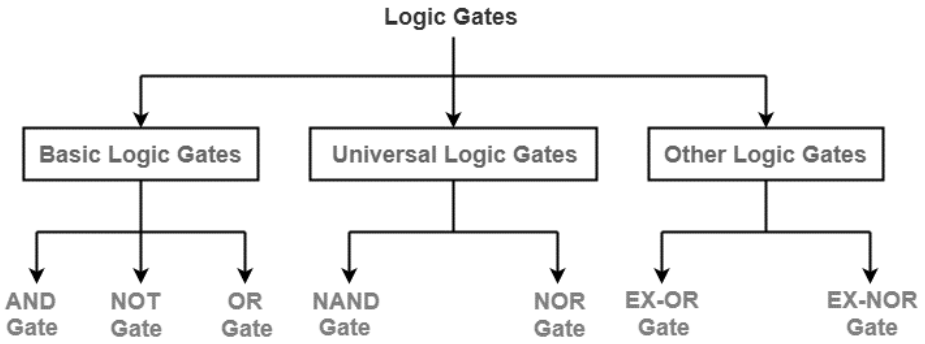
PEN : 200840131012

PRACTICAL - 1

Aim - Configure diodes and transistor as logic gates and Digital ICs for verification of truth table of logic gates.

Types Of Logic Gates-



Types of Logic Gates

Basic Logic Gates-

Basic Logic Gates are the fundamental logic gates using which universal logic gates and other logic gates are constructed.

They have the following properties-

- Basic logic gates are associative in nature.
- Basic logic gates are commutative in nature.

There are following three basic logic gates-

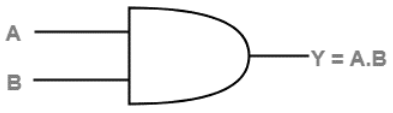
1. AND Gate
2. OR Gate
3. NOT Gate

1. AND Gate-

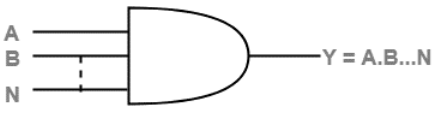
- The output of AND gate is high (‘1’) if all of its inputs are high (‘1’).
- The output of AND gate is low (‘0’) if any one of its inputs is low (‘0’).

Logic Symbol-

The logic symbol for AND Gate is as shown below-



2-Input AND Gate



N-Input AND Gate

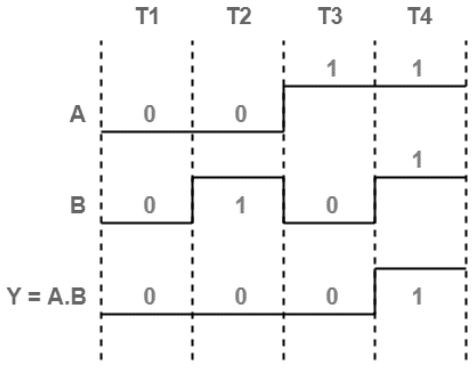
Truth Table-

The truth table for AND Gate is as shown below-

A	B	Y = A.B
0	0	0
0	1	0
1	0	0
1	1	1

Timing Diagram-

The timing diagram for AND Gate is as shown below-



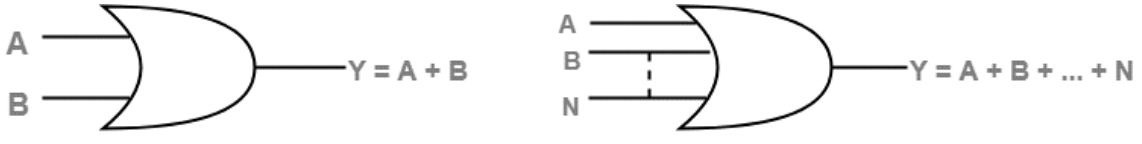
AND Gate Timing Diagram

2. OR Gate-

- The output of OR gate is high (‘1’) if any one of its inputs is high (‘1’).
- The output of OR gate is low (‘0’) if all of its inputs are low (‘0’).

Logic Symbol-

The logic symbol for OR Gate is as shown below-



2-Input OR Gate

N-Input OR Gate

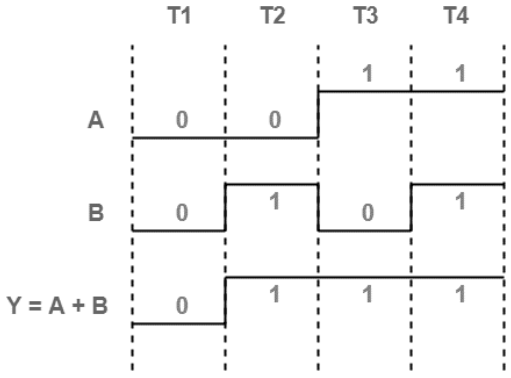
Truth Table-

The truth table for OR Gate is as shown below-

A	B	Y = A + B
0	0	0
0	1	1
1	0	1
1	1	1

Timing Diagram-

The timing diagram for OR Gate is as shown below-



OR Gate Timing Diagram

3. NOT Gate-

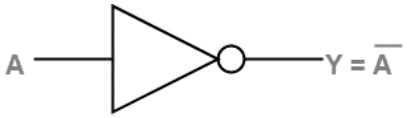
- The output of NOT gate is high (‘1’) if its input is low (‘0’).
- The output of NOT gate is low (‘0’) if its input is high (‘1’).

From here-

- It is clear that NOT gate simply inverts the given input.
- Since NOT gate simply inverts the given input, therefore it is also known as **Inverter Gate**.

