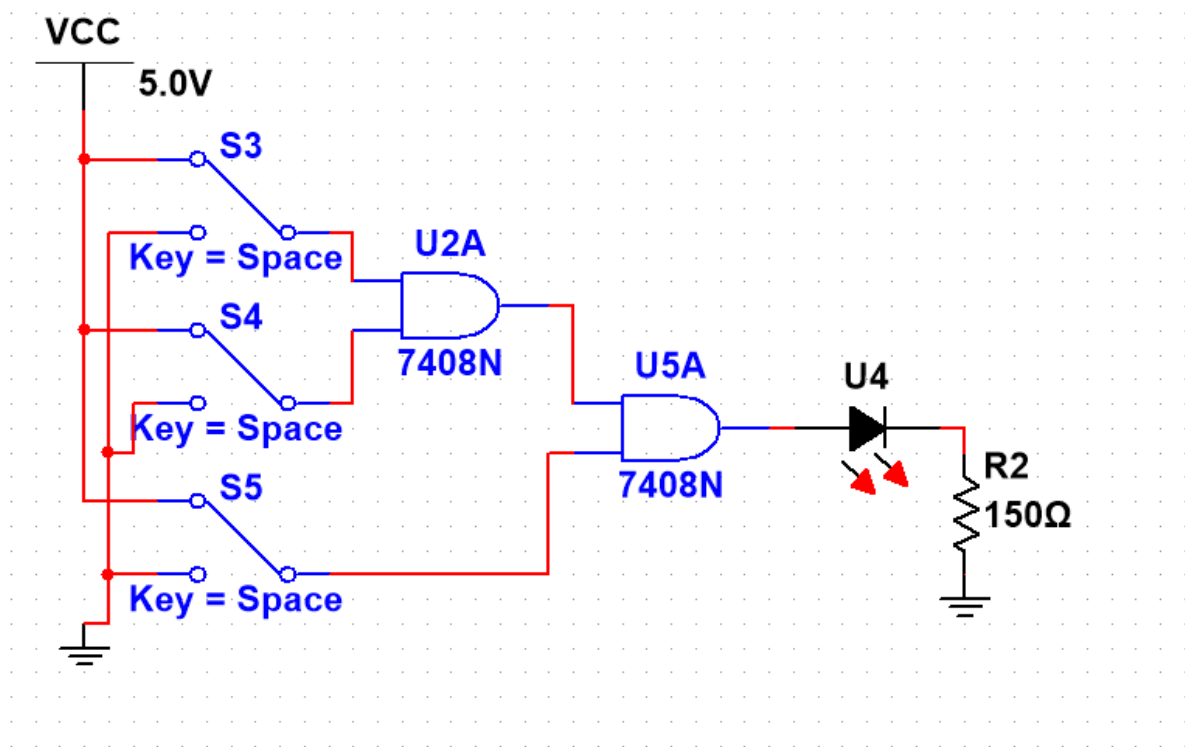
Table 3.1

Inputs				Output	
A		B			
Voltage	Binary	Voltage	Binary	Voltage	Binary
Low	0	Low	0	Low	0
Low	0	High	1	High	1
High	1	Low	0	High	1
High	1	High	1	High	1

Table 3.2

Inputs			Output
A	B	C	
0	0	0	0
0	0	1	0
0	1	0	0

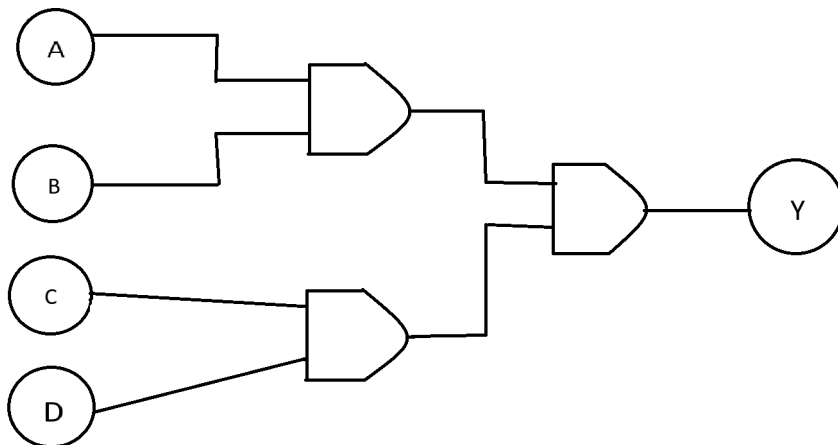| 0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

