

DIGITAL ELECTRONICS- LAB MANUAL

- *JV'n Ms. Indu*

JAYOTI VIDYAPEETH WOMEN'S UNIVERSITY, JAIPUR

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Experiment No: 1

Aim: Study of Bread Board.

Theory:

Introduction:

A breadboard is utilized to construct and test circuits rapidly prior to finishing any circuit plan. The breadboard has numerous openings into which circuit parts like ICs and resistors can be embedded. An ordinary breadboard is demonstrated as follows:

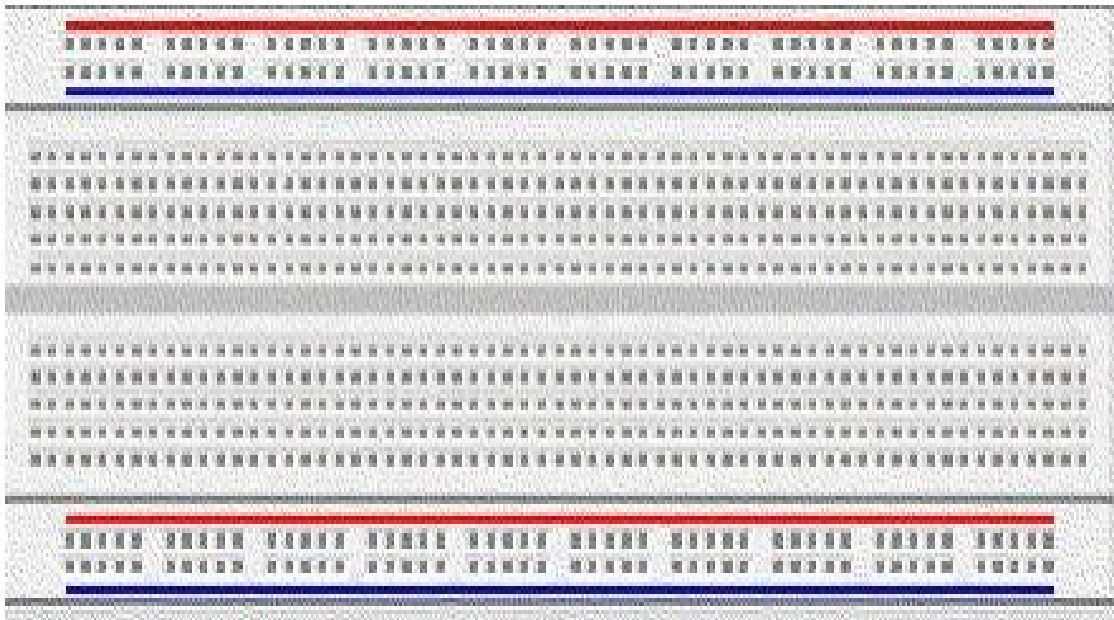


Figure 1: Image of Bread Board

The bread board has portions of metal which run under the board and associate the openings on the highest point of the board. The metal strips are spread out as demonstrated as follows. Note that the top also, base columns of openings are associated on a level plane while the excess openings are associated vertically.

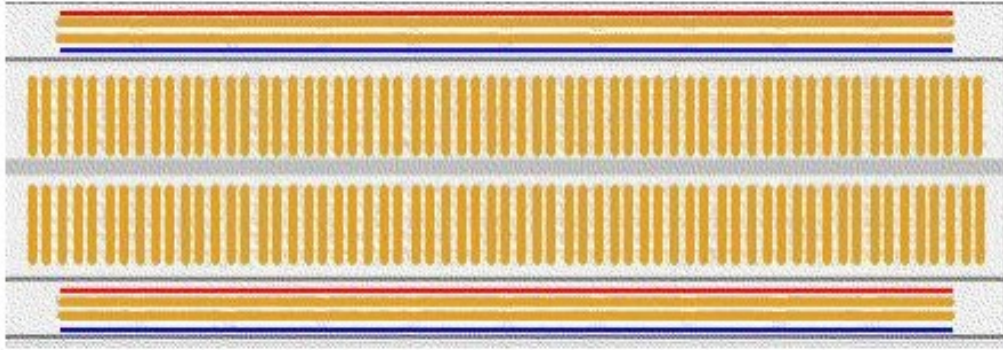


Figure 2: Internal Connection of Bread Board

To utilize the bread board, the legs of segments are set in the openings. Each set of openings associated by a metal strip under structures a hub. A hub is a point in a circuit where two parts are associated. Associations between various parts are shaped by placing their legs in a typical hub.

