Lab Report - 02

Course No: 206

Course Title: Digital Logic Design

Submitted To:

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Dept: CSE

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Section: 07

Dept: CSE

Lab report : 2

Name of Experiment :

Implementation of basic gates Logic using universal Gates on protues.

Implementation all basic gates using NAND and NOR Gates.

Equipment :

1. NAND Gate
2. Logic Gate
3. Logic probe

A universal gate is a great which can implement any Boolean function without need to use any other gate type.

So, The NAND and NOR gates are universal gates.

(2.)

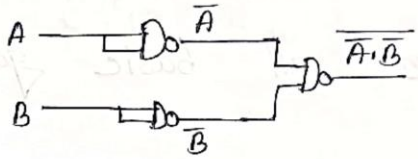
We will show that the AND, OR and NOT operation can be performed using only NAND gates.

OR Gate using NAND Gate.

$X = \overline{\overline{A} \cdot \overline{B}}$

$= \overline{\overline{A}} + \overline{\overline{B}}$

$= A + B$ [OR Gate]



AND Gate using NAND Gate

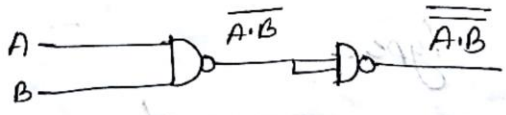
AND Logic $X = A \cdot B$

$X = \overline{AB}$ [using NAND]

$= \overline{\overline{AB}}$ [Double NAN]

$= AB$

= AND Gate



NOT Gate using NAND Gate

$X = \overline{A \cdot A}$ [NOT Logic and using NAND Gate]

$= \overline{A}$

= NOT Gate

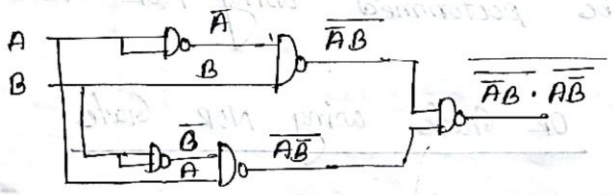
XOR Gate using NAND Gate

$X = \overline{\overline{A}B \cdot A\overline{B}}$ [output of XOR Gate using NAND]

$= \overline{\overline{A}B + A\overline{B}}$

$= \overline{A}B + A\overline{B}$

= X-OR Gate.



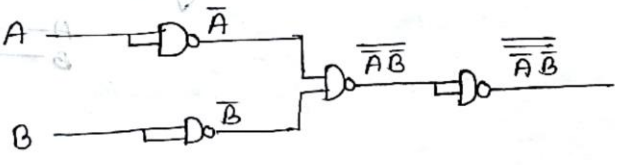
NOR Gate using NAND Gate

$X = \overline{\overline{A}\overline{B}}$

$= \overline{\overline{A} + \overline{B}}$

$= \overline{A + B}$

= NOR



(4) X-NOR Gate using NAND Gate

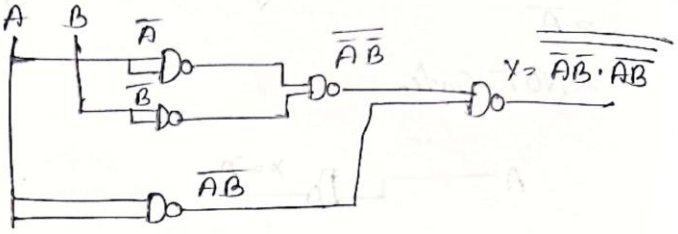
$X = \overline{\overline{A\bar{B}} \cdot \overline{\bar{A}B}}$ [Output of X-NOR using NAND]