Logic Symbol-

The logic symbol for NOT Gate is as shown below-



NOT Gate

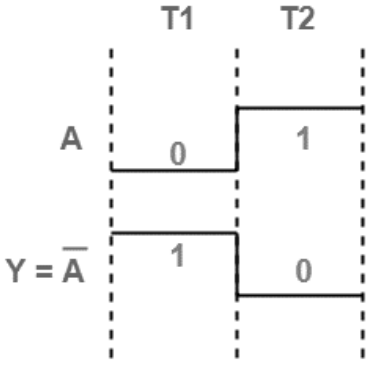
Truth Table-

The truth table for NOT Gate is as shown below-

A	**Y = A'**
0	1
1	0

Timing Diagram-

The timing diagram for NOT Gate is as shown below-



NOT Gate Timing Diagram

Universal Logic Gates-

Universal logic gates are the logic gates that are capable of implementing any Boolean function
without requiring any other type of gate.

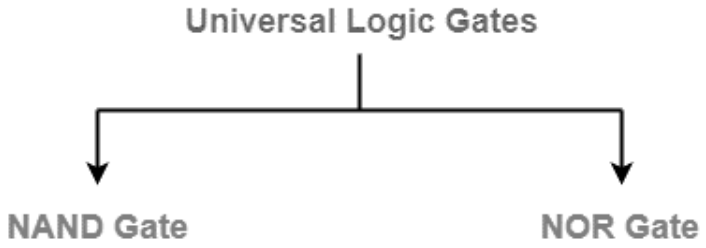
They are called as "**Universal Gates**" because-

- They can realize all the binary operations.
- All the basic logic gates can be derived from them.

They have the following properties-

- Universal gates are not associative in nature.
- Universal gates are commutative in nature.

There are following two universal logic gates-



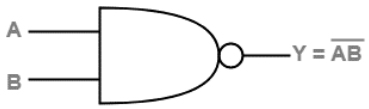
1. NAND Gate
2. NOR Gate

1. NAND Gate-

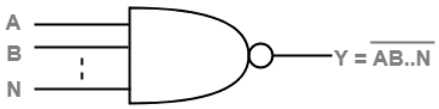
- A NAND Gate is constructed by connecting a NOT Gate at the output terminal of the AND Gate.
- The output of NAND gate is high ('1') if at least one of its inputs is low ('0').
- The output of NAND gate is low ('0') if all of its inputs are high ('1').

Logic Symbol-

The logic symbol for NAND Gate is as shown below-



2-Input NAND Gate



N-Input NAND Gate

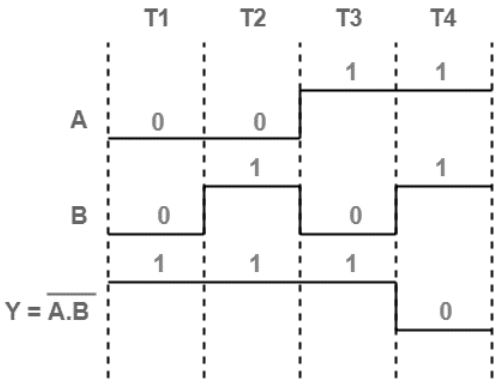
Truth Table-

The truth table for NAND Gate is as shown below-

A	B	Y = (A.B)'
0	0	1
0	1	1
1	0	1
1	1	0

Timing Diagram-

The timing diagram for NAND Gate is as shown below-



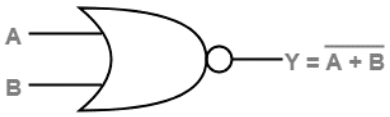
NAND Gate Timing Diagram

2. NOR Gate-

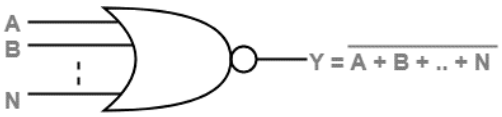
- A NOR Gate is constructed by connecting a NOT Gate at the output terminal of the OR Gate.
- The output of OR gate is high ('1') if all of its inputs are low ('0').
- The output of OR gate is low ('0') if any of its inputs is high ('1').

Logic Symbol-

The logic symbol for NOR Gate is as shown below-



2-Input NOR Gate



N-Input NOR Gate

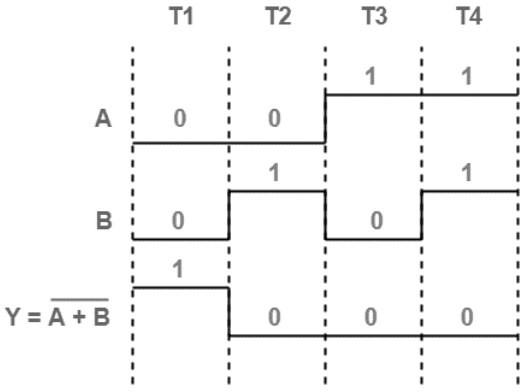
Truth Table-

The truth table for NOR Gate is as shown below-

A	B	Y = A + B
0	0	1
0	1	0
1	0	0
1	1	0

Timing Diagram-

The timing diagram for NOR Gate is as shown below-

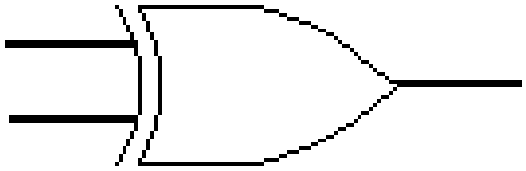


NOR Gate Timing Diagram

Other Logic Gates-

1. XOR Gate -

The XOR (exclusive-OR) gate acts in the same way as the logical "either/or." The output is "true" if either, but not both, of the inputs are "true." The output is "false" if both inputs are "false" or if both inputs are "true." Another way of looking at this circuit is to observe that the output is 1 if the inputs are different, but 0 if the inputs are the same.

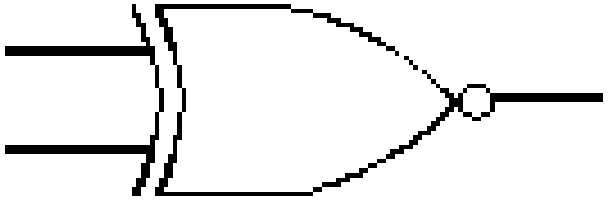


XOR gate

Input 1	Input 2	Output
0	0	0
0	1	1
1	0	1
1	1	0

2. XNOR Gate –

The XNOR (exclusive-NOR) gate is a combination XOR gate followed by an inverter. Its output is "true" if the inputs are the same, and "false" if the inputs are different.



