EXPERIMENT NO.1

AIM: Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the datasheet, concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.

APPARATUS REQUIRED:

No.	Name of Apparatus	Specifications	Qty.
1	7400	TTL NAND Gate	01
2	7408	TTL AND Gate	01
3	7432	TTL OR gate	01
4	7402	TTL NOR Gate	01
5	7404	TTL NOT Gate	01
6	7486	TTL X-OR Gate	01
7	Digital Trainer kit	With Bread board & 5V dc Supply	01
8	Patch Cords		As required

THEORY:

IC Family Summary: - Various families of logic ICs exist on the market however the families. Mainly used in digital electronics lab are the TTL and the high speed CMOS families.

Vcc: - It is supply voltage which operates any instrument without damaged. Vcc terminal is always Red.

Ground: - It is zero potential point, GND terminal is always black.

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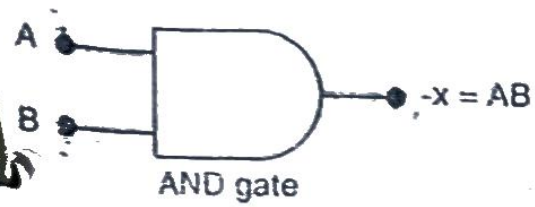
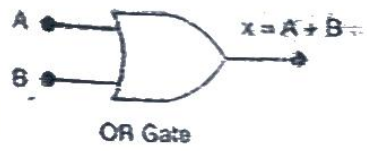
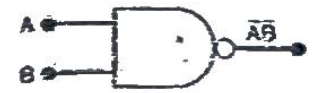
Logic Diagram and Truth Tables for various logic gates:

GATE	DESCRIPTION	TRUTH TABLE
AND GATE  AND gate	The AND gate is a logic gate that gives an output of '1'only when all of its inputs are '1'. Thus it is '0' whenever at least one of its input is '0'. Mathematically x = A.B	A | B | X = A . B 0 | 0 | 0 0 | 1 | 0 1 | 0 | 0 1 | 1 | 1
OR GATE  OR Gate	The OR gate is a logic gate that gives an output of '0'only when all of its inputs are '0'. Thus it is '1' whenever at least one of its input is '1'. Mathematically x = A+B	A | B | X = A + B 0 | 0 | 0 0 | 1 | 1 1 | 0 | 1 1 | 1 | 1
NOT GATE 	The NOT gate is a logic gate that gives an output that is opposite the state of its input.	A | $x = \bar{A}$ 0 | 1 1 | 0
NAND GATE 	The NAND gate is an AND gate with a NOT gate at its end. Thus for the same combinations of the inputs, the output of the NAND gate will be opposite that of an AND gate.	A | B | $x = \overline{A.B}$ 0 | 0 | 1 0 | 1 | 1 1 | 0 | 1 1 | 1 | 0

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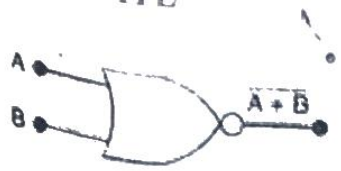
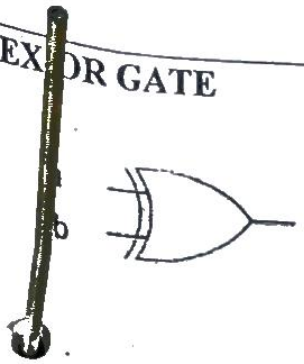
NOR GATE



The NOR gate is and OR gate with a NOT gate at its end. Thus for the same combinations of the inputs, the output of the NOR gate will be opposite that of an OR gate.

A	B	$x = \bar{A} + \bar{B}$
0	0	1
0	1	0
1	0	0
1	1	0

EX OR GATE

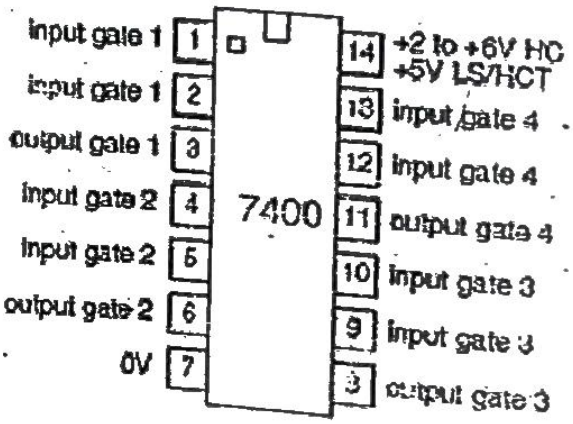


The Exclusive OR gate is a logic gate that gives an output of '1' when only one of the input is '1'.

A	B	$x = A\bar{B} + \bar{A}B$
0	0	0
0	1	1
1	0	1
1	1	0

Useful IC Pin details

7400(NAND)



