BSc (Hons) in Computer Engineering
Laboratory Practical

Experiment 5: Hand on Experience on Digital Logic Gates

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Intake

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Instructor Name and Signature:

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Objectives:
To make digital gate circuits on a project board, then implement it as a complete product on a dot board.

Outcomes:
After completing this experiment, you will be able to:

a) Explore the basic logic gates.
b) Determine the behavior of the logic gates.
c) Explain the steps for circuit designing using logic gates.
d) Read circuit diagrams and implement them.
e) Read the datasheet and modify the circuit as required.

Equipment Required:

Bread Board, Digital ICs (7400, 7402, 7404, 7408, 7432, 7486), Resistors (390 Ohms, 1KOhms), LEDs (Red, Green), Multi Meter, Wires, DC Power Supply.
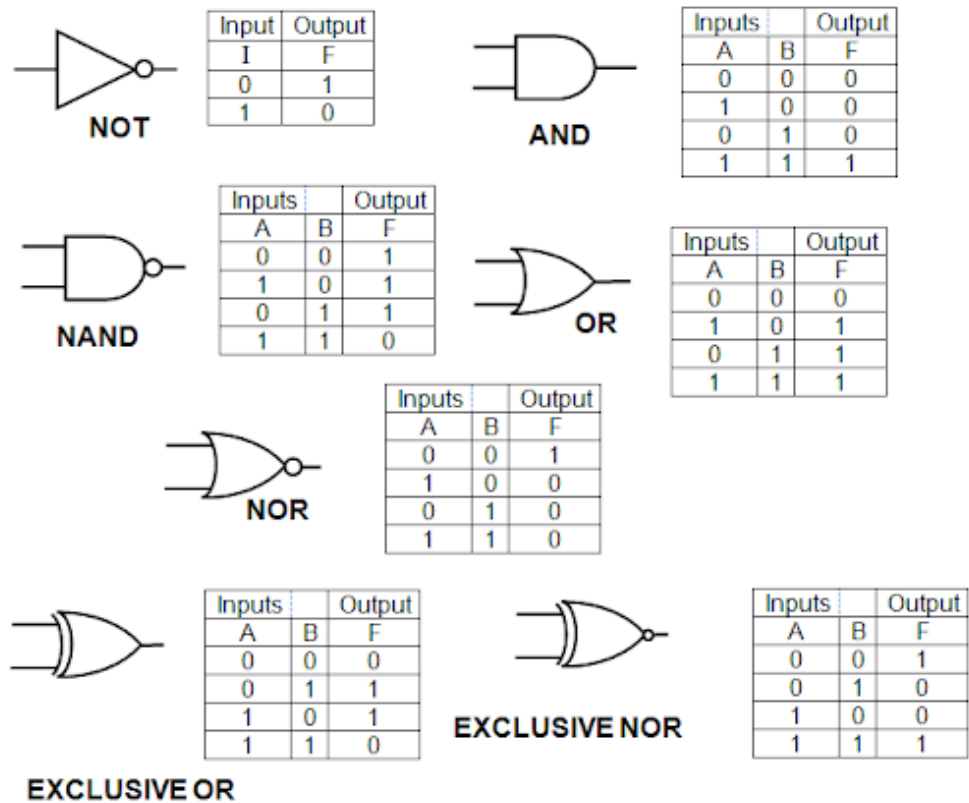
Task 01: Get the Knowledge About Basic Digital Gates

Figure No. 01: Basic Digital Gates

Task 02: Get an Idea About Representation of the Logic 0 and 1

In Digital Electronics we use logic 5V DC as '1' and Logic 0V as '0' (If you need input logic '1' you can use 5V DC also Logic '0' you can use 0V.
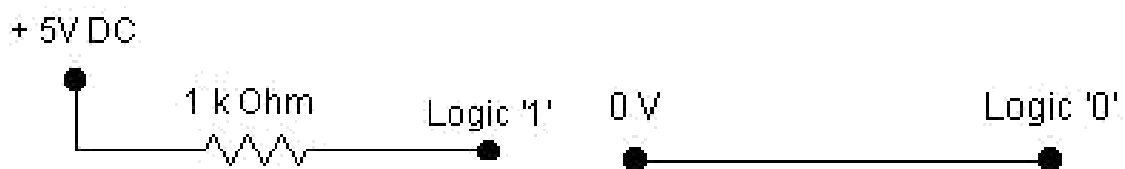

Figure No. 02: Logic Representation

Task 03: Gets an Idea About Digital IC

Digital ICs have 2 series, TTL and CMOS, TTL ICs are numbered 74XX, and CMOS are numbered as 4XXX. All the Digital ICs required 5V DC stable power supply.