The long top and base line of openings are typically utilized for power supply associations. The rest of the circuit is worked by putting segments and interfacing them along with jumper wires. ICs are set in the board with the goal that a big part of the legs are on one side of the center line and half on the other.

A finished circuit may resemble the accompanying.

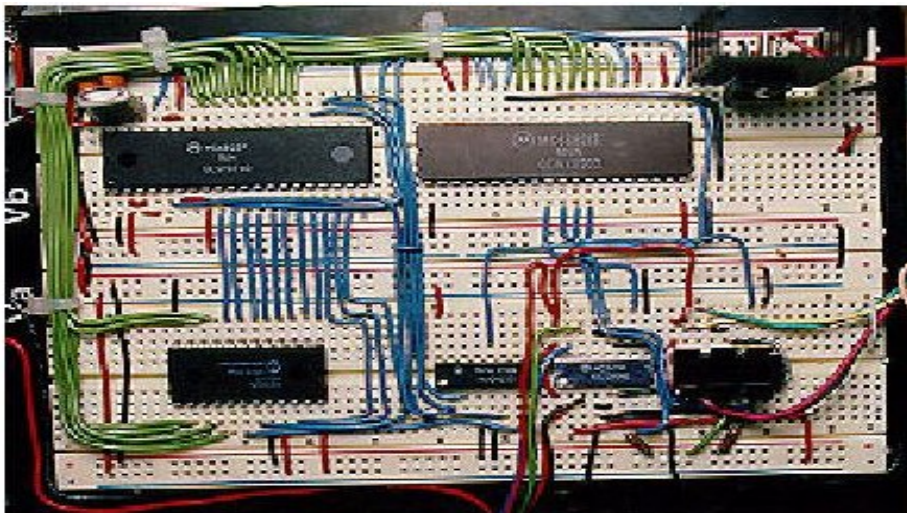


Figure 3: A Circuit on Bread Board

Tips for Bread Boarding:

It is imperative to breadboard a circuit flawlessly and deliberately, with the goal that one can troubleshoot it furthermore, make it run effectively and rapidly. It additionally helps when another person needs to comprehend and assess the circuit. Here are a few hints:

1. Continuously utilize the side-lines for power supply associations. Force the chips from the side-lines and not straightforwardly from the force supply.
2. Utilize dark wires for ground associations (0V), and red for other force associations.
3. Keep the jumper wires on the board level, so the board doesn't look jumbled.
4. Course jumper wires around the chips and not over the chips. This makes evolving the chips when required simpler.
5. You could manage the legs of segments like resistors, semiconductors and LEDs, so that they fit in cozily and don't get pulled out unintentionally.

Questions:

Q1. A Breadboard is used for:

- a) designing or test electronic circuits
- b) code converting circuit
- c) both A and B
- d) none of the above

Q2. Write the tips for bread boarding.

Experiment No: 2

Aim: To Study and Verification of truth table of NOT Gate.

Apparatus: Breadboard, DC Power Supply, Connecting Wires

Component: 7404 IC

Theory:

Introduction:

NOT Gate is used to perform complementation or inversion. It has one input and one output. If the input of the NOT gate is LOW then the output will be HIGH and if the input of the NOT gate is HIGH then the output will be LOW.