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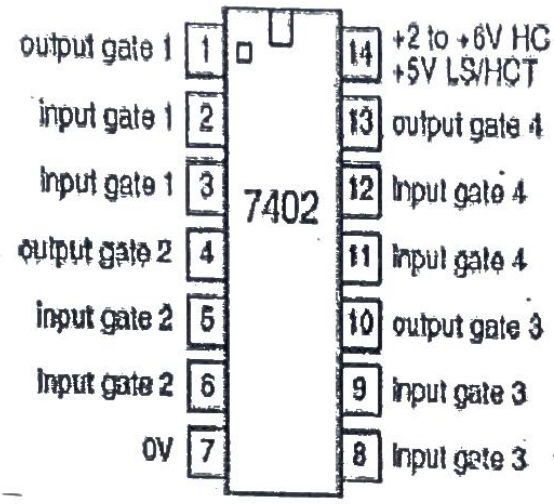
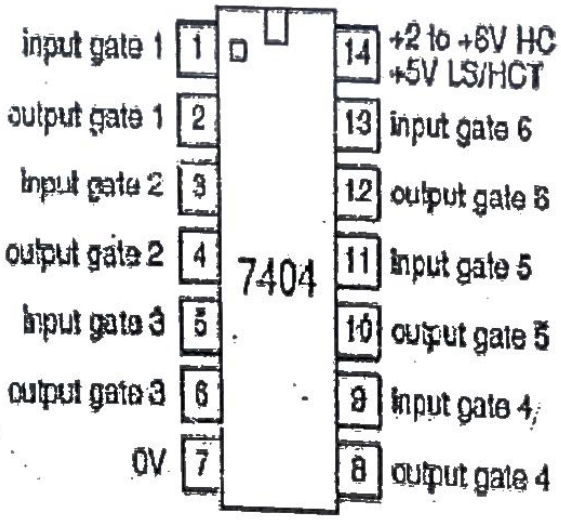
7402(NOR)



7404(NOT)



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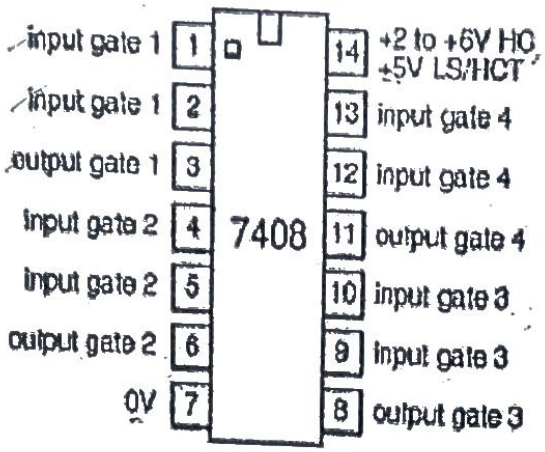
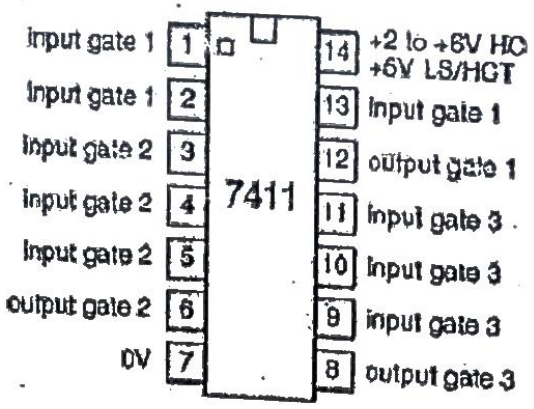
7408(AND)



7411(3-i/p AND)



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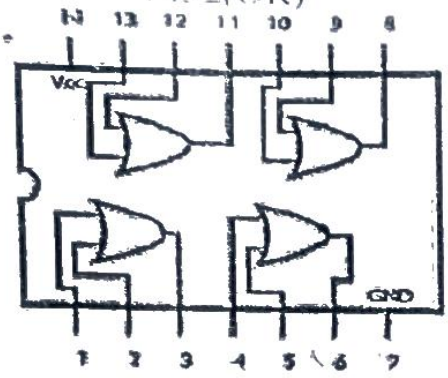
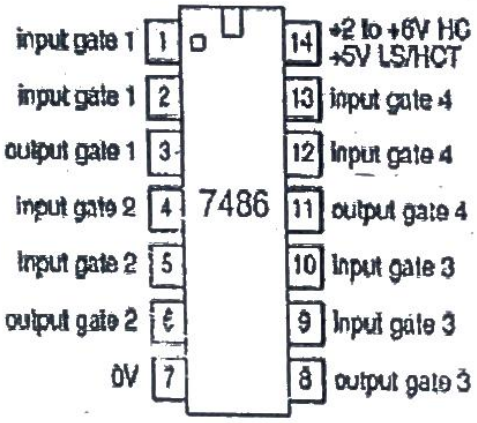
7432(OR)



7486(EX-OR)



PROCEDURE:

1. OR Gate

- Place the 2 Input OR gate IC 7432 in the bread board.
- Connect pin no.14 to Vcc(+5V) and pin no. 7 to ground.
- Make the connection for gate 1 connect among pin 1,2 and 3.
- Verify the truth table for various combinations of inputs.

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2. AND Gate

- Place the 2 Input AND gate IC 7408 on the bread board.
- Repeat step 2 to 4 as given for OR gate.
- Verify the truth table for various combinations of inputs.

3. NOT Gate

- Place NOT gate IC 7404 on the bread board.
- Connect pin no.14 to Vcc(+5V) and pin no. 7 to ground.
- Make the connection for gate 1 connect among pin 1and 2.
- Verify the truth table for various combinations of inputs.

4. NAND Gate

- Place the 2 Input NAND gate IC 7400 on the bread board.
- Repeat step 2 to 4 as given for OR gate.
- Verify the truth table for various combinations of inputs.

5. NOR Gate

- Place the 2 Input NOR gate IC 7402 on the bread board.
- Repeat step 2 to 3 as given for OR gate.
- Connect the output to pin no. 3.
- Verify the truth table for various combinations of inputs.

6. X-OR Gate

- Place the 2 Input X-OR gate IC 7486 on the bread board.
- Repeat step 2 to 4 as given for OR gate.
- Verify the truth table for various combinations of inputs

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RESULT:

Truth tables of logic gates using TTL ICs are successfully verified.

PRECAUTIONS:

1. All the ICs should be checked before use the apparatus.
2. All LEDs should be checked.
3. All connections should be tight.
4. Always connect GND first and then connect Vcc.
5. Use suitable type Patch cords.
6. The circuit should be off before change the connections.

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