

EXPERIMENT-01

Aim:- Realisation and verification of logic functions using various logic gates ICs (NAND And NOR).

Apparatus Required:

Prototyping Board (bread board) attached to logic trainer kit.

DC power supply (5V)

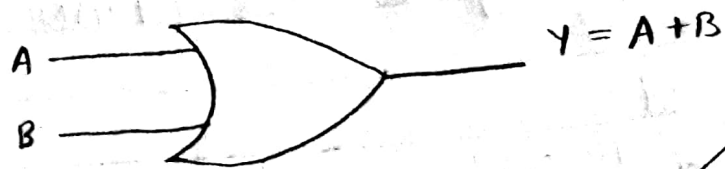
Digital ICs : 7400 quad 2 input NAND gate
7402 quad 2 input NOR gate

Connecting and jump wires.

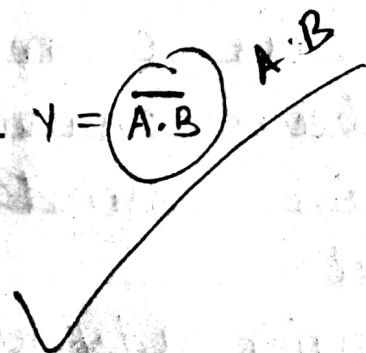
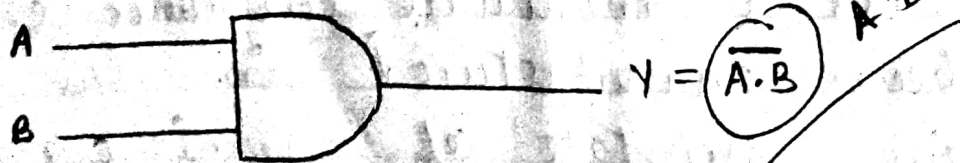
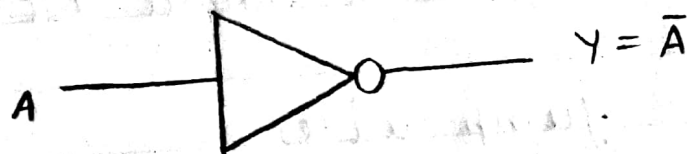
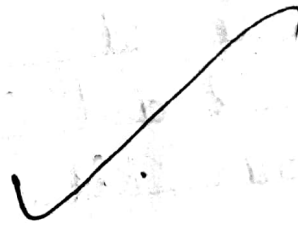
Theory :

A logic gate is a device which gives output when input is '1' or '0'. In this experiment we will study different logic gate functions using universal gate IC's. An integrated circuit is a miniature electronic circuit that has been manufactured in the surface of a thin substrate of semi-conductor material.

The major advantages of IC's are low cost, high performance and they also consume less power.



OR gate



LOGIC GATES

(1) 'OR' GATE :

Truth table :

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

(2) NOT GATE :

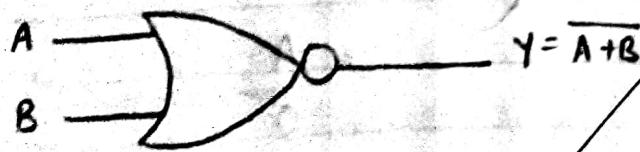
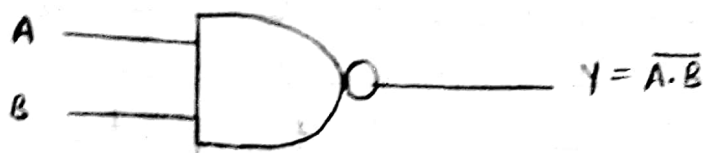
Truth table :

A	$Y = \bar{A}$
0	1
1	0

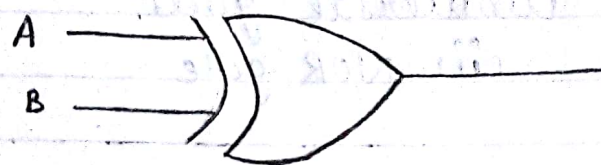
(3) AND GATE :

Truth table :