Logic Symbol:

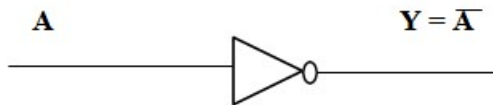


Figure 4: Logical Symbol of NOT Gate

Truth Table:

Inputs A	Output $Y = \overline{A}$
0	1
1	0

Table 1: Truth Table of NOT Gate

Circuit Diagram of NOT Gate By Using Transistor:

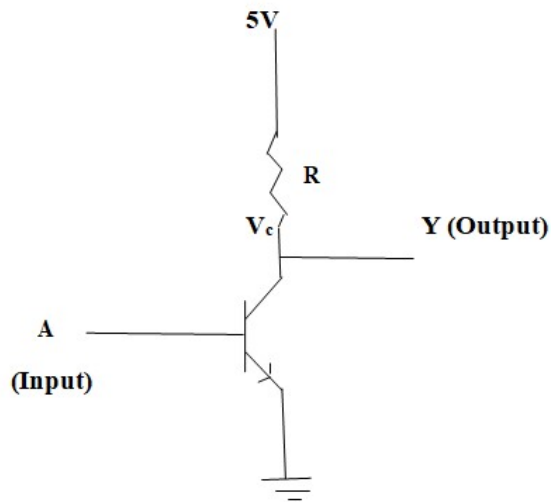


Figure 5: Circuit Diagram of NOT Gate by using Transistor

The figure 5 shows the circuit diagram of NOT Gate. If input $A = 0$, then transistor will be in OFF state and output will be HIGH and vice-versa.

Pin Diagram of NOT Gate:

We use 7404 IC for NOT gate.

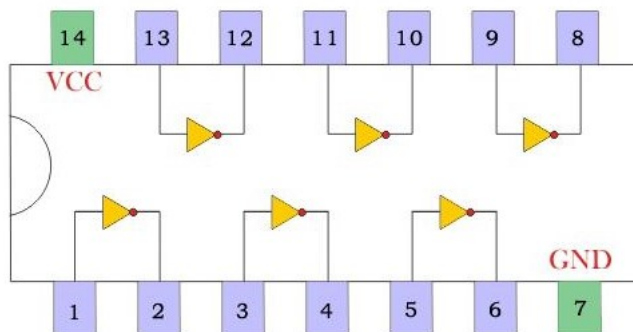


Figure 6: Pin Diagram of 7404 IC

Pin No.	Name of the Pin	Function
1	Input 1	Input / Output of First Inverter
2	Output 1	
3	Input 2	Input / Output of Second Inverter
4	Output 2	
5	Input 3	Input / Output of Third Inverter
6	Output 3	
7	Ground	Ground (0V)
8	Output 4	Input / Output of Forth Inverter
9	Input 4	
10	Output 5	Input / Output of Fifth Inverter
11	Input 5	
12	Output 6	Input / Output of Sixth Inverter
13	Input 6	
14	V _{CC}	Supply Voltage 5V (4.75 V – 5.25 V)

Table 2: Pin Explanation of 7404 IC

Questions:

Q1. Define NOT gate.

Q2. Explain the truth table of NOT gate.

Q3. Explain the PIN diagram of 7404 IC.

Experiment No: 3

Aim: To Study and Verification of truth table of AND Gate.

Apparatus: Breadboard, DC Power Supply, Connecting Wires

Component: 7408 IC

Theory:

Introduction:

AND gate performs the multiplication operation. It has two or more than two inputs and only one output. If all the inputs are HIGH then AND gate produces HIGH output. If only one input is LOW then AND gate produces LOW output.

Logic Symbol:



Figure 7: Logic Symbol of AND gate

Truth Table:

Inputs		Output $Y = AB$
A	B	
0	0	0
0	1	0
1	0	0
1	1	1

Table 3: Truth Table of AND Gate

Circuit Diagram of AND Gate by Using Diodes:

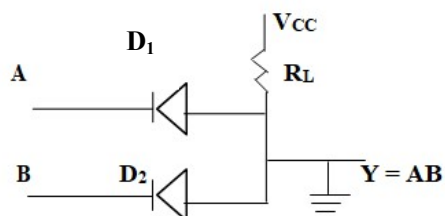


Figure 8: Circuit diagram of AND gate by using diodes

Figure 8 shows the circuit diagram of AND gate by using diodes.

