

Experiment No. 1

Study of Basic Logic Gates: AND, OR, NOT, NAND, NOR, XOR

Objective

To check the operation of AND, OR, NOT, NAND, NOR, XOR gates according to their truth tables.

Equipment

Components

1. IC 74LS08
2. IC 74LS32
3. IC 74LS04
4. IC 74LS00
5. IC 74LS02
6. IC 74LS86

Tools

1. AM2000 Trainer
 2. Multimeter
 3. Cutter
 4. Single core wire
 5. Tweezers
- Pair of Pliers

Procedure

The ICs in the above mentioned components' list contain AND, OR, NOT, NAND, NOR and XOR gates respectively.

1. Connect the AM 2000 trainer to the 220V AC Power Supply.
2. Install the respective IC on trainer's breadboard.
3. Make connections to the IC consulting gate IC's data sheet and pin configuration diagram.
4. Use logic switches S0, S1 for inputs A and B respectively.
5. For output indication use LED L0.
6. Power Up the IC by applying +5 volts at pin **14** and grounding pin 7.
7. Apply all possible combinations of inputs as shown in the tables below for AND, OR, NOT, XOR, NAND, NOR etc and fill the tables below
8. Verify the output.
9. Fill up the truth table based on the experimental results.

Please note that since the procedure of checking the operation of all the gates will be the same, you can just follow the steps in the procedure given below each time replacing the ICs on the trainer breadboard.

Table1.1 Truth Table for AND Gate (7408)

| Inputs | | Outputs |
|--------|--------|----------|
| A (S0) | B (S1) | AND (L1) |
| 0 | 0 | |
| 0 | 1 | |
| 1 | 0 | |
| 1 | 1 | |

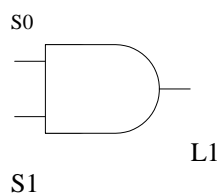


Table1.2 Truth Table for OR Gate (7432)

| Inputs | | Outputs |
|--------|--------|---------|
| A (S0) | B (S1) | OR (L1) |
| 0 | 0 | |
| 0 | 1 | |
| 1 | 0 | |
| 1 | 1 | |

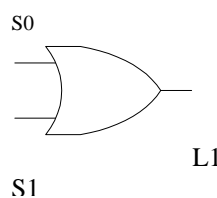


Table1.3 Truth Table for NOT Gate (7404)

| Input | Output |
|-------|--------|
| A | NOT |
| 0 | |
| 1 | |

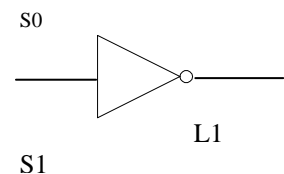


Table1.4 Truth Table for NAND Gate (7400)

| Inputs | | Outputs |
|--------|--------|-----------|
| A (S0) | B (S1) | NAND (L1) |
| 0 | 0 | |
| 0 | 1 | |
| 1 | 0 | |
| 1 | 1 | |

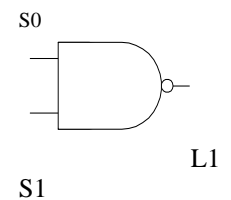


Table1.5 Truth Table for NOR Gate (7402)

| Inputs | | Outputs |
|--------|--------|----------|
| A (S0) | B (S1) | NOR (L1) |
| 0 | 0 | |
| 0 | 1 | |
| 1 | 0 | |
| 1 | 1 | |

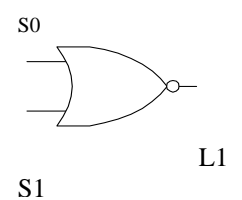
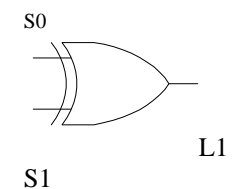


Table1.6 Truth Table for XOR Gate (7486)

| Inputs | | Outputs |
|--------|--------|----------|
| A (S0) | B (S1) | XOR (L1) |
| 0 | 0 | |
| 0 | 1 | |
| 1 | 0 | |
| 1 | 1 | |



PROBLEMS

1. 3-Input AND/OR using 2-Input AND/OR
 (a) Draw the circuit of a three input (3 I/P) AND/OR gate using two 2-I/P AND/OR gates.

- (b) Implement (just one) and show your results in the table below.

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2. 2-Input AND/OR using 3-Input AND/OR
 (a) Draw the circuit of a two input (2 I/P) AND/OR gate using 3-I/P AND/OR gate.

- (b) Implement (just one) and show your results in the table below.

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3. NAND as inverter
 (a) Draw the circuit of an inverter using a NAND and NOR gate.

- (b) Implement (any one) and show your results in the table below.

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4. XOR a Inverter
 (a) Draw the circuit of an XOR to be used as an inverter.

- (b) Implement and show your results in the table below.

- (c) Draw the circuit of a three input (3 I/P) AND gate using two 2-I/P AND gates.

- (d) Implement and show your results in the table below.

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