# Computer Architecture – Gates Lab Assignment 1 (27/2/2017)

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**Materials:**  Logic Box, Gates – AND, NAND, OR, NOR, Inverter, Exclusive OR, Exclusive NOR, Wire

**Method for Circuit 1:**

1. Set up the circuit as displayed in Figure 1:



*Figure 1*

1. Connect all of the inputs to the switches on the logic boxes which are seen in Figure 1.
2. Connect the output to the Light Emitting Diode (LED).
3. Create a truth table and write down the results that follow for each part.

**Results:**

|  |  |  |
| --- | --- | --- |
| **S1** | **S0** | **Z** |
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

**Conclusion:** The truth table displays an AND gate as the table states that if there is any low value of 0 in the inputs, the output will take a 0 (low). But if both inputs have a high input of 1, the output will take in 1 (high output).

**Method for Circuit 2:**

1. Set up the circuit as displayed in Figure 2:



*Figure 2*

1. Connect all of the inputs to the switches on the logic boxes which are seen in Figure 2.
2. Connect the output to the Light Emitting Diode (LED).
3. Create a truth table and write down the results that follow for each part.

**Results:**

|  |  |  |
| --- | --- | --- |
| **S1** | **S0** | **Z** |
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

**Conclusion:** The truth table in Circuit 2 illustrates a NAND gate as the table proves that if any value of 0 is present in the inputs where the inputs are low, the output will take a 1 (high). However, if both inputs have a 1 which is high, the output will take in 0 (low).

**Method for Circuit 3:**

1. Set up the circuit as displayed in Figure 3:



*Figure 3*

1. Connect all of the inputs to the switches on the logic boxes which are seen in Figure 3.
2. Connect the output to the Light Emitting Diode (LED).
3. Create a truth table and write down the results that follow for each part.

**Results:**

|  |  |  |
| --- | --- | --- |
| **S1** | **S0** | **Z** |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

**Conclusion:** The truth table displays an OR gate because the table highlights that if any high value of 1 features in the inputs, the output will take a 1 (high). Otherwise, the output will take 0 if both inputs are 0 (low).

**Method for Circuit 4:**

1. Set up the circuit as displayed in Figure 4:



*Figure 4*

1. Connect all of the inputs to the switches on the logic boxes which are seen in Figure 4.
2. Connect the output to the Light Emitting Diode (LED).
3. Create a truth table and write down the results that follow for each part.

**Results:**

|  |  |  |
| --- | --- | --- |
| **S1** | **S0** | **Z** |
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |

**Conclusion:** The truth table displays a NOR gate since the table stresses that if both inputs have a low 0, the output will take in 1 (high). Other than that, there is any high value of 1 in the inputs, the output will take a 0 (low).

**Method for Circuit 5:**

1. Set up the circuit as displayed in Figure 5:



*Figure 5*

1. Connect all of the inputs to the switches on the logic boxes which are seen in Figure 1.
2. Connect the output to the Light Emitting Diode (LED).
3. Create a truth table and write down the results that follow for each part.

**Results:**

|  |  |
| --- | --- |
| **S0** | **Z** |
| 0 | 1 |
| 1 | 0 |

**Conclusion:** The truth table displays a NOT gate due to the table showing that if the input is opposite to the output, the output number will be opposite to the input. For example, if a high 0 is an input, it will become a low 1 in the output and vice versa.

**Method for Circuit 6:**

1. Set up the circuit as displayed in Figure 6:



*Figure 6*

1. Connect all of the inputs to the switches on the logic boxes which are seen in Figure 6.
2. Connect the output to the Light Emitting Diode (LED).
3. Create a truth table and write down the results that follow for each part.

**Results:**

|  |  |  |
| --- | --- | --- |
| **S1** | **S0** | **Z** |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

**Conclusion:** The truth table in Circuit 6 is an XOR gate as the table states that if both inputs have the same number of either 0 or 1, e.g 00 and 01, the output will take a 0 (low). But if the inputs take opposite logic numbers, e.g 01 and 10, the output will take in 1 (high).

**Method for Circuit 7:**

1. Set up the circuit as displayed in Figure 7:



*Figure 7*

1. Connect all of the inputs to the switches on the logic boxes which are seen in Figure 7.
2. Connect the output to the Light Emitting Diode (LED).
3. Create a truth table and write down the results that follow for each part.

**Results:**

|  |  |  |
| --- | --- | --- |
| **S1** | **S0** | **Z** |
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

**Conclusion:** The truth table displays an XNOR gate because the table indicates that if both inputs take the same number, e.g 00 and 11, the output will take a 1. Otherwise the output will take a 1 if the inputs contain opposite logic numbers, e.g 01 and 10.