Case 1 If $A = 0$ and $B = 0$, then D_1 and D_2 will be ON

Therefore, $\text{Output}(Y) = 0$

Case 2 If $A = 0$ and $B = 1$, then D_1 will be ON and D_2 will be OFF

Therefore, $\text{Output}(Y) = 0$

Case 3 If $A = 1$ and $B = 0$, then D_1 will be OFF and D_2 will be ON

Therefore, $\text{Output}(Y) = 0$

Case 4 If $A = 1$ and $B = 1$, then D_1 will be OFF and D_2 will be OFF

Therefore, $\text{Output}(Y) = 1$

Pin Diagram of AND Gate:

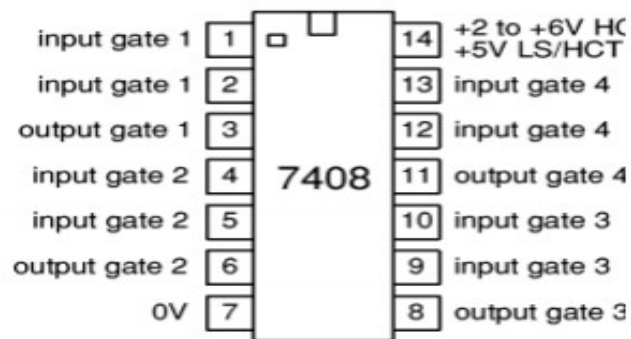


Figure 9: (a) Pin Diagram of 7408 IC

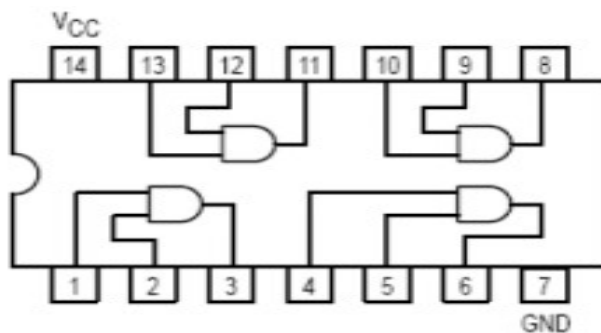


Figure 9: (b) Pin Diagram of 7408 IC

Questions:

Q1. Define AND gate.

Q2. Explain the truth table of AND gate.

Q3. Explain the PIN diagram of 7408 IC.

Experiment No: 4

Aim: To Study and Verification of truth table of OR Gate.

Apparatus: Breadboard, DC Power Supply, Connecting Wires

Component: 7432 IC

Theory:

Introduction:

OR gate performs the logical addition operation. It has two or more than two inputs and only one output. If all the inputs are LOW then OR gate produces LOW output. If only one input is HIGH then OR gate produces HIGH output.

Logic Symbol:



Figure 10: Logic Symbol of OR Gate

Truth Table:

Inputs		Output $Y = A+B$
A	B	
0	0	0
0	1	1
1	0	1
1	1	1

Table 4: Truth Table of OR Gate

Circuit Diagram of OR Gate by Using Diodes:

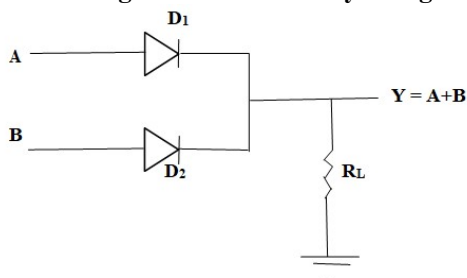


Figure 11: Circuit Diagram of OR Gate by Using Diodes

Figure 11 shows the circuit diagram of AND gate by using diodes.