A	B	$Y = A \cdot B$
0	0	0
0	1	0
1	0	0



Truth table :		A	B	$Y = \overline{A \cdot B}$
		0	0	1
		0	1	1
		1	0	1
		1	1	0



$$Y = \bar{A} \cdot B + A \cdot \bar{B}$$



$$Y = A \cdot B + \bar{A} \cdot \bar{B}$$

Truth table :

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

(5) X-OR GATE :

Truth table :

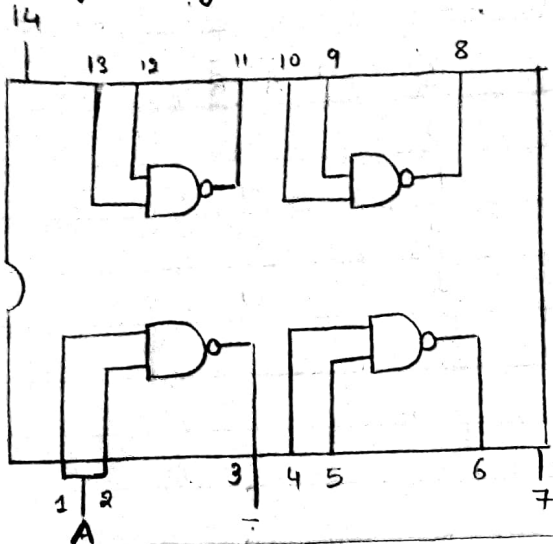
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

(6) X-NOR GATE :

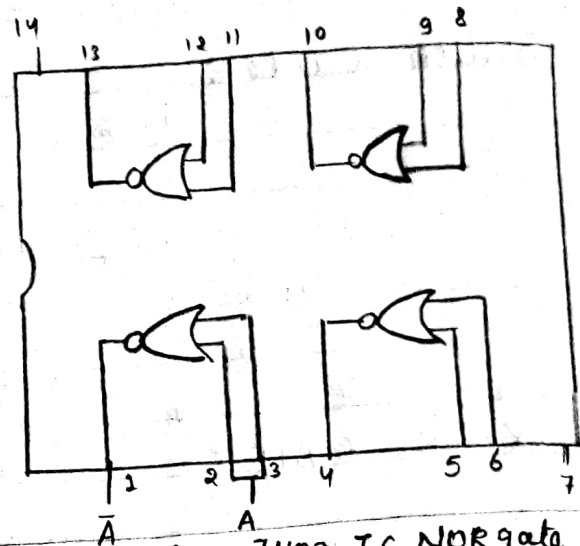
Truth table :