XNOR gate

Input 1	Input 2	Output
0	0	1
0	1	0
1	0	0
1	1	1

PRACTICAL - 2

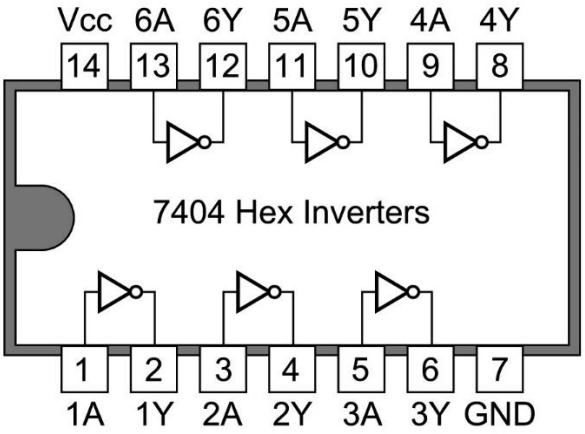
Aim - Getting familiar with various digital integrated circuits of different logic families. Study of data sheet of these circuits and see how to test these circuits using Digital IC Tester.

Types Of Integreted Circuit Gates-

1. IC 7404

- It consists of six NOT Gates. We know that the NOT gate also called inverters because it does the complements of the input. When we apply 0 or low signal to the input it gives 1 or high signal in output.

Pin Diagram:



Operating Condition of IC 74LS04:

1. The power supply should be given to the IC from 4.5V DC to 5.25V DC
2. The IC will consider a signal as high when the voltage of the signal is above 2V
3. The IC will consider a signal as low when the voltage of the signal is below 0.8V
4. The operating temperature of the IC should be below the 70-degree centigrade

Characteristics:

1. IC 74LS04 can deliver -0.4 mA current when the output is high.
2. It can deliver 16 mA current when the output is low.
3. When the Vcc is 5V and the input signal is 5V then the IC draws 1 mA current.
4. When the Vcc is 5V and the input signal is 2.7V then the IC draws 20 to 40 micro-ampere currents.
5. When the Vcc is 5V and the input signal is 0.4V then the IC draws -1.6 mA current.

Pin Description of the IC 74LS04:

Pin 1:	The pin 1 is the input for 1st NOT Gate.
Pin 2:	Pin 2 is the output of 1st NOT Gate.
Pin 3:	Pin 3 is connected to the input of the 2nd NOT Gate.
Pin 4:	Pin 4 is the output of the 2nd NOT Gate.
Pin 5:	Pin 5 is connected to the input of the 3rd NOT Gate.
Pin 6:	Pin 6 is connected to the output terminal of the 3rd NOT Gate
Pin 7:	Pin 7 is the ground pin, it is used to provide power supply to the IC.
Pin 8:	It is the output pin of the 4th Gate.
Pin 9:	It provides the input pin for the 4th Gate.
Pin 10:	Output of the 5th Gate is connected to the pin 10
Pin 11:	Input of the 5th Gate.
Pin 12:	It is connected to the output of the 6th Gate.
Pin 13:	The pin 13 is connected to the input of 6th Gate.
Pin 14:	It is the Vcc terminal of the IC, it is used to provide the power supply to the IC chip.

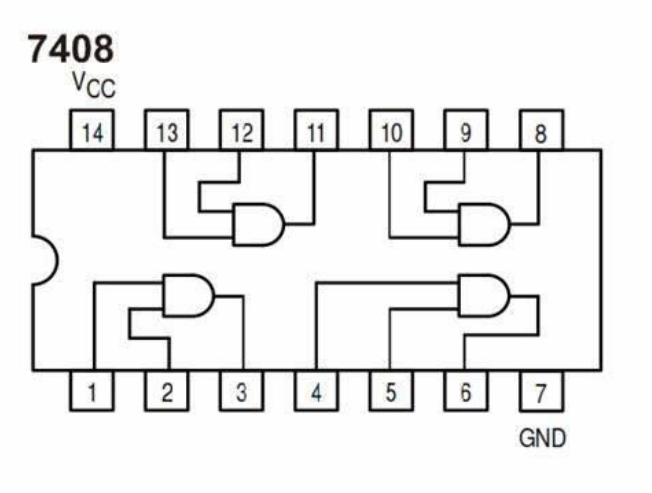
Application of IC 7404:

1. IC 7404 is mostly used for digital electronics projects.
2. They are also used in some electronic devices.
3. They are also used in Space instruments.

2.IC 7408

- It consists of four two-input AND Gates. The AND gate perform logical AND operation. Logic gates come in form of ICs. The all four AND gates are independent. Each gate has three pins two inputs and one output. IC 74HC08, IC DM7408 are AND gate ICs.

Pin Diagram:



Operating Condition of IC DM7408 :

1. The power supply should be given to the IC from 4.5V DC to 5.25V DC
2. The IC can identify a signal as a high-level signal if the voltage of the signal is above 2V
3. The IC can identify a signal as a low-level signal if the voltage of the signal is below 0.8V
4. The IC should be operated below the 70-degree centigrade

Characteristics:

1. The IC DM7408 can deliver 21 mA current when the output signal is high at maximum Vcc Voltage.
2. The IC can deliver 33 mA current when the output signal is low at maximum Vcc voltage.
3. When the Vcc is maximum and the input signal is 5.5V then the IC draws 1 mA current.
4. When the Vcc is maximum and the input signal is 2.7V then the IC draws 20 to 40 micro-ampere currents.
5. When the Vcc is maximum and the input signal is 0.4V then the IC draws -1.6 mA current.