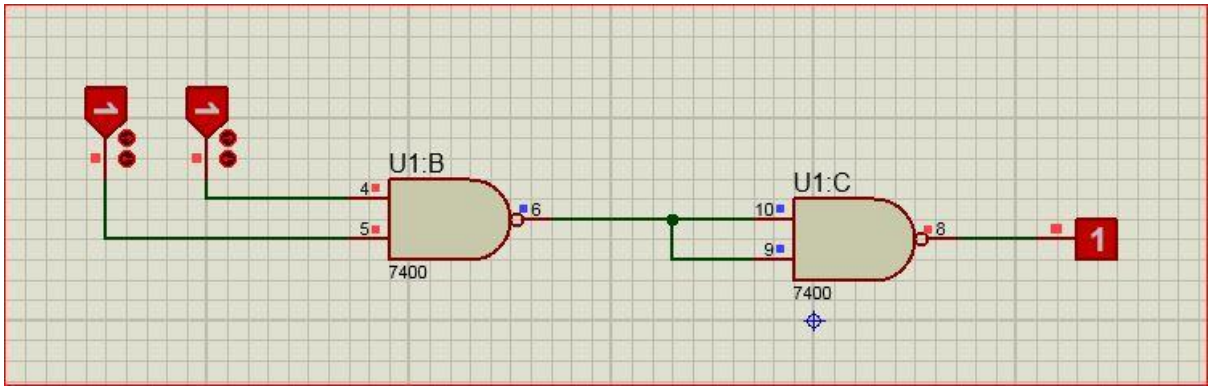
$= \overline{\overline{A} \cdot \overline{B} + AB}$

$= AB + \bar{A}\bar{B}$

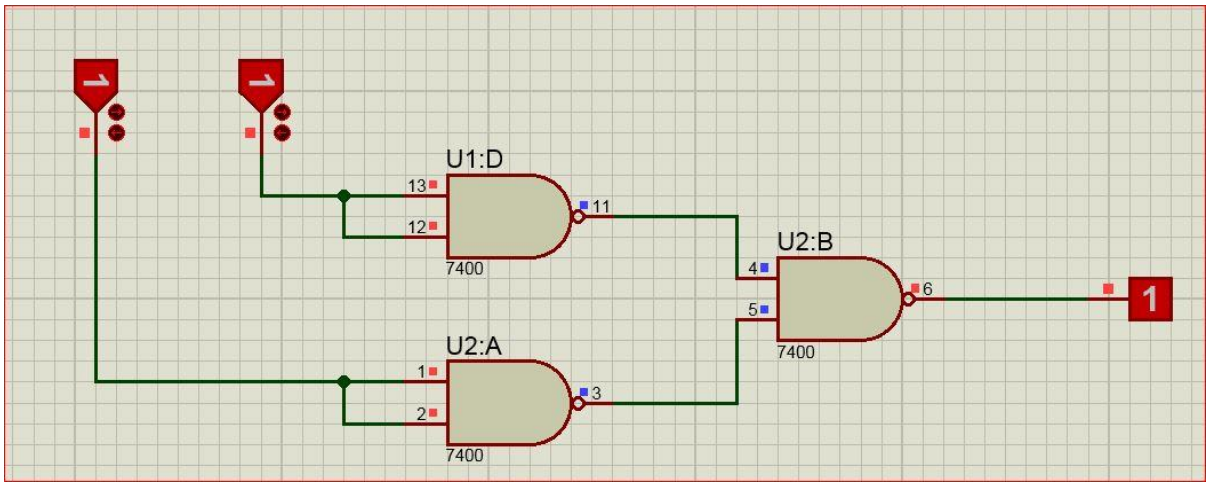
$= \overline{A \oplus B}$

= X-NOR Gate.