Case 1 If $A = 0$ and $B = 0$, then D_1 and D_2 will be OFF

Therefore, $\text{Output}(Y) = 0$

Case 2 If $A = 0$ and $B = 1$, then D_1 will be OFF and D_2 will be ON

Therefore, $\text{Output}(Y) = 1$

Case 3 If $A = 1$ and $B = 0$, then D_1 will be ON and D_2 will be OFF

Therefore, $\text{Output}(Y) = 1$

Case 4 If $A = 1$ and $B = 1$, then D_1 will be ON and D_2 will be ON

Therefore, $\text{Output}(Y) = 1$

Pin Diagram of OR Gate:

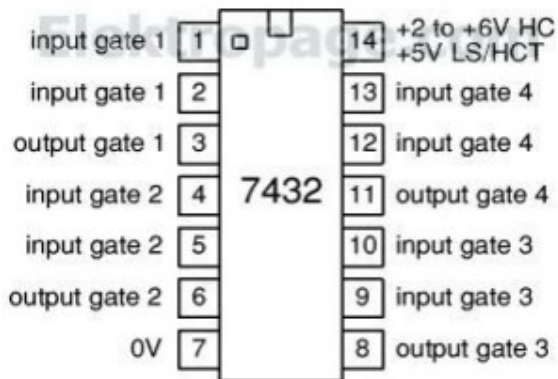


Figure 12: (a) Pin Diagram of 7432 IC

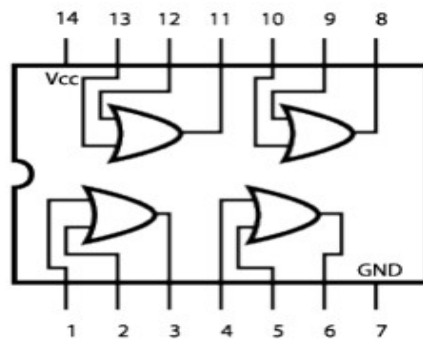


Figure 12: (b) Pin Diagram of 7432 IC

Questions:

Q1. Define OR gate.

Q2. Explain the truth table of OR gate.

Q3. Explain the PIN diagram of 7432 IC.

Experiment No: 5

Aim: To Study and Verification of truth table of Universal Gates.

Apparatus: Breadboard, DC Power Supply, Connecting Wires

Components: 7400 IC, 7402 IC

Theory:

Introduction:

Universal logic gates are used to design all other logic gates. There are two types of logic gates-

- a) NAND Gate
- b) NOR gate

NAND Gate:

NAND gate is the combination of NOT gate and AND gate. It performs multiplication and complementation. It has two or more than two inputs and only one output. If all the inputs are HIGH then NAND gate produces LOW output. If only one input is LOW then NAND gate produces HIGH output.

Logic Symbol:



Figure 13: Logic Symbol of NAND Gate

Truth Table:

Inputs		output
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

Table 5: Truth Table of NAND Gate

Pin Diagram of NAND Gate:

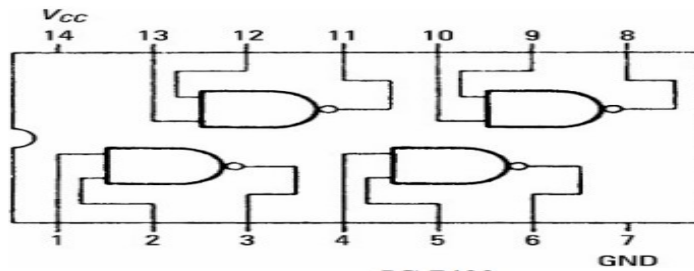


Figure 14: Pin Diagram of 7400 IC

NOR Gate:

NOR gate is the combination of NOT gate and OR gate. It performs addition and complementation. It has two or more than two inputs and only one output. If all the inputs are LOW then NOR gate produces HIGH output. If only one input is HIGH then NOR gate produces LOW output.

Logic Symbol:



Figure 15: Logic Symbol of NOR Gate

Truth Table:

inputs		output
A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

Table 6: Truth Table of NOR Gate

Pin Diagram of NOR Gate:

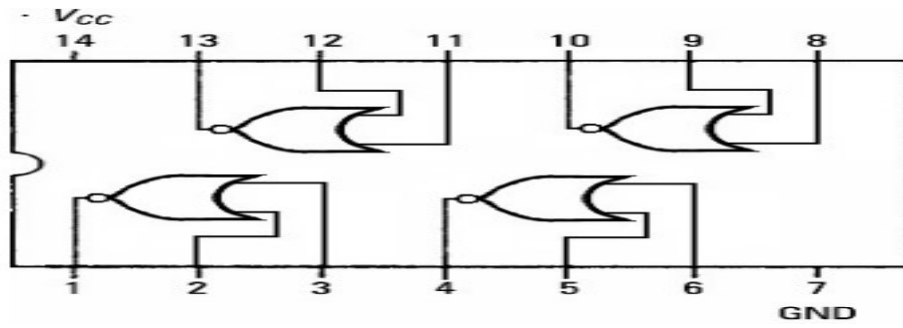


Figure 16: Pin Diagram of 7402 IC

Questions:

Q1. Define NAND gate.