Questions

1. Draw a single logic symbol for a three-input AND gate. Label the inputs A, B, and C; label the output Y.
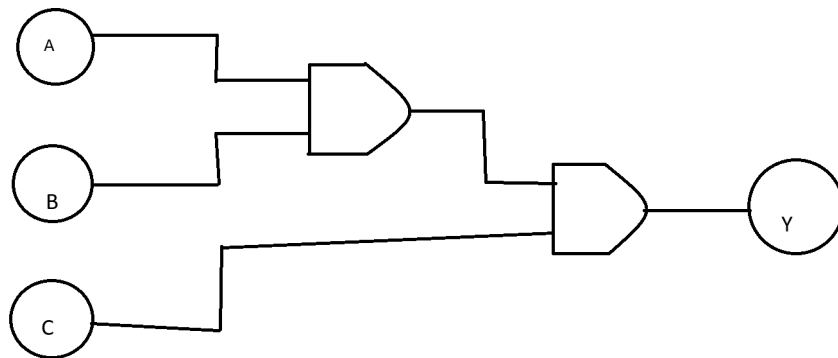
2. Draw a logic symbol diagram of a four-input AND gate using 3 two input AND gates.

3. In this experiment a LOW voltage at the input switch stood for a

a) Logical 0

4. In this experiment a HIGH voltage (near +5 V) stood for a

b) Logical 1

5. Draw a truth table for a four-input AND gate. Label the inputs A, B, C, and D; label the output Y.

Inputs				Output
A	B	C	D	Y
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	1

6. When powering the IC in this experiment, the VCC pin is connected to the positive terminal of the power supply.

7. The AND gate's unique output is a 1which only occurs when all inputs are HIGH

Lab experiment 3-2: OR gates

Objectives:

- To wire and operate a two-input OR gate.
- To design and implement a logic circuit that will perform the two-input OR function using NAND gates

Components:

- 1x 7400 quad two-input NAND gate
- 1x 7432N two-input OR gate IC
- 1x LED indicator
- 1x 5-V VCC power supply
- 1x GND component

