LAB-3

(Universal GATES)

⇒ There are two universal gates

(1) NAND (2) NOR

⇒ Universal Means we can make any gate using NAND gate and NOR GATE

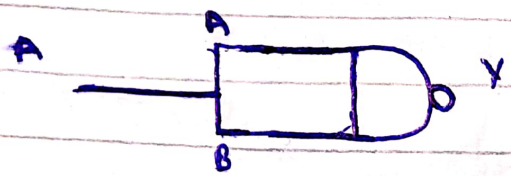
⇒ Making All other gates will

(NAND GATE) $Y = \overline{A.B}$ 74,00

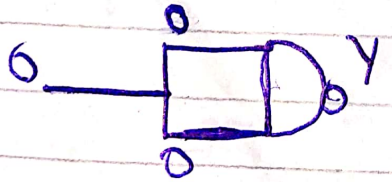
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(1) NOT GATE with NAND GATE

⇒ we just have to join the inputs

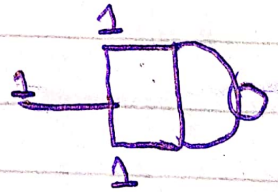


Exp (1)



0 0 1

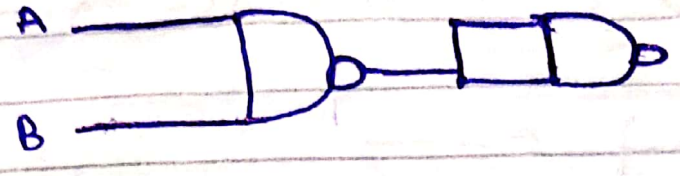
Exp 2



1 1 0

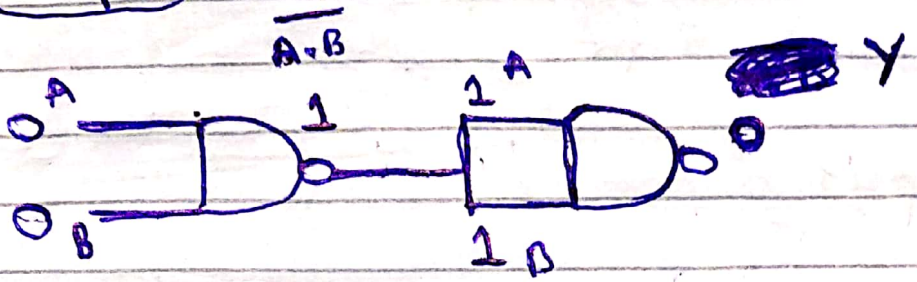
⇒ it is behaving like Not gate

⑧ (AND GATE with NAND GATE IC)