Figure No. 03: An IC

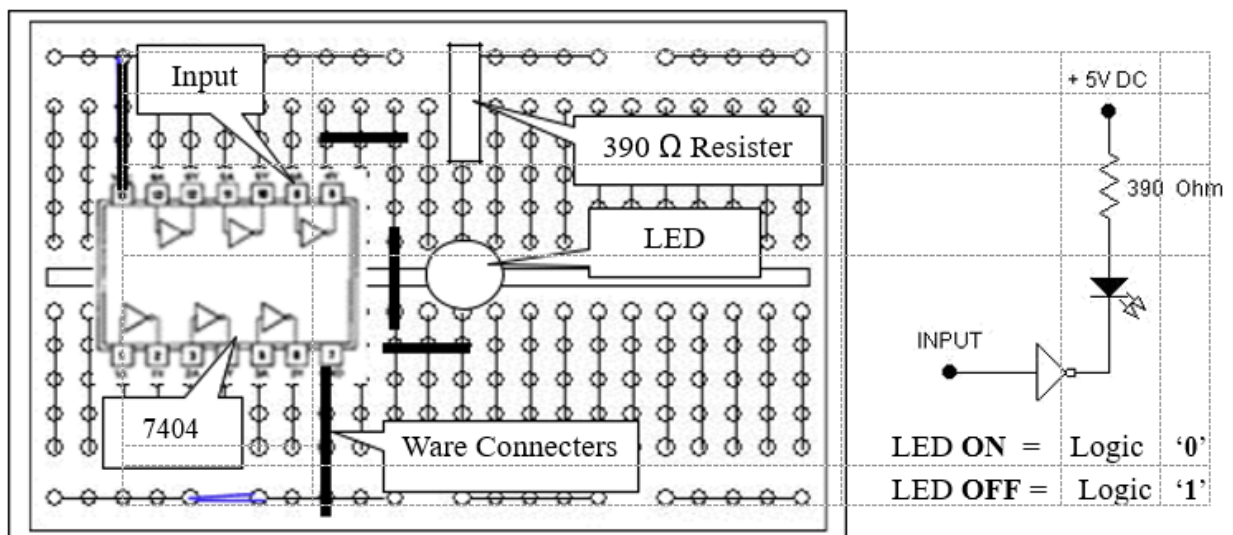## Task 04: Use 7404 (NOT GATE) and Identify How NOT Gate Works

Figure No. 04: Not Gate

Do the following steps:

1. Remove power in your breadboard
2. Fix 7404 Digital IC in your breadboard
3. Create an output indicator to display output (Fix LED bulb with resister to see the output stage)
4. Add power into IC **(Carefully do this one otherwise, your IC can be damaged)**
5. Set logic 1 (5 V) into input for the Gate.
6. See the Output (Is LED is on or off describe the result)
7. Set logic 0 (0 V) into input for the Gate.
8. See the Output (Is LED is on or off describe the result)
9.

Task 05: Use 7408 (AND GATE) and Identify How AND Gate Works
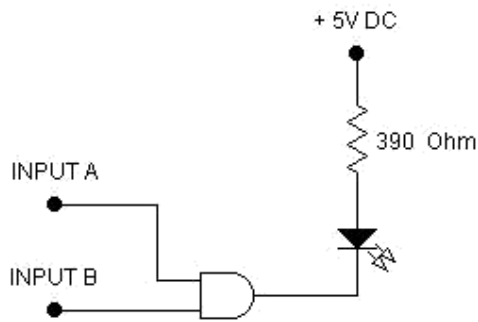
INPUT A	INPUT B	OUTPUT
0V	0V	?
0V	5V	?
5V	0V	?
5V	5V	?