Pin Description of IC 7408:

Pin 1:	The pin 1 is the 1st input for 1st AND Gate.
Pin 2:	Pin 2 is the 2nd input of 1st AND Gate.
Pin 3:	Pin 3 is connected to the output of the 1st AND Gate.
Pin 4:	Pin 4 is the 1st input of the 2nd AND Gate.
Pin 5:	Pin 5 is connected to the 2nd input of the 2nd AND Gate.
Pin 6:	Pin 6 is connected to the output terminal of the 2nd AND Gate.
Pin 7:	Pin 7 is the ground pin, it is used to provide power supply to the IC.
Pin 8:	It is the output pin of the 3rd AND Gate.
Pin 9:	It provides the 2nd input pin for the 3rd Gate.
Pin 10:	It is the 1st input pin of the 3rd AND gate
Pin 11:	It is the 1st input pin of the 3rd AND gate
Pin 12:	It is connected to the 2nd input of the 4th Gate.
Pin 13:	The pin 13 is connected to the 1st input of 4th Gate.
Pin 14:	It is the Vcc terminal of the IC, it is used to provide the power supply to the IC chip.

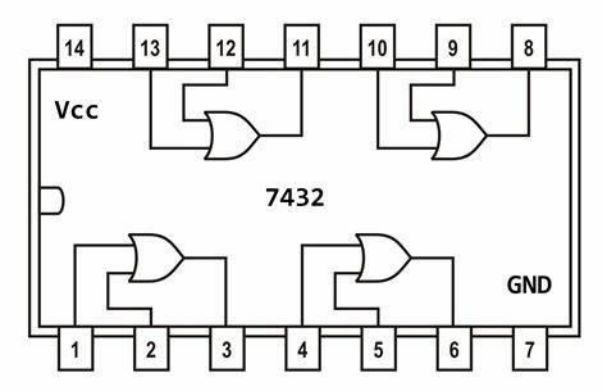
Application of IC 7408:

1. IC 7408 is used for digital electronics projects.
2. Used in some electronics devices.

3. IC 7432

It consist of four OR Gates. The OR gate performs logical OR operation. The OR gates come in form of DIP package ICs. Each gate has three terminal two inputs and one output. The ICs are made by CMOS, TTL technology.

Pin Diagram:



Operating Condition of IC 7432:

1. The power supply should be given to the IC from 4.5V DC to 5.25V DC
2. The IC will consider a signal as high if the voltage of the signal is above 2V
3. The IC will consider a signal as low if the voltage of the signal is below 0.8V
4. The operating temperature of the IC should be below the 70-degree centigrade

Characteristics:

1. IC 74LS04 can deliver -0.4 mA current when the output is high.
2. It can deliver 16 mA current when the output is low.
3. When the Vcc is maximum and the input signal is 5V then the IC draws 1 mA current.
4. When the Vcc is maximum and the input signal is 2.7V then the IC draws 20 to 40 micro-ampere currents.
5. When the Vcc is maximum and the input signal is 0.4V then the IC draws -1.6 mA current.

Pin Description of IC 7432:

Pins	Description
Pin 1	It is connected to the Input(A) of OR Gate 1
Pin 2	Input(B) of OR Gate 1
Pin 3	It is connected to the Output(Y) of OR Gate 1
Pin 4	Input(A) of OR Gate 2
Pin 5	Input(B) of OR Gate 2
Pin 6	This pin provides the Output(Y) of OR Gate 2
Pin 7	Ground Pin which used to provide the power supply to the IC.
Pin 8	It is connected to the Output(Y) of OR Gate 3
Pin 9	It is connected to the Input(A) of OR Gate 3
Pin 10	Input(B) of OR Gate 3
Pin 11	It is the output(Y) pin of the OR Gate 4
Pin 12	It is the input(A) pin of the OR Gate 4
Pin 13	It is the input(B) pin of the OR Gate 4
Pin 14	It is Vcc pin which used to provide the power supply to the IC.

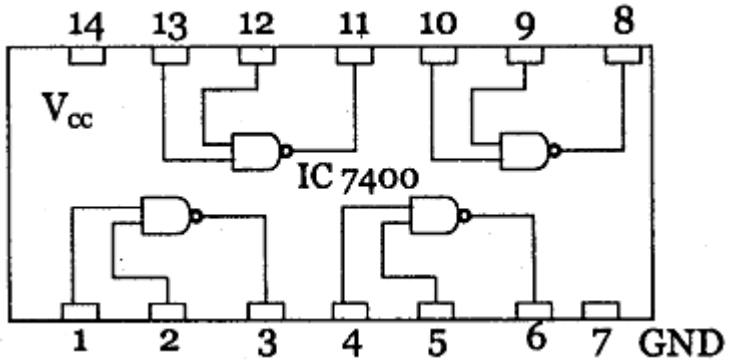
Application of IC 7432:

1. IC 7432 are used in digital electronics projects.

4. IC 7400

The IC 7400 consist of four NAND Gates. The NAND Gate is also called Universal Gate. The NAND gate has a total of three terminals, two inputs terminals, and one output terminal. All NAND Gates are independent. IC 7400 is also called Quad 2-input NAND Gate IC.

Pin Diagram:



Operating Condition of IC 7400:

1. The IC 7400 can operate from 4.5V Dc to 5.25V DC voltage. So power supply to the IC should be given in that range.
2. It can identify a signal as a high signal if the signal has the voltage above 2V.
3. It can identify a signal as a low signal if the signal has the voltage below 0.8V
4. The Ic 7400 can withstand up to 70-degree centigrade temperature so the operating temperature should be below that temperature.