Q2. Explain the truth table of NAND gate.

Q3. Explain the PIN diagram of 7400 IC.

Q4. Define NOR gate.

Q5. Explain the truth table of NOR gate.

Q6. Explain the PIN diagram of 7402 IC.

Experiment No: 6

Aim: To Study and Verification of truth table of Ex-OR Gate.

Apparatus: Breadboard, DC Power Supply, Connecting Wires

Component: 7486 IC

Theory:

Introduction:

Ex-OR gate is stands for Exclusive OR gate. It is also known as odd one detector. When in the inputs odd one is present then it will produce HIGH output. When inputs are same then it will produce LOW output.

Logic Symbol:

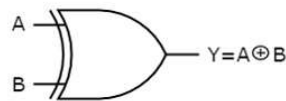


Figure 17: Logic Symbol of Ex-OR Gate

Truth Table:

INPUT		OUTPUT
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

Table 7: Truth Table of Ex-OR Gate

Pin Diagram of Ex-OR Gate:

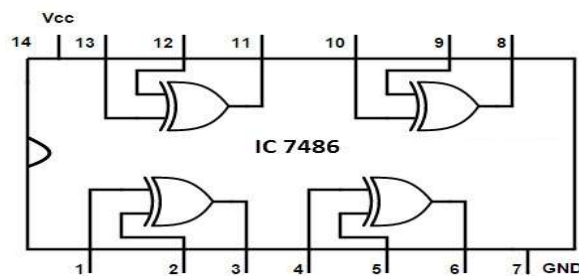


Figure 18: PIN Diagram of 7486 IC

Questions:

Q1. Define Ex-OR gate.

Q2. Explain the truth table of Ex-OR gate.

Q3. Explain the PIN diagram of 7486 IC.

Experiment No: 7

Aim: To Study and Verification of truth table of Ex-NOR Gate.

Apparatus: Breadboard, DC Power Supply, Connecting Wires

Component: 74266 IC

Introduction:

Ex-NOR gate is stands for Exclusive NOR gate. When inputs are same then it will produce HIGH output and when inputs are different then it will produce LOW output.

Logic Symbol:

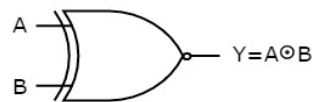


Figure 19: Logic Symbol of Ex-NOR gate

Truth Table:

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

Table 8: Truth Table of Ex-NOR Gate

Pin Diagram of Ex-NOR Gate:

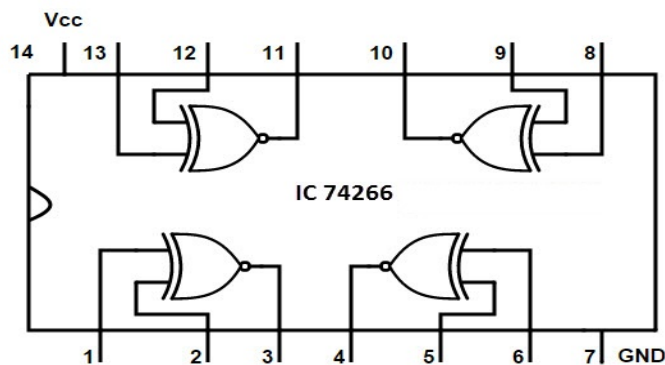


Figure 20: Pin Diagram of 74266 IC

Questions:

Q1. Define Ex-NOR gate.

Q2. Explain the truth table of Ex-NOR gate.

Q3. Explain the PIN diagram of 74266 IC.

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