⇒ Two NAND GATE = AND GATE

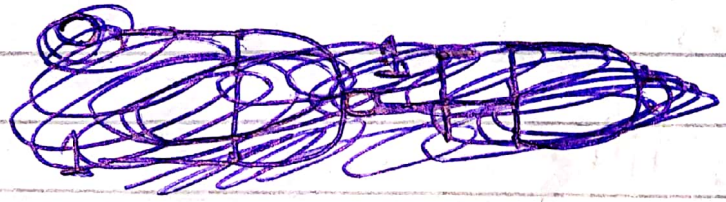
Exp 1

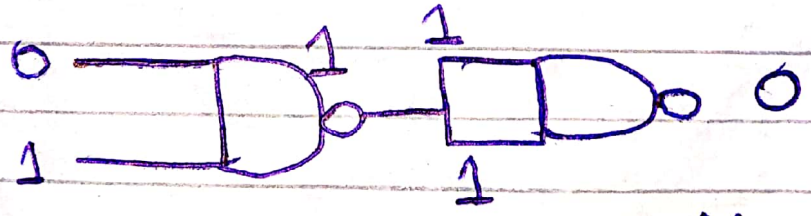


Means

A	B	Y
0	0	0

Exp 2





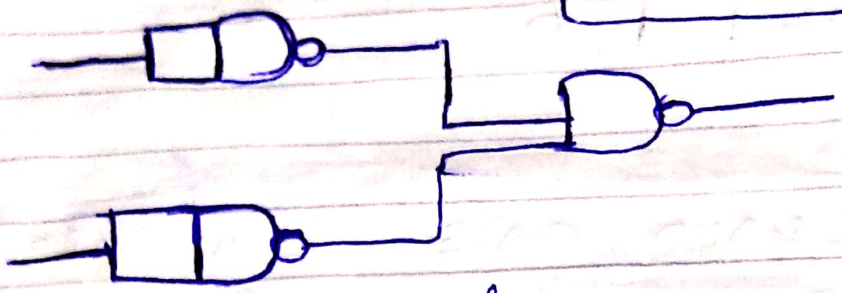
Means

A	B	Y
0	1	0

⇒ it is behaving like AND GATE

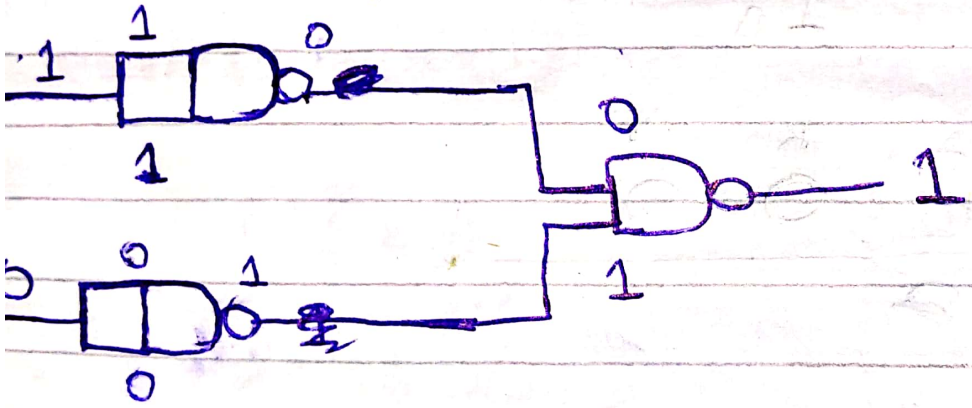
③ OR GATE using NAND IC

=> 3-NAND = OR-GATE



=> Two one-input And gates and 3rd and gate

Exp-1

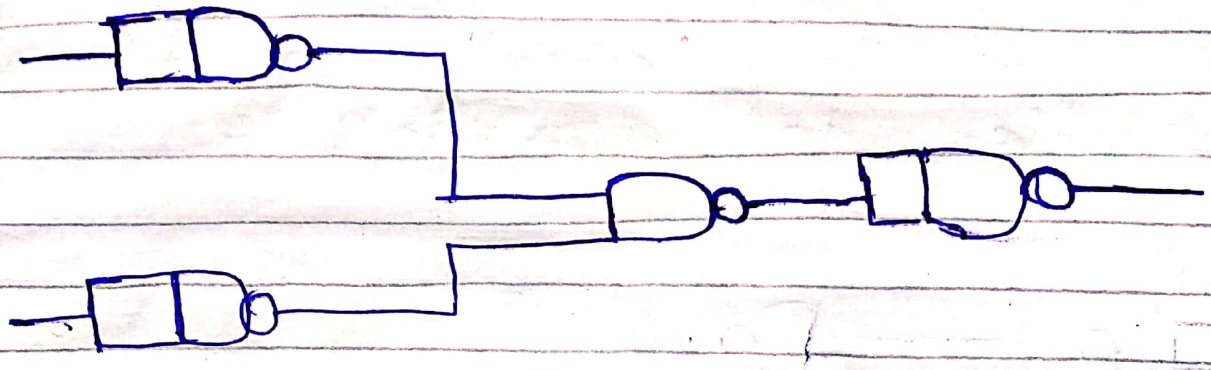