Figure No. 05: AND Gate

Do the following steps:

1. Remove power in your breadboard and remove all component
2. Fix 7408 Digital IC in your breadboard
3. Create an output indicator to display output (Fix LED bulb with resister to see the output stage)
4. Add power into IC **(Carefully do this one otherwise, your IC can be damaged)**
5. Set inputs in the Gate (input combinations are given in the above table)
6. See the Output (Is LED is ON or OFF. Describe the result)
7. Draw the truth table

Task 06: Use an Unknown Gate and Identify It

Unknown Digital IC datasheet is bellowed. A, B are inputs and Y is the output of the gate. One IC contains 4 gates. Now using this datasheet, you identify the above gate.
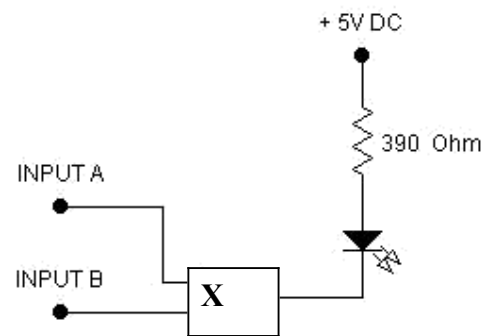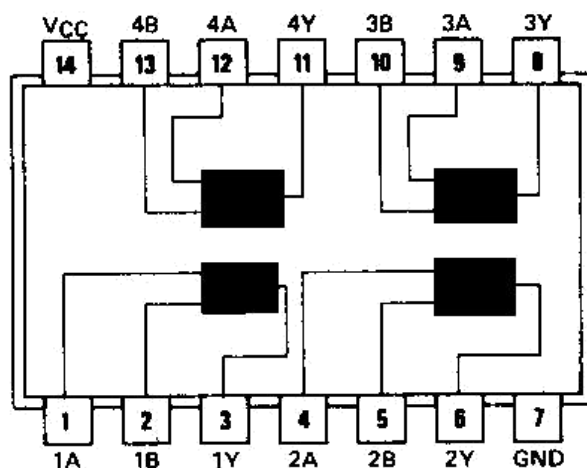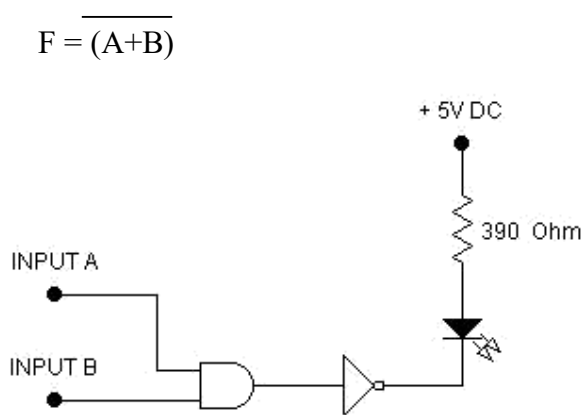

Figure No. 06: An Unknown Gate

Do the following steps:

1. Remove power in your breadboard and remove all component
2. Fix Digital IC in your breadboard
3. Create an output indicator to display output (Fix LED bulb with resister to see the output stage)
4. Add power to IC
5. Set inputs combinations into a gate
6. See the output of all input combinations stage.
7. Draw a truth table and identify the gate.

Task 07: Check the Output of the Equation

$F = \overline{(A+B)}$

Figure No. 07: Representing the Equation

Steps

1. Remove power in your breadboard and remove all component
2. Fix Digital ICs in your breadboard
3. Design the circuit and create an output indicator to display output (Fix LED bulb with resister to see the output stage)

4. Add power into IC
5. Set input combinations into a gate and check the output.
6. Draw the truth table.

Task 08: Create a Simple Combinational Logic Circuit using Digital Logic Gates

A Digital Logic Circuit (DLC) has three inputs A, B, and C and A is the Most Significant Bit (MSB). The output of the circuit will be 1 (HIGH), only whenever two or more inputs are 1 and for all other cases, the output should be 0.
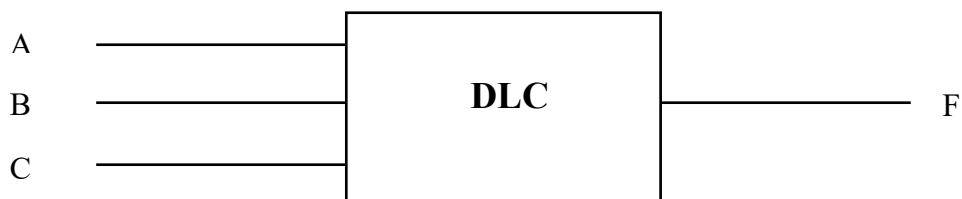
a) Derive the truth table for the above-mentioned circuit.