Electrical Characteristics:

1. The high-level input current is 20 micro-ampere at maximum Vcc and input voltage 2.7V
2. The low-level input current is -0.36 mA at maximum Vcc and input voltage 0.4V
3. Supply current with output HIGH is 1.6 mA at Maximum Vcc
4. Supply current with output LOW is 4.4 mA at Maximum Vcc
5. The short circuit output current is -20 to -100 mA at maximum Vcc

Pin Description of IC 7400:

Pins	Description
Pin 1	It is connected to the Input(A) of NAND Gate 1
Pin 2	Input(B) of NAND Gate 1
Pin 3	It is connected to the Output(Y) of NAND Gate 1
Pin 4	Input(A) of NAND Gate 2
Pin 5	Input(B) of NAND Gate 2
Pin 6	This pin provides the Output(Y) of NAND Gate 2
Pin 7	Ground Pin which used to provide the power supply to the IC.
Pin 8	It is connected to the Output(Y) of NAND Gate 3
Pin 9	It is connected to the Input(A) of NAND Gate 3
Pin 10	Input(B) of NAND Gate 3
Pin 11	It is the output(Y) pin of the NAND Gate 4
Pin 12	It is the input(A) pin of the NAND Gate 4
Pin 13	It is the input(B) pin of the NAND Gate 4
Pin 14	It is Vcc pin which used to provide the power supply to the IC.

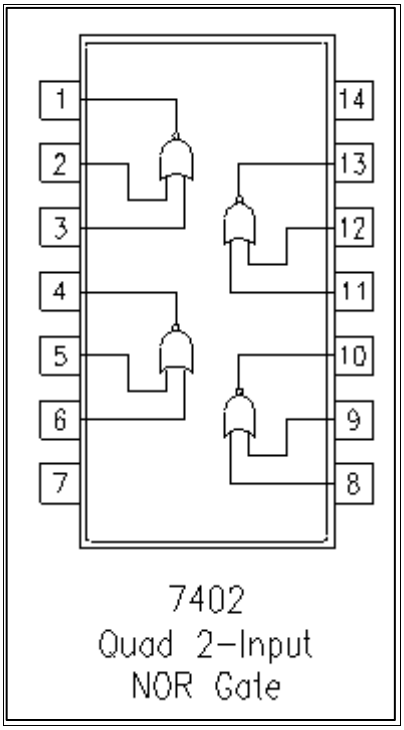
Application of IC 7400:

1. NAND gate is a universal gate so it can be used to make others gates like NOT, AND gates etc.
2. They are used in digital electronics projects.

5. IC 7402

402 IC is a device containing four independent gates each of which performs the logic NOR function. 7402 package options include: plastic small outline, ceramic chip carriers, flat packages, plastic and ceramic DIPs.

Pin Diagram:



Electrical Characteristics:

1. Four Independent 2-Input NOR Gates
2. Outputs Directly Interface to CMOS, NMOS and TTL
3. Large Operating Voltage Range
4. Wide Operating Conditions
5. Not Recommended for New Designs Use 74LS02

Pin Description of IC 7402:

Pin Number	Description
1	Y Output Gate 1
2	A Input Gate 1
3	B Input Gate 1
4	Y Output Gate 2
5	A Input Gate 2
6	B Input Gate 2
7	Ground
8	A Input Gate 3
9	B Input Gate 3
10	Y Output Gate 3
11	A Input Gate 4
12	B Input Gate 4
13	Y Output Gate 4
14	Vcc - Positive Supply

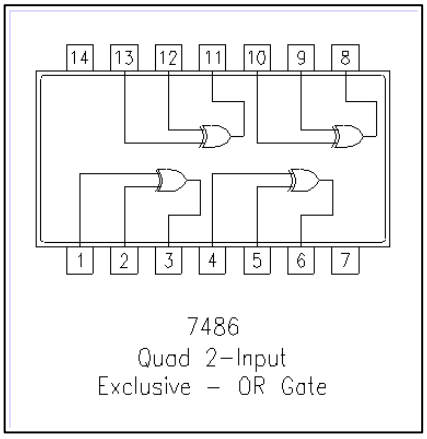
Application of IC 7402:

1. NOR gate can be used as a general use of NOR logic.
2. In Digital Electronics, Server and many ALUs also come with NOR gate.
3. NOR gate has wide use in Memory units.
4. Networking needs NOR gates for some operations.

6. IC 7486

The XOR gate can be designed with a transistor or with other gates but that will come up with a circuit large in size, to solve this issue we use 74LS86 IC. The IC 7486 comes up with four internal XOR gates. The IC is smaller in size and it comes up with internal speed protection. It also comes in multiple packages that help to solve the requirement of IC in different devices. The output of the IC comes in TTL which makes it compatible to use with other TTL based devices and microcontrollers. The IC has wide use in designing of an adder at the logic level.

Pin Diagram:



Operating Condition of IC 7486:

1. A single IC provides four XOR gates in different sizes.
2. The IC provides output in TTL form, which makes it compatible with other TTL devices and microcontrollers.
3. The IC comes in multiple packages, SOIC, PDIP, and SOC.
4. The single power supply uses to power up all four gates.
5. IC 74LS86 can be used as a single XOR gate without affecting the others.
6. Its cost is much less than a transistor-based XOR gate.

Electrical Characteristics:

1. The power supply voltage for IC is 4.75 to 5.25. The Power can max up to 7V.
2. The output current for the HIGH state is -0.4mA and for the LOW state is 8.0mA
3. IC can work up in temperature range from 0 to 70 degrees.
4. The input voltage range for the HIGH state is a minimum of 2.0 and 0.8 for the LOW state.
5. The input clamp diode can protect up to 1.5V.
6. The IC has Propagation delay time for the HIGH state is 22ns and for the LOW state is 17ns.