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

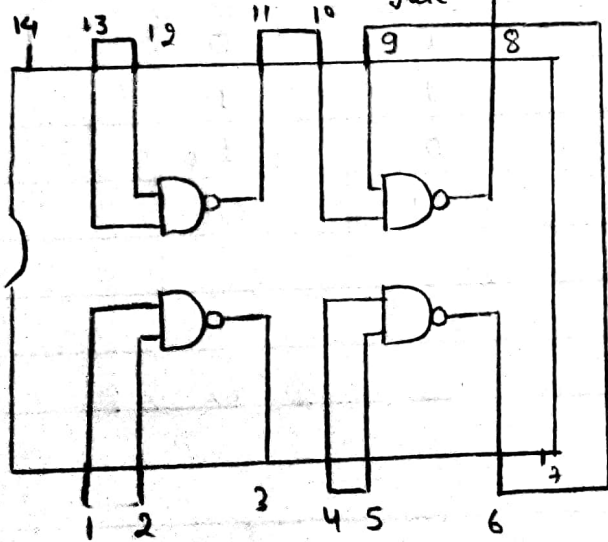
NOT gate using 7400 IC NAND gate



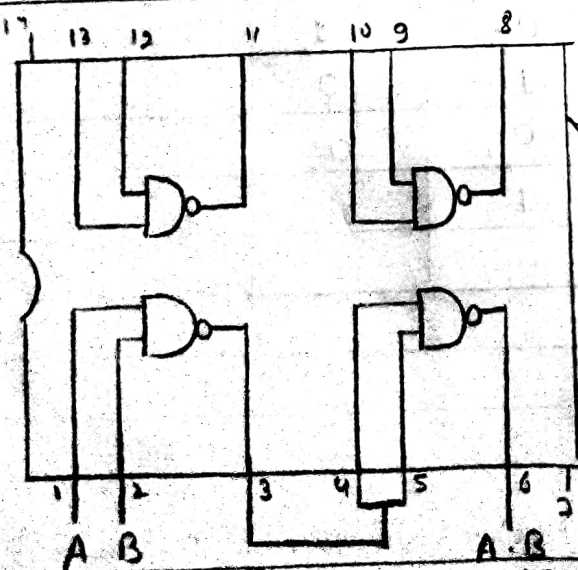
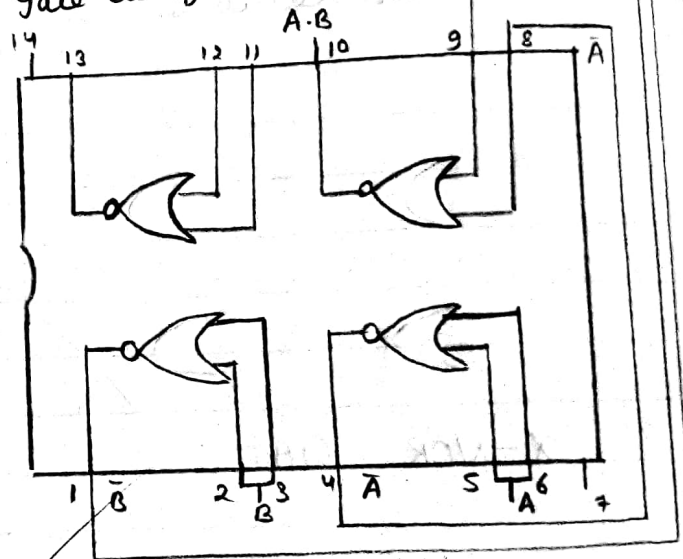
NOT gate using 7402 IC NOR gate



OR gate using 7400 IC NAND gate $A+B$

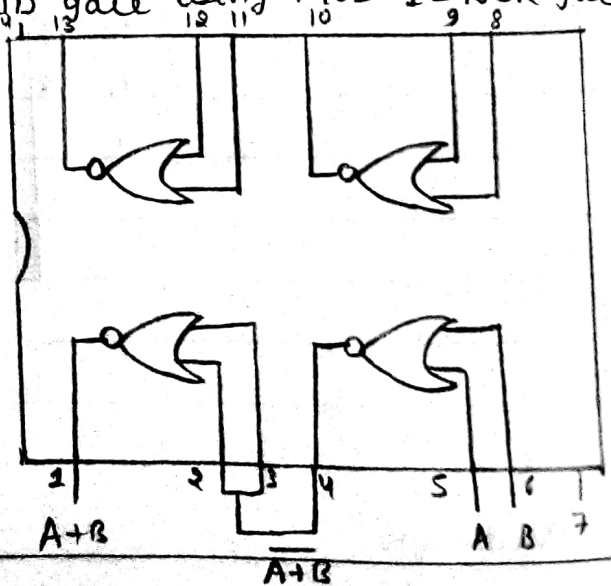


OR gate using 7402 IC NOR gate $A+B$



AND gate using 7400 IC NAND gate

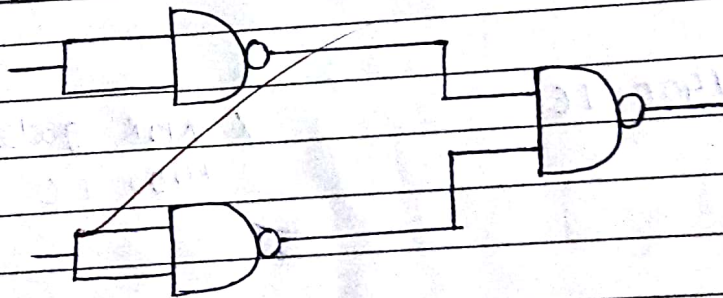
AND gate using 7402 IC NOR gate



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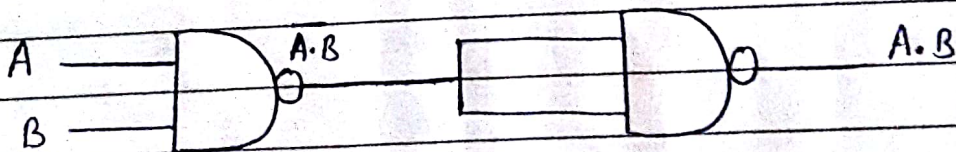
FORMATION OF DIFFERENT GATES USING NAND GATE:(1) NOT gate:

$$Y = \bar{A}$$

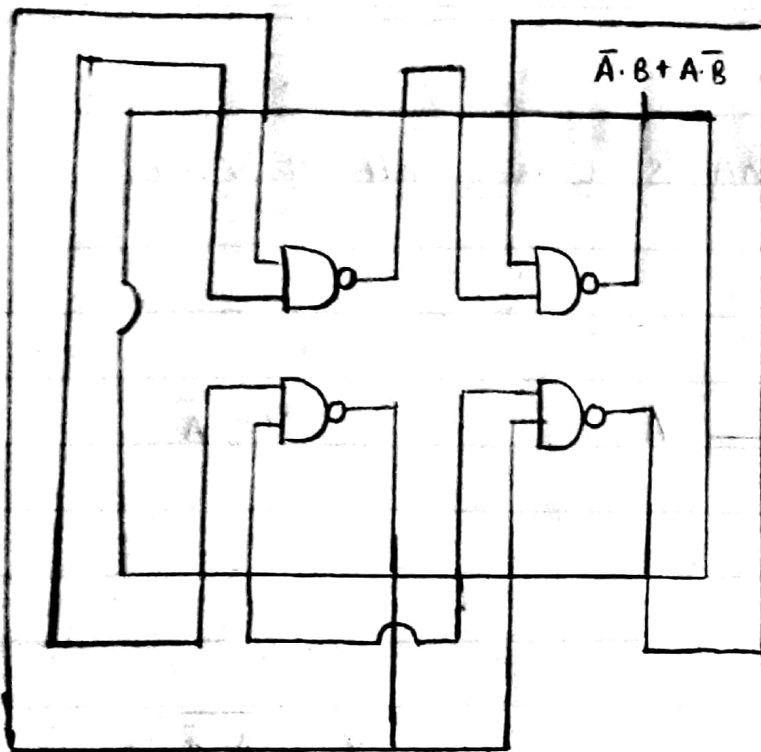
(2) OR gate:

$$\begin{aligned} Y &= \overline{\bar{A} \cdot \bar{B}} \\ &= \overline{\bar{A}} + \overline{\bar{B}} \\ &= A + B \end{aligned}$$