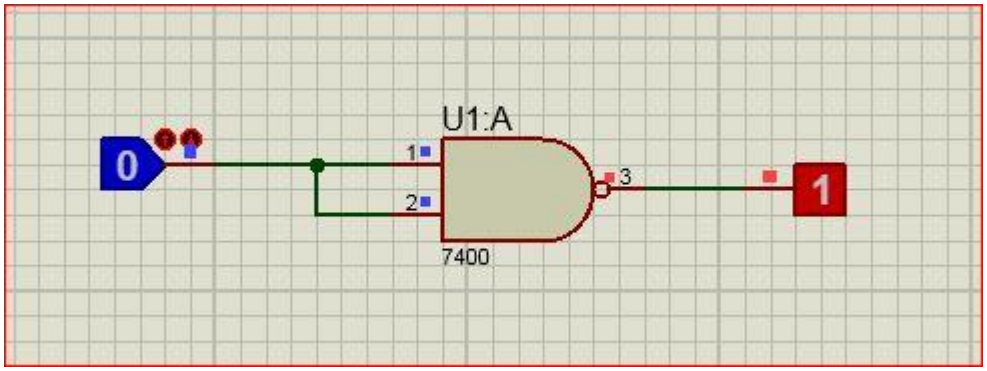




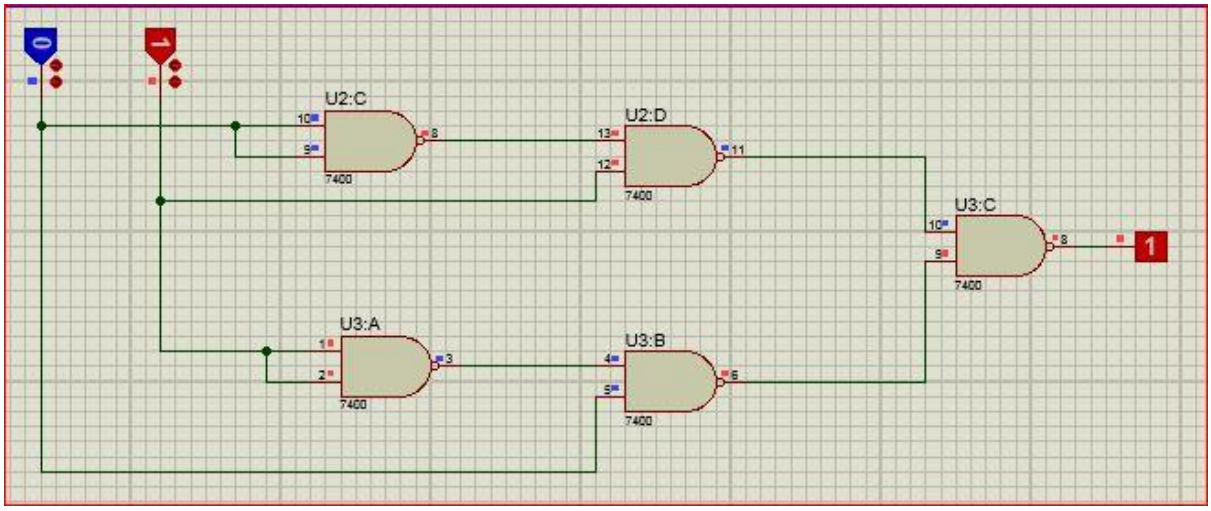
Picture of AND Gate Using NAND Gate



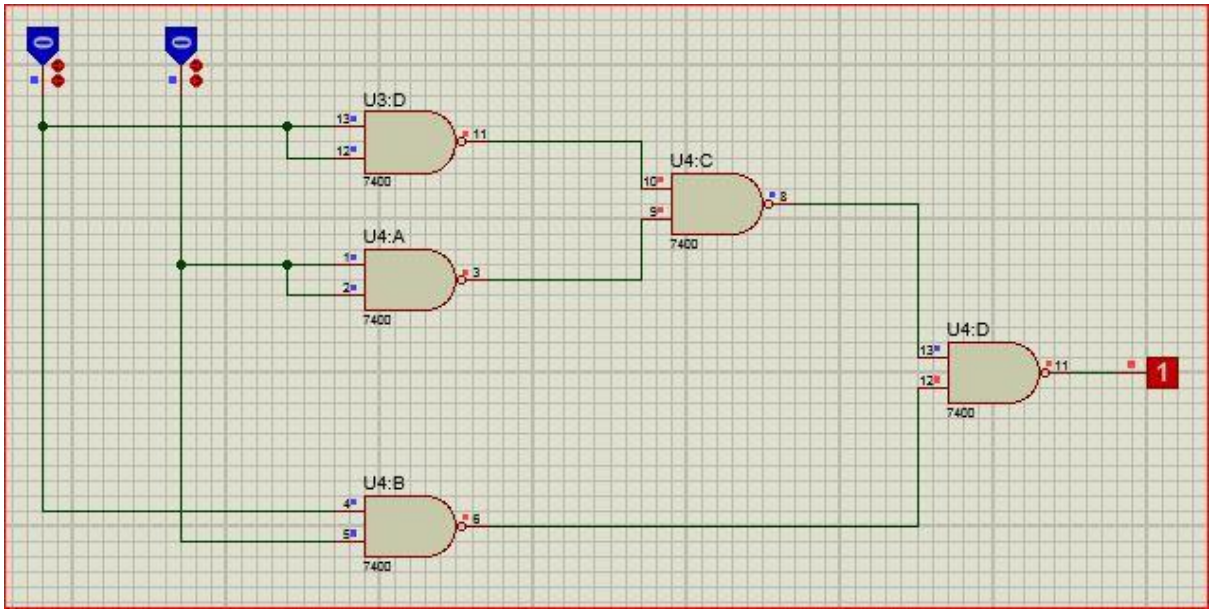
Picture of OR Gate Using NAND Gate



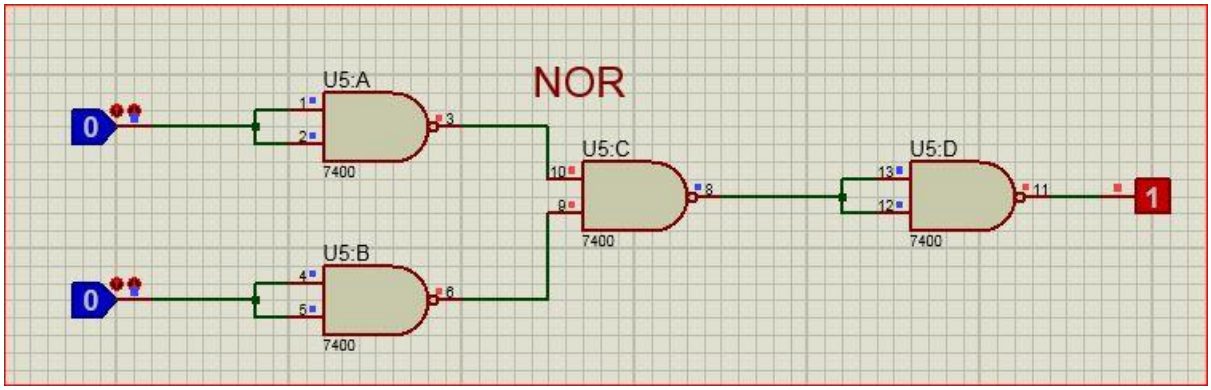
Picture of NOT Gate Using NAND Gate



Picture of X-OR Gate Using NAND Gate



Picture of X-NOR Gate Using NAND Gate



Picture of NOR Gate Using NAND Gate

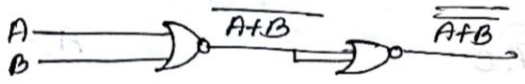
① Implementation all gates using NOR Gate

we will show that the AND, OR and NOT operation can be performed using NOR Gate.

OR Gate using NOR Gate.