Pin Description of IC 7486:

PINS		**DETAIL**
A1	Pin 1	The 74LS86 comes up with four XOR gates and Pin 1 will be used as the first input pin. It will use to input the data to first XOR gate within the IC
B2	Pin 2	Pin 2 will use as the second input pin. It will also use to input the data to the first XOR gate.
Y1	Pin 3	Pin 3 is an output pin of the first XOR gate. It will use to receive the output from the first XOR gate.
A2	Pin 4	Pin 4 will be used as the first input pin for the second XOR gate in the IC.
B2	Pin 5	Pin 5 will also use as the second input pin for the second XOR gate in the IC.
Y2	Pin 6	Pin 6 is an output pin of the second XOR gate of the IC. It will give the output of the second XOR gate.
GND	Pin 7	Pin 7 will be used as the ground pin. It will use to make the common ground with power supply and other devices.
Y3	Pin 8	Pin 8 is an output pin used to receive the output from the third XOR gate.
A3	Pin 9	Pin 9 is an output pin used to send the first input to the third XOR gate in the IC.
B3	Pin 10	Pin 10 is also an output pin used to send the second input to the third XOR gate in the IC.
Y4	Pin 11	Pin 11 is an output pin. It is used to receive the output from the fourth XOR gate.
A4	Pin 12	Pin 12 is an input pin used to send the first input to the fourth XOR gate of the IC.
B4	Pin 13	Pin 13 is also an output pin used to send the second input to the fourth XOR gate of IC.
VCC	Pin 14	VCC is a power pin used to power up the IC to make it functional.

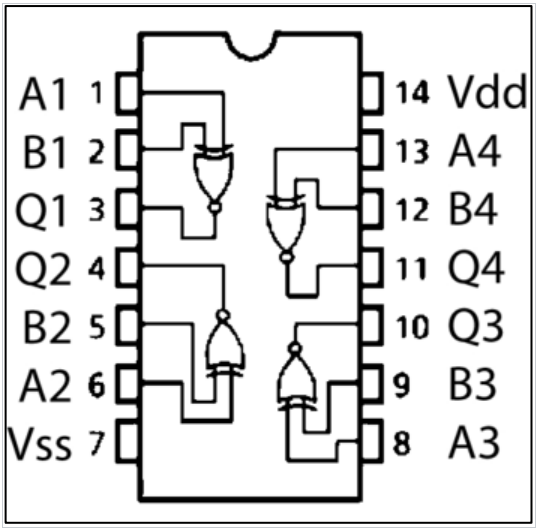
Application of IC 7486:

1. It is used to make the Adder.
2. The IC has multiple uses in Networking.
3. Servers also have multiple uses of the XOR gate.
4. XOR gate is also used in sequence detection for binary data.

7. IC 74266

IC 74266 Quad 2-input XNOR gate The 74266 is open collector outputs EX-NOR gate. 74266 contains Four independent EX-NOR gates in one package. The EX- NOR (exclusive-NOR) gate is a combination XOR gate followed by an inverter. Its output is “true” if the inputs are the same, and”false” if the inputs are different.

Pin Diagram:



Pin Description of IC 74266:

Pin Number	Description
1	Input Gate 1
2	Input Gate 1
3	Output Gate 1
4	Output Gate 2
5	Input Gate 2
6	Input Gate 2
7	Ground
8	Input Gate 3
9	Input Gate 3
10	Output Gate 3
11	Output Gate 4
12	Input Gate 4
13	Input Gate 4
14	Positive Supply

PRACTICAL - 3

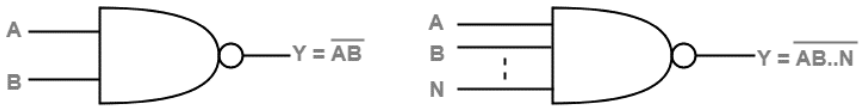
Aim - Configuring NAND and NOR logic gates as universal gates.

1. NAND Gate-

- A NAND Gate is constructed by connecting a NOT Gate at the output terminal of the AND Gate.
- The output of NAND gate is high (‘1’) if at least one of its inputs is low (‘0’).
- The output of NAND gate is low (‘0’) if all of its inputs are high (‘1’).

Logic Symbol-

The logic symbol for NAND Gate is as shown below-



2-Input NAND Gate N-Input NAND Gate

Truth Table-

The truth table for NAND Gate is as shown below-

A	B	Y = (A.B)’
0	0	1
0	1	1
1	0	1
1	1	0

i. NAND gates as NOT gate

A NOT produces complement of the input. It can have only one input, tie the inputs of a NAND gate together. Now it will work as a NOT gate. Its output is

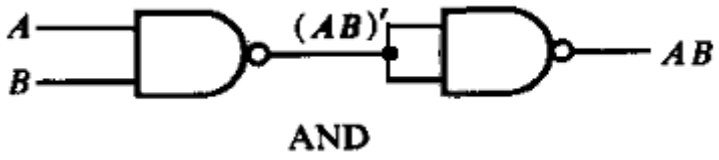
Y = (A.A)’
Y = (A)’

NOT (inverter)

ii. NAND gates as AND gate

A NAND produces complement of AND gate. So, if the output of a NAND gate is inverted, overall output will be that of an AND gate.

