

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

DEPARTMENT OF PHYSICS



LAB MANUAL

INTERCONVERSION OF UNIVERSAL GATES

Aim: - Implementation of various gates by using universal properties of NAND & NOR gates & Verify truth table.

APPARATUS REQUIRED

1. Breadboard
2. IC 7400 (NAND gate)
3. IC 7402(NOR gate)

THEORY:

NAND OR NOR gates are sufficient for the realization of any logic expression. because of this reason, NAND and NOR gates are known as UNIVERSAL gates.

1. For NAND gate as universal gate

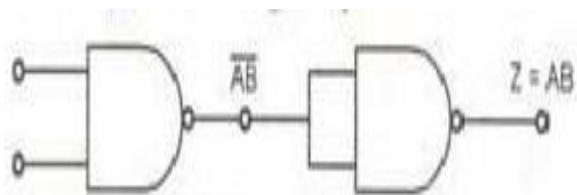
PROCEDURE:

1. Make the connections as per the logic diagram.
2. Connect +5v to pin 14 & ground to pin 7 of IC 7400
3. Apply diff combinations of inputs to the i/p terminals.
4. Note o/p for NAND as universal gate.
5. Verify the truth table.



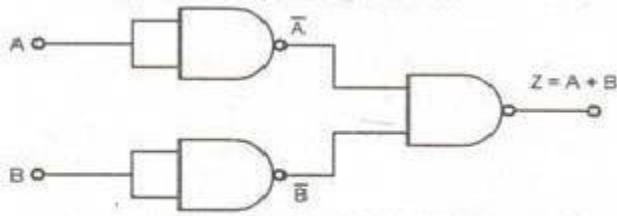
(a) NOT Logic Operation

A	\bar{A}
0	1
1	0



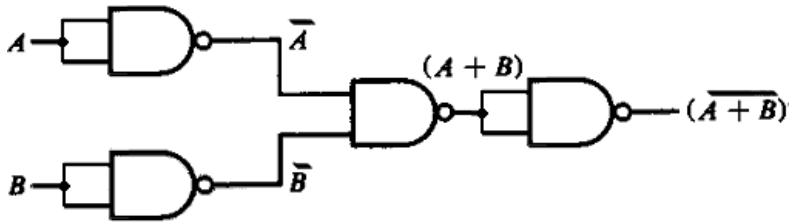
(b) AND Logic Operation

A	B	AB
0	0	0
0	1	0
1	0	0
1	1	1



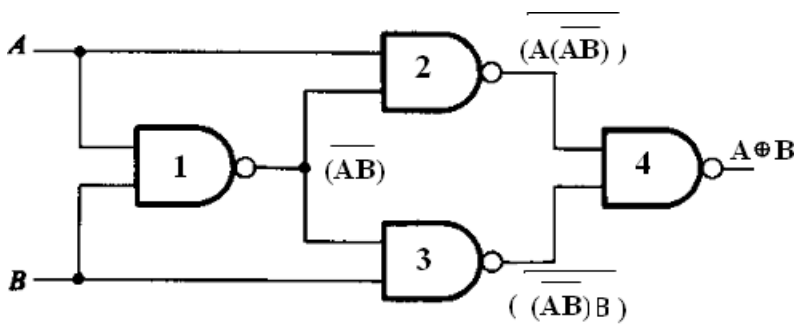
(c) OR Logic Operation

A	B	A+B
0	0	0
0	1	1
1	0	1
1	1	1



NOR Logic operation

A	B	$\overline{A+B}$
0	0	1
0	1	0
1	0	0
1	1	0



XOR Logic operation

A	B	$A \oplus B$
0	0	0
0	1	1
1	0	1
1	1	0

2. For NOR gate as universal gate

PROCEDURE:

1. Make the connections as per the logic diagram.
2. Connect +5v to pin 14 & ground to pin 7 of IC 7402
3. Apply diff combinations of inputs to the i/p terminals.
4. Note o/p for NAND as universal gate.
5. Verify the truth table



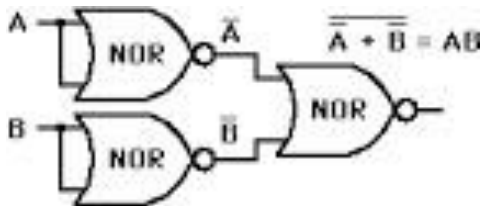
NOT Logic operation

A	\bar{A}
0	1
1	0



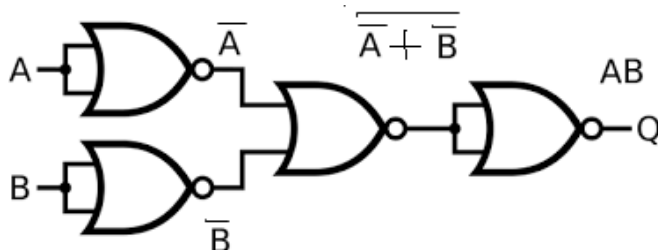
OR Logic operation

A	B	A+B
0	0	0
0	1	1
1	0	1
1	1	1



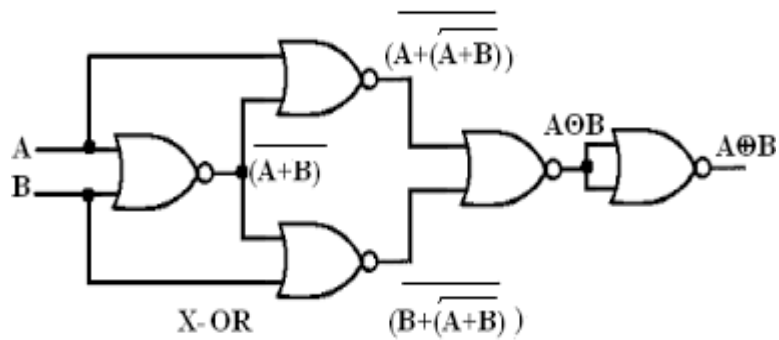
AND Logic operation

A	B	AB
0	0	0
0	1	0
1	0	0
1	1	1



NAND Logic operation

A	B	AB
0	0	1
0	1	1
1	0	1
1	1	0



XOR Logic operation

A	B	$A\oplus B$
0	0	0
0	1	1
1	0	1
1	1	0

Conclusion:-

We have constructed and verified truth table of all gates using universal gates NAND and NOR gate.