Task description

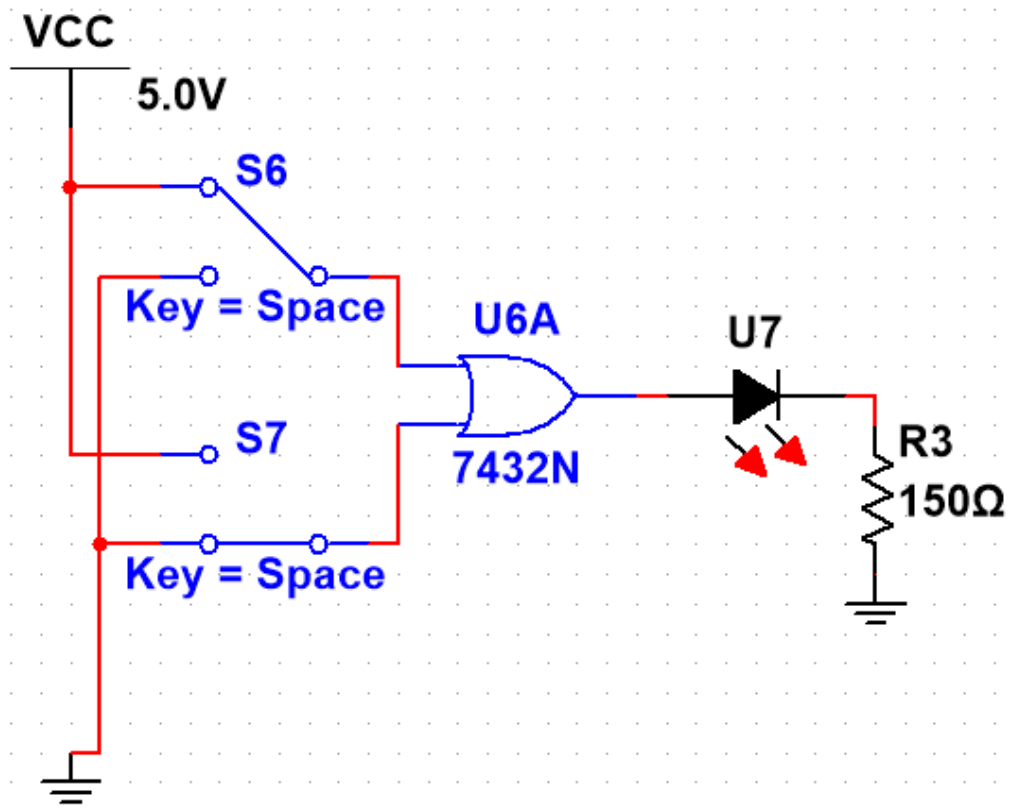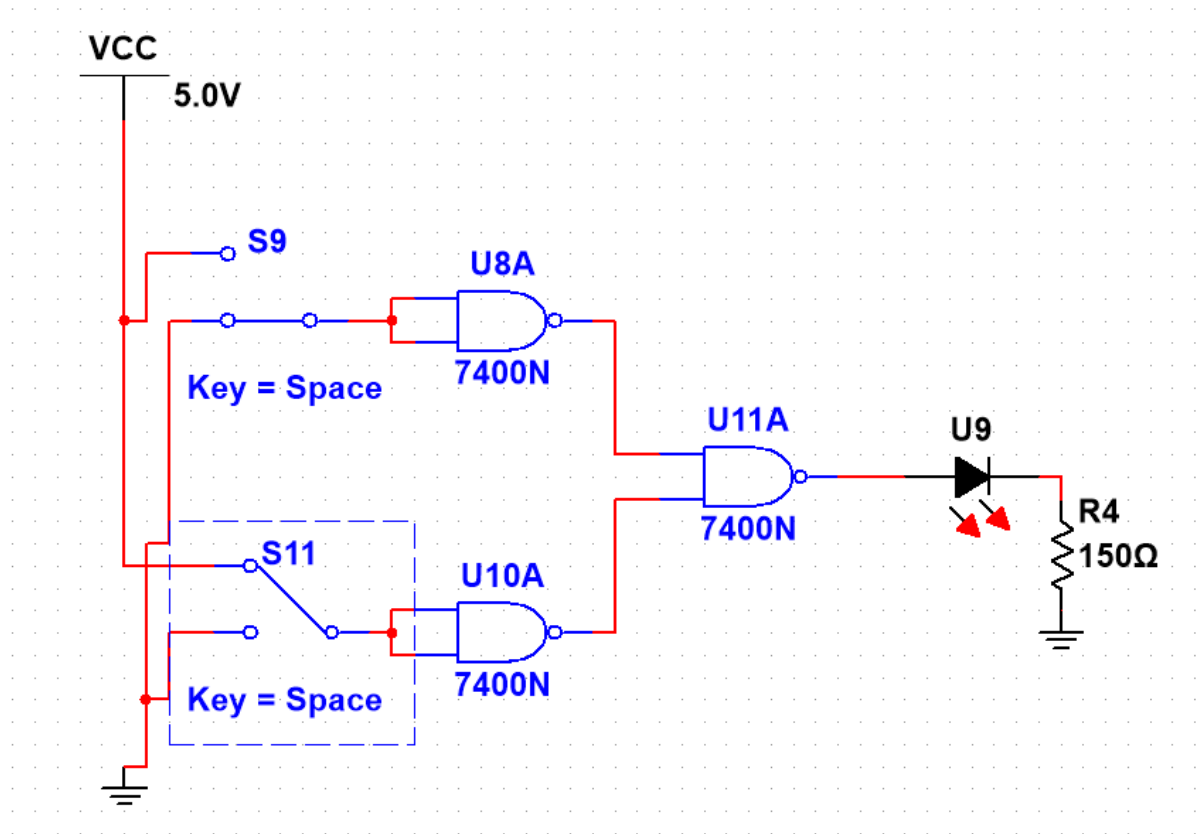Figs. 3-3 and 3-4 demonstrate wiring schemes of two- and five-input OR gates that you need to wire in this experiment.