$$Y = ((A.B)')'$$
$$Y = (A.B)$$



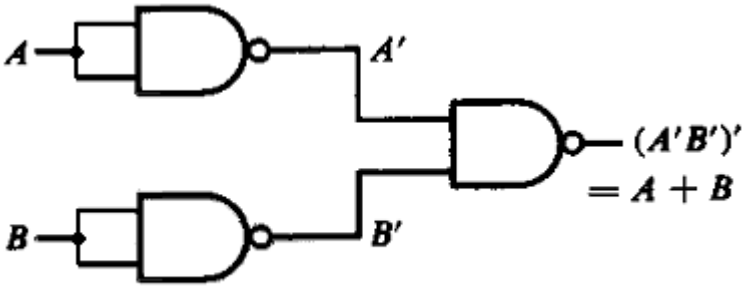
AND

iii. NAND gates as OR gate

From DeMorgan's theorems: **(A.B)' = A' + B'**

(A'.B')' = A'' + B'' = A + B

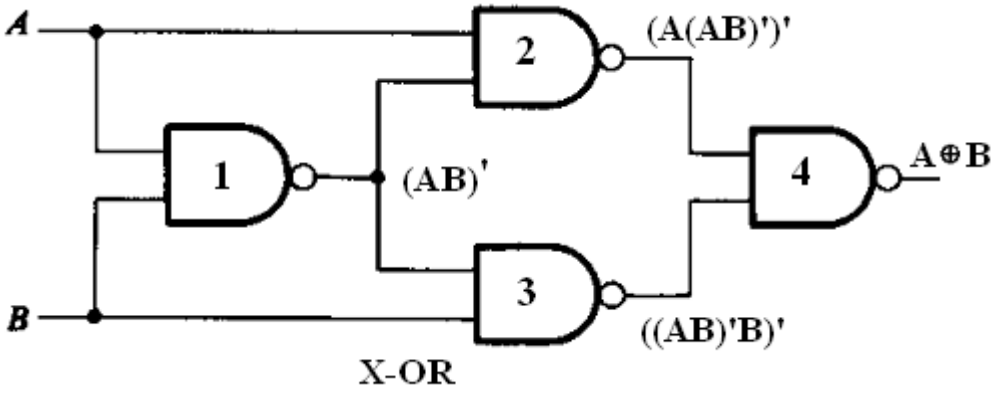
So, give the inverted inputs to a NAND gate, obtain OR operation at output.



OR

iv. NAND gates as X-OR gate

The output of a to input X-OR gate is shown by: **Y = A'B + AB'**. This can be achieved with the logic diagram shown in the left side.



X-OR

Gate No.	Inputs	Output
1	**A, B**	**(AB)'**
2	**A, (AB)'**	**(A (AB)')'**
3	**(AB)', B**	**(B (AB)')'**
4	**(A (AB)')', (B (AB)')'**	**A'B + AB'**

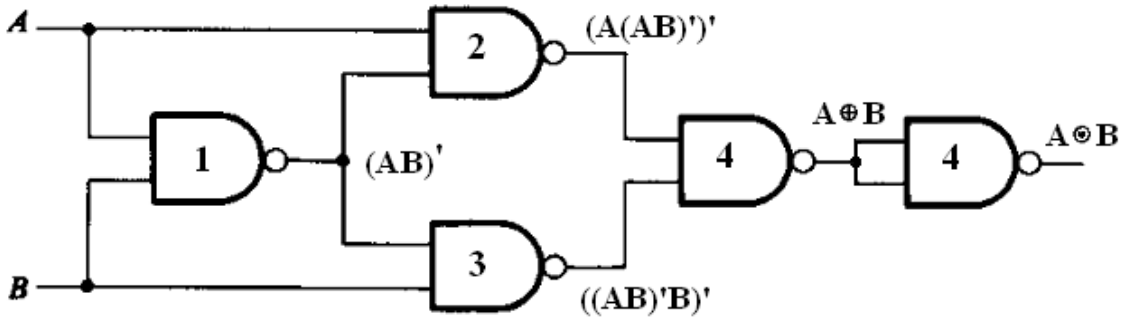
Now the ouput from gate no. 4 is the overall output of the configuration.

$$
\begin{aligned}
\mathbf{Y} &= \mathbf{((A\ (AB)')'\ (B\ (AB)')')'} \\
&= (A(AB)'')'' + (B(AB)'')'' \\
&= (A(AB)') + (B(AB)') \\
&= (A(A' + B)') + (B(A' + B')) \\
&= (AA' + AB') + (BA' + BB') \\
&= (\ 0 + AB' + BA' + 0\ ) \\
&= AB' + BA' \\
\mathbf{Y} &= \mathbf{AB' + A'B}
\end{aligned}
$$

v. NAND gates as X-NOR gate

X-NOR gate is actually X-OR gate followed by NOT gate. So give the output of X-OR gate to a NOT gate, overall ouput is that of an X-NOR gate.

$$\mathbf{Y = AB + A'B'}$$

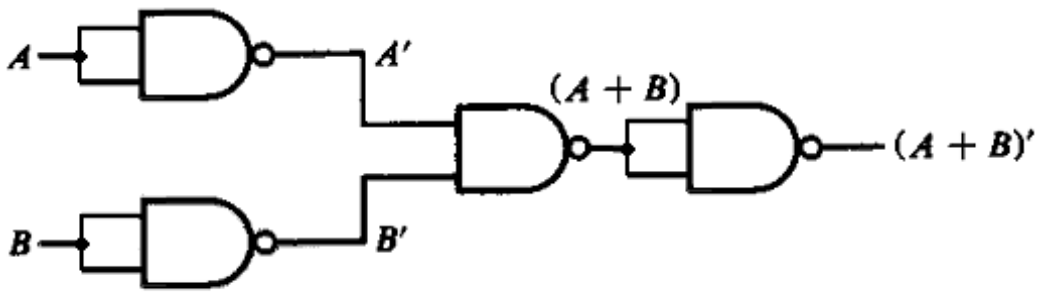


X-NOR

vi. NAND gates as NOR gate

A NOR gate is an OR gate followed by NOT gate. So connect the output of OR gate to a NOT gate, overall output is that of a NOR gate.

$$\mathbf{Y = (A + B)'}$$



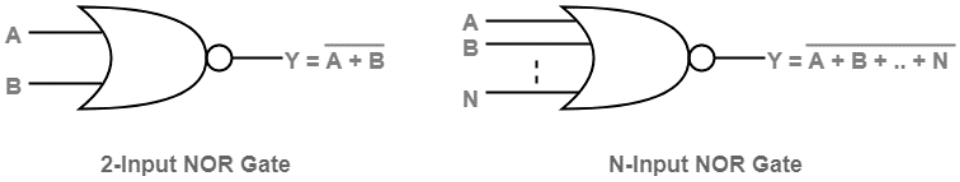
NOR

2. NOR Gate-

- A NOR Gate is constructed by connecting a NOT Gate at the output terminal of the OR Gate.
- The output of OR gate is high (‘1’) if all of its inputs are low (‘0’).
- The output of OR gate is low (‘0’) if any of its inputs is high (‘1’).

