LAB 11: MULTIPLEXER

1 Goals

- Understand the working principle of a multiplexer (MUX)
- Know how to build a MUX using basic logic gates.

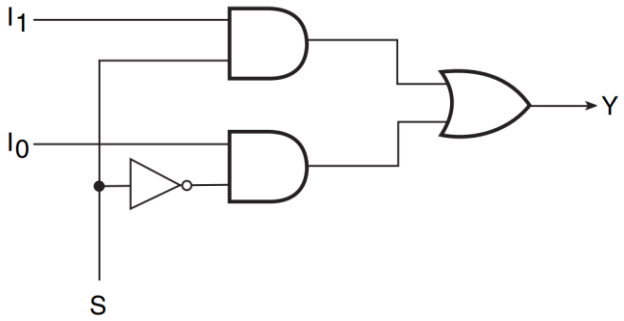
2 MUX

A *MUX* (or *data selector*) is a combinational circuit that consists of several input lines, one output line, and several selection lines. Depending on the logic status of the selection lines, the binary information present on any one of the input lines is selected and routed to the output line.

2.1. 2-to-1 MUX

The following figure shows a 2-to-1 MUX and its truth table.

- 2 *1-bit* input lines: **I_0, I_1**
- 1 *1-bit* output line: **Y**
- 1 *1-bit* selection line: **S**



S	Y
0	I_0
1	I_1

From the truth table, we can represent the Boolean expression of the 2-to-1 MUX as: $Y = \bar{S}.I_0 + S.I_1$.

Requirements:

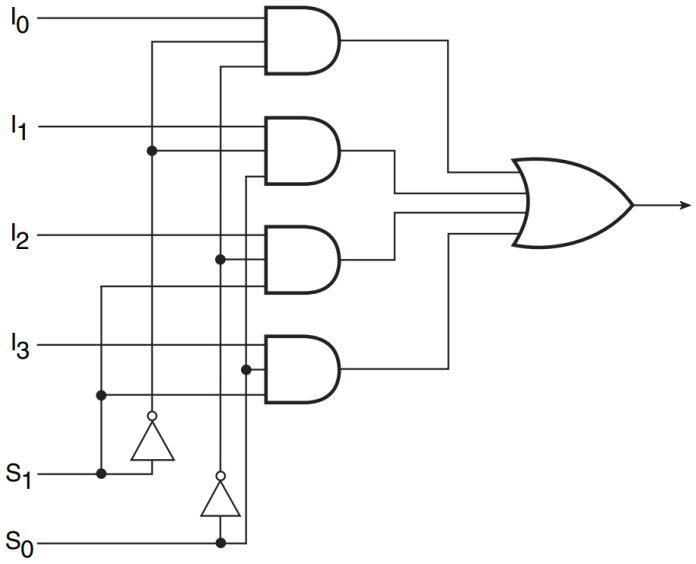
- Test all ICs and equipment.
- Assemble the above 2-to-1 MUX on a breadboard using the given ICs (74LS32/08/04), resistors, LEDs, and buttons (or switches).
- Supply 5V/GND power to the circuit.
- Use a function generator and an oscilloscope to define the circuit's activities, i.e., checking circuit's output for all input states.
- Write comments on the experimental results.

2.2. 4-to-1 MUX

The following figure shows the possible implementation of a 4-to-1 MUX and its truth table.

- 4 *1-bit* input lines: **I_0, I_1, I_2, I_3**

- 1 *1-bit* output line: **Y**
- 2 *1-bit* selection lines: **S_0, S_1**



S_1	S_0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

Requirements:

- Test all ICs and equipment.
- Assemble the above 4-to-1 MUX on the breadboard using the given ICs (74LS32/08/04), resistors, LEDs, and buttons (or switches).
- Supply 5V/GND power to the circuit.
- Use a function generator and an oscilloscope to define the circuit's activities, i.e., checking circuit's output for all input states.
- Write comments on the experimental results.

Components/Equipment	**Quantity**
74LS(HC)32 (4x 2-input OR)	1
74LS(HC)08 (4x 2-input AND)	2
74LS(HC)04 (6x NOT)	1
Resistor (330Ω), (10kΩ)	Few
LED	Few
Buttons (or switches) for input and selection lines	Few
Breadboard	1
Connecting Wires	Few
Multimeter/power supply/function generator/oscilloscope	1/1/1/1