$x = \overline{\overline{A+B}}$ [double NOR Gate use]

$= A+B$ [OR Gate Logic]

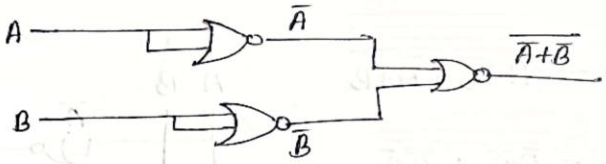


AND using NOR Gate

$X = \overline{\overline{A} + \overline{B}}$

$= \overline{\overline{A}} \cdot \overline{\overline{B}}$

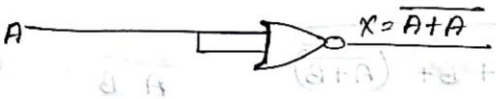
$= A \cdot B$ [AND Gate Logic]



NOT Gate using NOR Gate

$X = \overline{A + A}$

$= \overline{A}$ [NOT Gate]

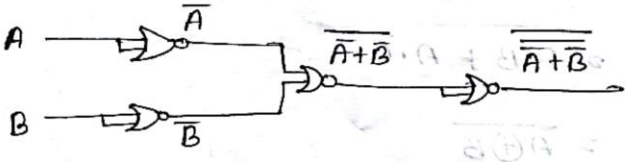


NAND Gate using NOR Gate

$X = \overline{\overline{A + B}}$

$= \overline{\overline{A} \cdot \overline{B}}$

$= \overline{A \cdot B}$ [NAND Gate]