Table 3.3

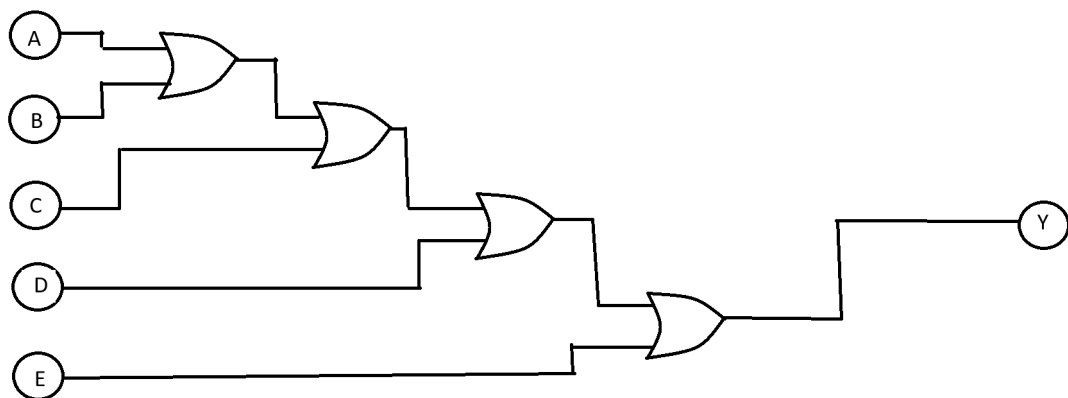| Inputs		Output
A	**B**	**OR gate**
0	0	0
0	1	1
1	0	1
1	1	1

- Stop your simulation. Using a single 7400 quad two-input NAND gate IC, design a logic circuit that will perform the two-input OR function. HINT: refer to your lectures, textbook.
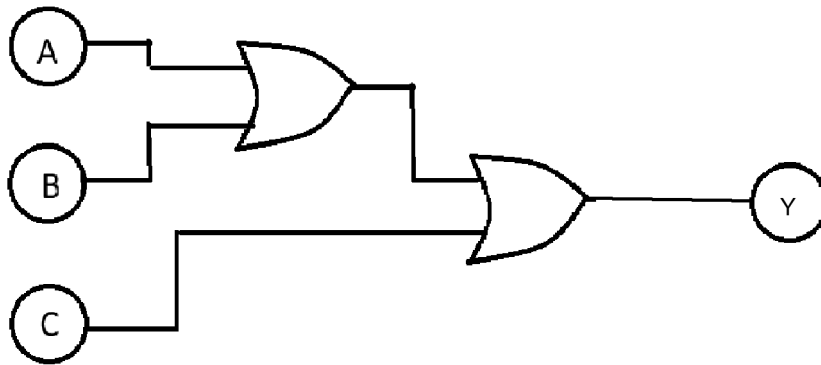
Questions

1. Draw a single logic symbol for the five-input OR gate you wired in this experiment. Label the inputs A, B, C, D, and E; label the output Y.

2. Draw a logic diagram of a three-input OR gate using 2 two-input OR gates. Label the inputs A, B, and C and the output Y.

3. A logical 0 on the truth table in this experiment means that input or output
is
a. Near GND voltage
4. A logical 1 on the truth table in this experiment means that input or output
is
a. Near GND voltage
b. Near _5 V
5. A truth table with two inputs has how many switch combinations? 4 switch
combinations (2^input number)
6. A truth table with three inputs has how many switch combinations? 8 switch
combinations
7. A truth table with five inputs has how many switch combinations? 32 switch
combinations
8. The OR gate's unique output is a 0, which only
occurs when all inputs are LOW
9. The 7432 is described by the manufacturer as a quadruple two-input OR
gate from the TTL family of digital ICs.
10. The logic circuit shown below performs the three-input
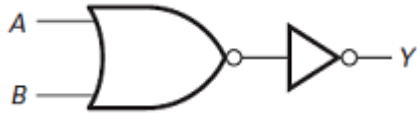OR logic function.
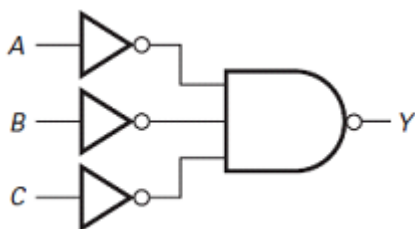
Inputs: The OR gate has three inputs, which we'll call A, B, and C. Each of
these inputs can either be a 0 or a 1

Logic Function: The OR gate performs the logical OR operation. This means that if any of the inputs A, B, or C is 1, then the output Y will also 1. If all inputs are 0, then the output Y will be 0.

11. The logic circuit drawn below performs the two-input OR (NAND, OR) logic function.

•Inputs: The NOR gate has two inputs. Each of these inputs can either be a 0 or a 1

Logic Function: The NOR gate performs the logical NOR operation. This means that if both inputs A and B are 0, then the output Y will be 1. If either or both inputs are 1, then the output Y will be 0.

Output: The output Y is connected to the curved shape with a small triangle on the right side, which represents the NOR function.