Logic Symbol-

The logic symbol for NOR Gate is as shown below-



2-Input NOR Gate N-Input NOR Gate

Truth Table-

The truth table for NOR Gate is as shown below-

A	B	Y = A + B
0	0	1
0	1	0
1	0	0
1	1	0

i. NOR gates as NOT gate

A NOT produces complement of the input. It can have only one input, tie the inputs of a NOR gate together. Now it will work as a NOT gate. Its output is

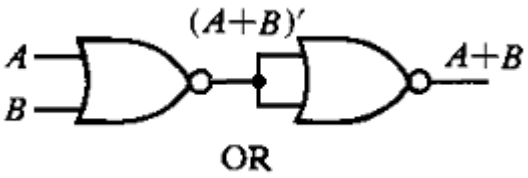
$$Y = (A+A)'$$
$$Y = (A)'$$

NOT

ii. NOR gates as OR gate

A NOR produces complement of OR gate. So, if the output of a NOR gate is inverted, overall output will be that of an OR gate.

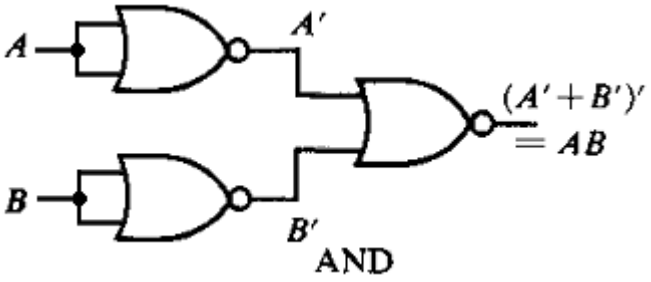
Y = ((A+B)')'
Y = (A+B)



iii. NOR gates as AND gate

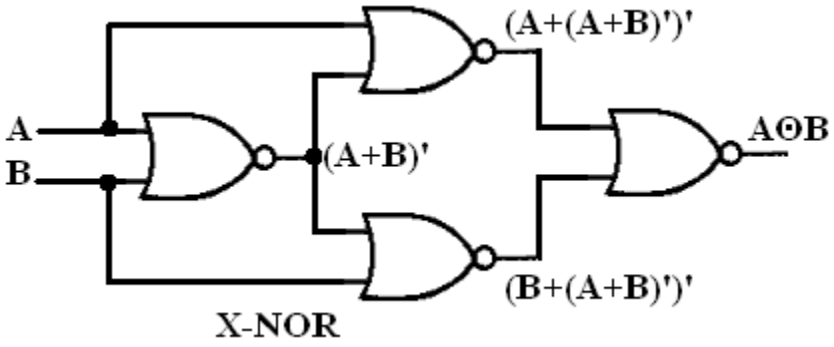
From DeMorgan's theorems: **(A+B)' = A'B'**
(A'+B')' = A''B'' = AB

So, give the inverted inputs to a NOR gate, obtain AND operation at output.



iv. NOR gates as X-NOR gate

The output of a two input X-NOR gate is shown by: Y = AB + A'B'. This can be achieved with the logic diagram shown in the left side.



Gate No.	Inputs	Output
1	A, B	(A + B)'
2	A, (A + B)'	(A + (A+B)')'
3	(A + B)', B	(B + (A+B)')'
4	(A + (A + B)')', (B + (A+B)')'	AB + A'B'

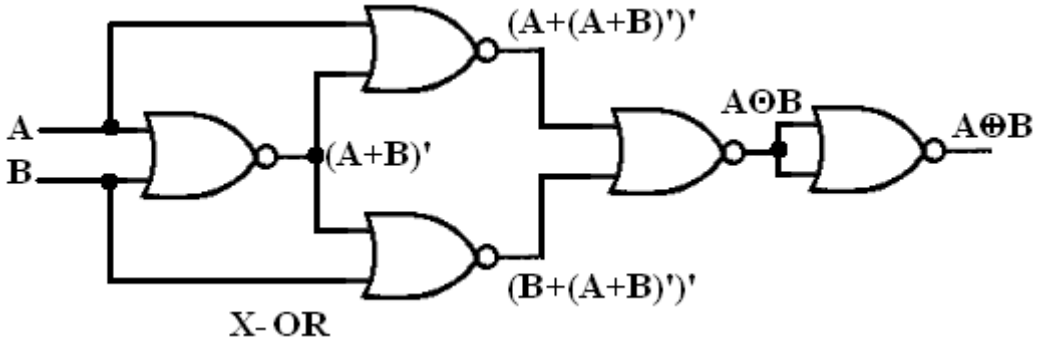
Now the ouput from gate no. 4is the overall output of the configuration.

Y	**=**	**((A + (A+B)')' (B +(A+B)')')'**
	=	(A+(A+B)')''.(B+(A+B)')''
	=	(A+(A+B)').(B+(A+B)')
	=	(A+A'B').(B+A'B')
	=	(A + A').(A + B').(B+A')(B+B')
	=	1.(A+B').(B+A').1
	=	(A+B').(B+A')
	=	A.(B + A') +B'.(B+A')
	=	AB + AA' +B'B+B'A'
	=	AB + 0 + 0 + B'A'
	=	AB + B'A'
Y	**=**	**AB + A'B'**

v. NOR gates as X-OR gate

X-OR gate is actually X-NOR gate followed by NOT gate. So give the output of X-NOR gate to a NOT gate, overall ouput is that of an X-OR gate.

Y = A'B+ AB'



vi. NOR gates as NAND gate

A NAND gate is an AND gate followed by NOT gate. So connect the output of AND gate to a NOT gate, overall output is that of a NAND gate.

Y = (AB)'