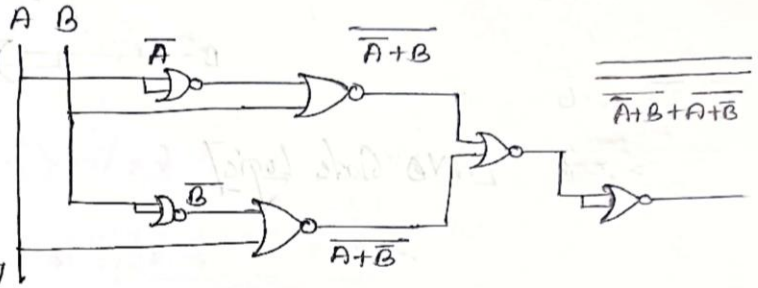
(3) X-OR using NOR Gate

$$X = \overline{\overline{A+\overline{B}} + \overline{\overline{A}+B}}$$

$$= \overline{\overline{A}\cdot\overline{\overline{B}} + \overline{\overline{A}}\cdot\overline{B}}$$

$$= \overline{A}B + A\overline{B}$$

$$= A \oplus B \quad [\text{X-OR Gate}]$$



X-NOR using NOR Gate

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

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

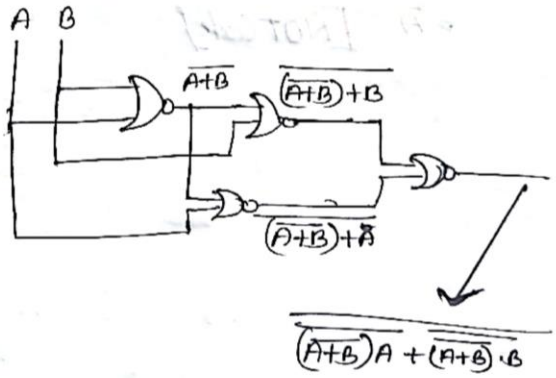
$$= \overline{\overline{A}\cdot(A+B) + \overline{B}\cdot(A+B)}$$

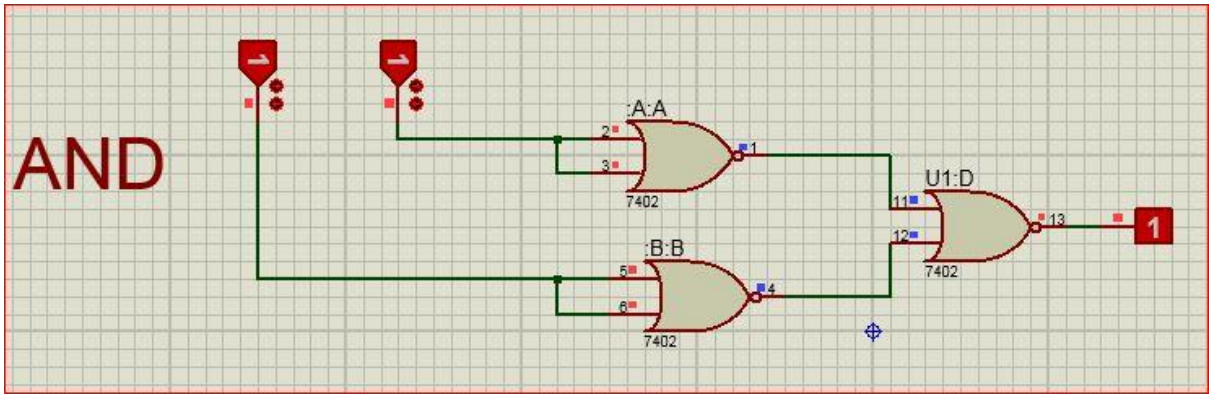
$$= \overline{A}\cdot B + \overline{A}\cdot A + A\overline{B} + B\overline{B}$$