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b) Write the Boolean expression for the output (F) in Sum-of-Product (SoP) form.

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c) Simplify the above Boolean expression using the K-MAP simplification method.

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d) Draw a circuit diagram for the simplified expression in part (III) using Basic Logic Gates.

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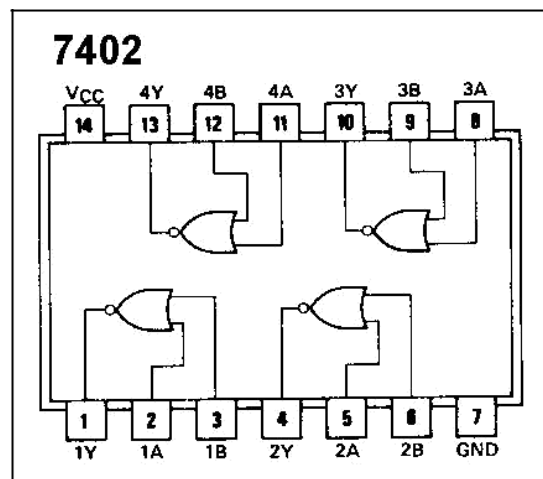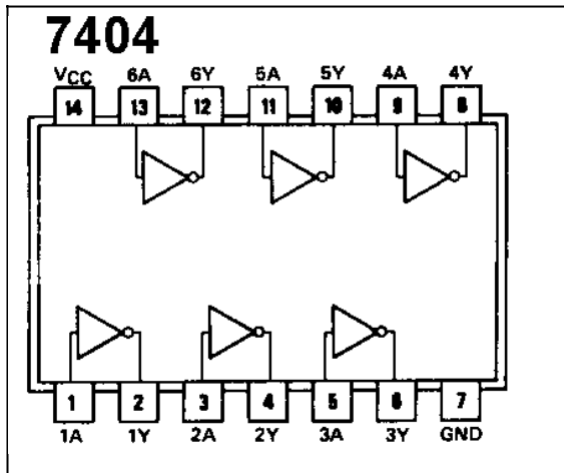**DATA SHEET (7400, 74002, 7404, 7408, 7432,7486)**
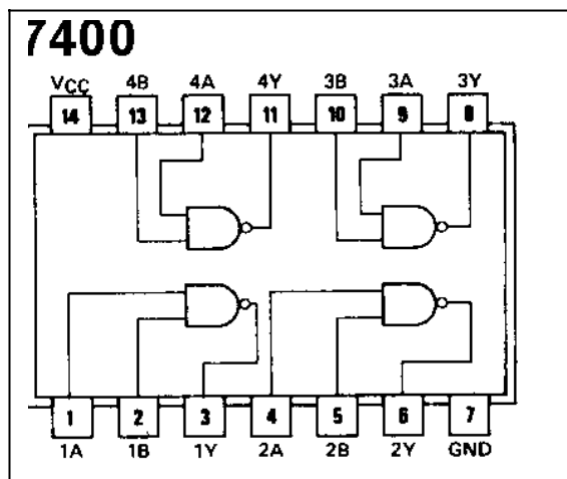
2 INPUT NAND GATE

2 INPUT NOR GATE

7404

NOT GATE

7408

2 INPUT AND GATE

7432
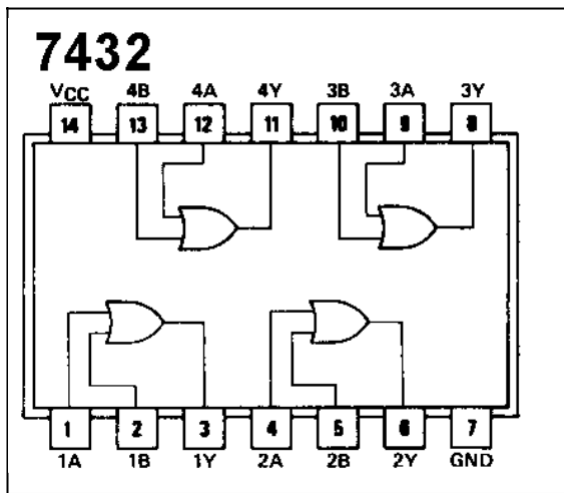

2 INPUT OR GATE

7486

2 INPUT XOR GATE

END