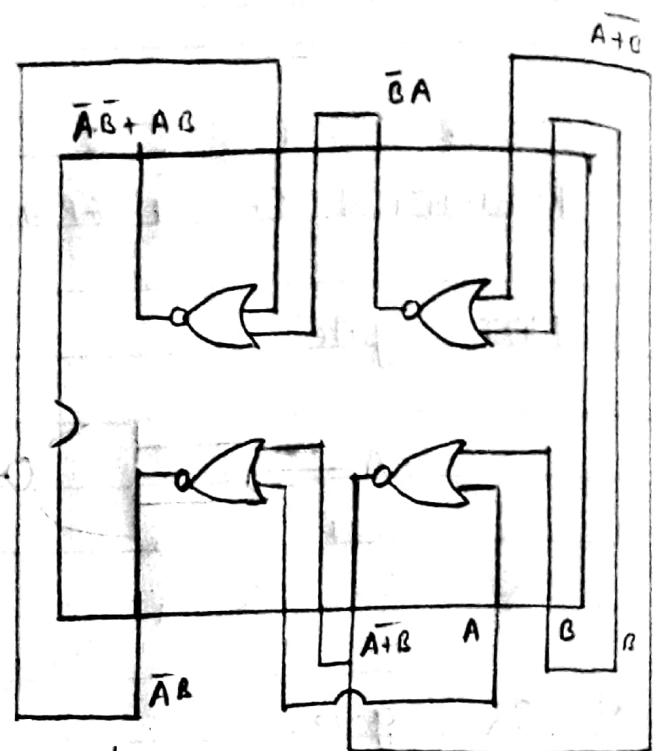
$$Y = A + B$$

(3) AND gate

$$Y = A \cdot B$$

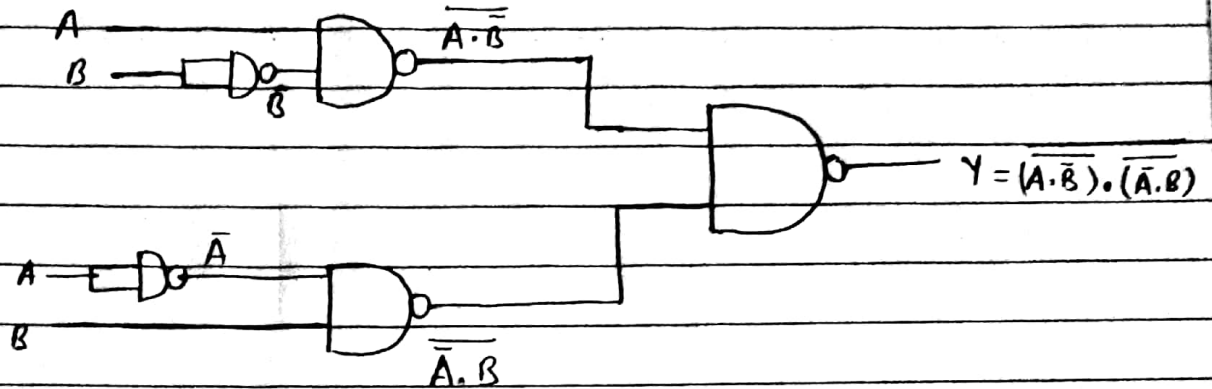


XOR gate using 7400 IC
NAND gate



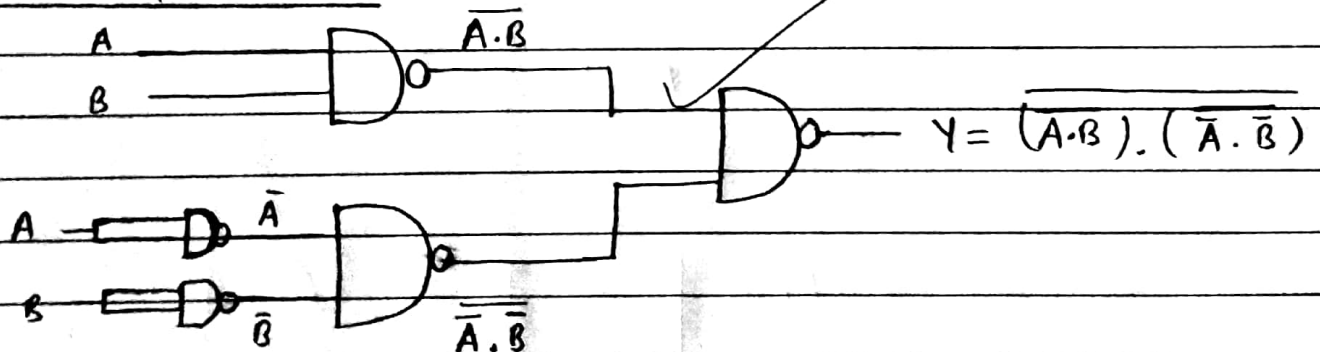
X-NOR gate using
7402 IC NOR gate

(4) X-OR GATE:



$$\begin{aligned}
 Y &= \overline{(A \cdot B) \cdot (\overline{A} \cdot \overline{B})} \\
 &= \overline{(\overline{A \cdot B}) \cdot (\overline{\overline{A} \cdot \overline{B}})} \\
 &= (A \cdot B) \cdot (\overline{\overline{A} \cdot \overline{B}})
 \end{aligned}$$

(5) X-NOR GATE



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

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

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

Conclusion: All the gates have been verified using universal NAND gate.