$$= \overline{A}\cdot B + A\cdot\overline{B}$$

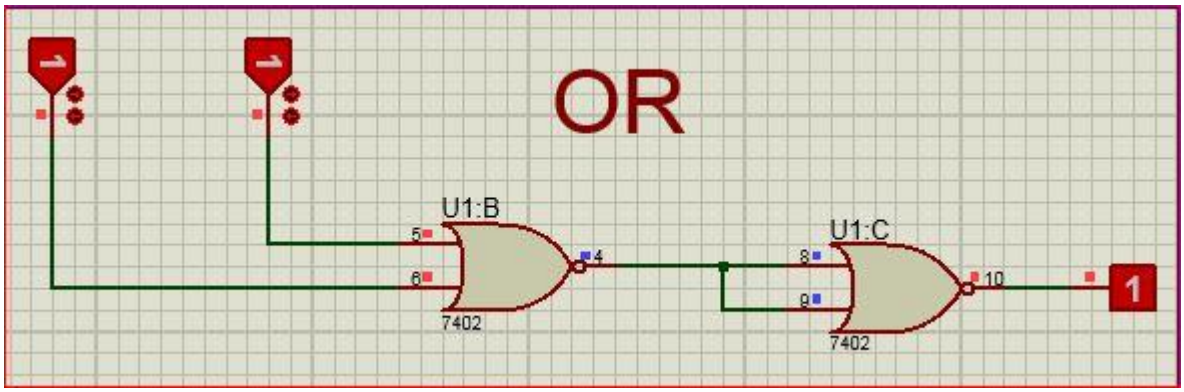
$$= \overline{A \oplus B}$$

$$= \overline{A}\,\overline{B} + AB \quad [\text{X-NOR Gate}]$$

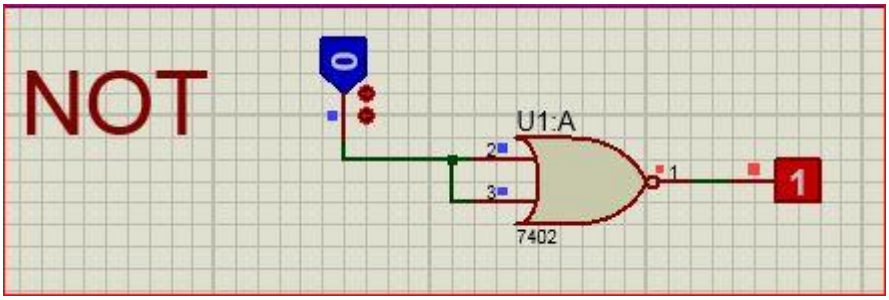




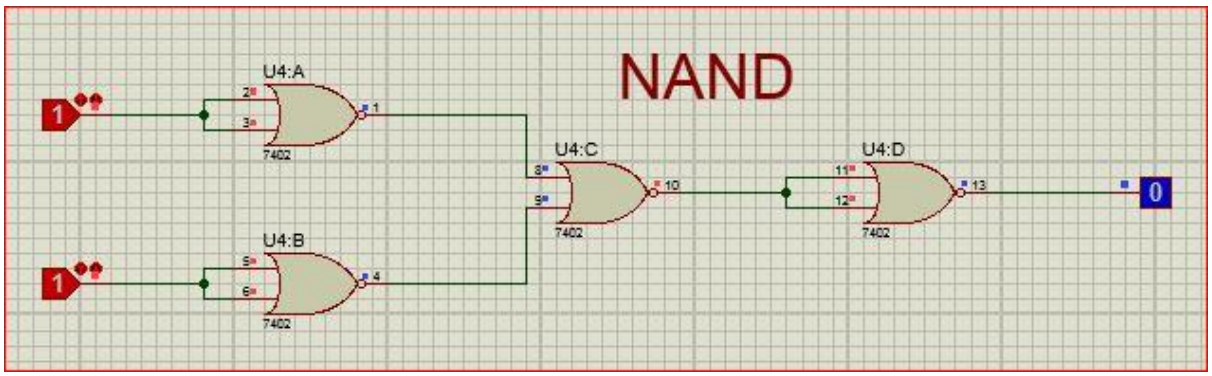
Picture of AND Gate Using NOR gate



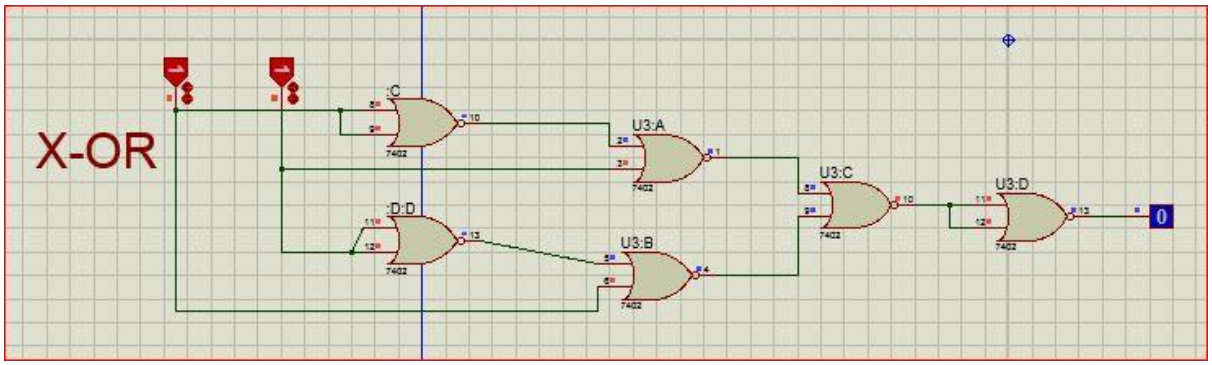
Picture of OR Gate Using NOR gate



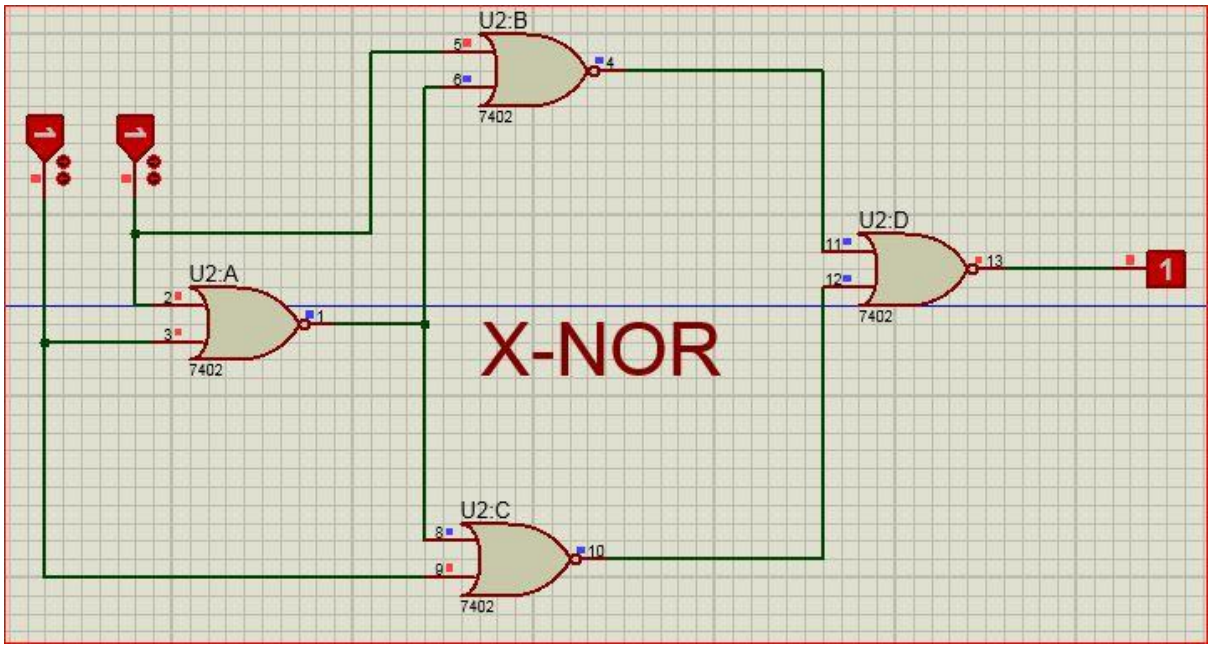
Picture of NOT Gate Using NOR gate



Picture of NOT Gate Using NOR gate



Picture of X-OR Gate Using NOR gate



Picture of X-NOR Gate Using NOR gate

Conclusion:

1. we have learn't how to implement basic gates from universal gates.
2. we have learn what is NAND and what is NOR.
3. we got two types of variant of each gates from NAND and NOR.
4. we have also learn how to implement circuits in proteus software.
5. Lastly we understand the NAND an NOR gates to build up basic gates.