A	B	Y
1	0	1

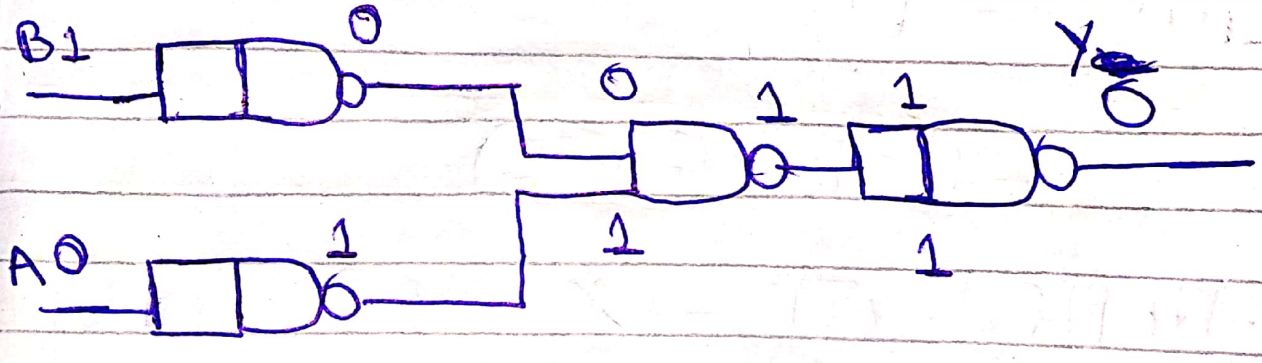
just like OR gate

(NOR GATE using NAND-IC)

4-NAND = NOR



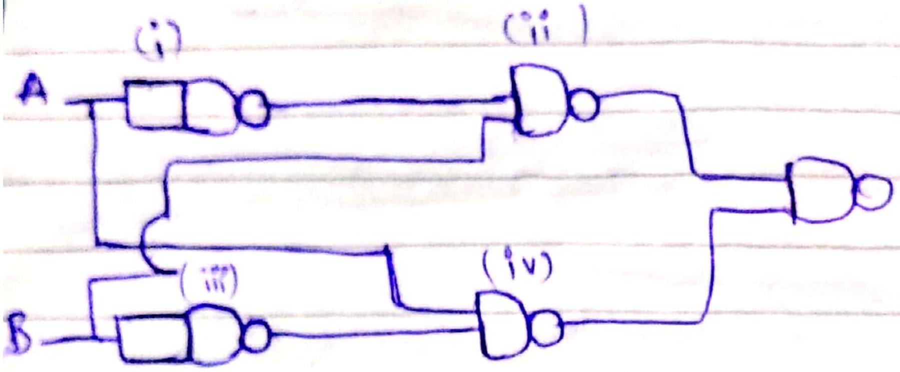
Exp-1



(EX-OR using NAND-GATE)

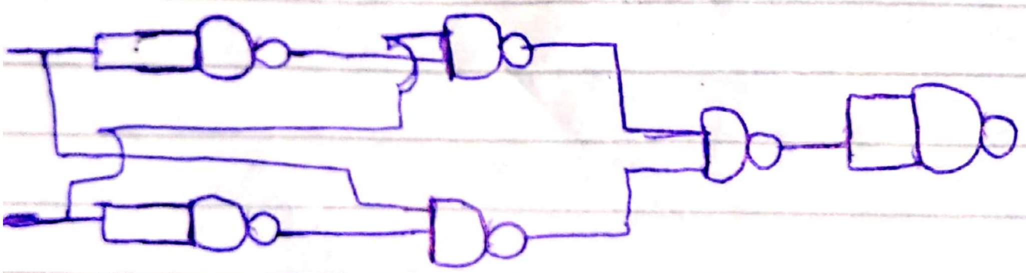
5-NAND = X-OR

- just give the connection of ii- gate to iv- gate



(EX-NOR GATE)

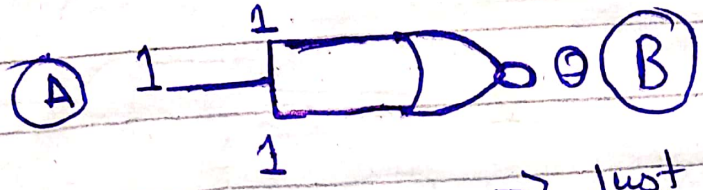
6-NAND GATE = X-NOR



⇒ just add one extra nand gate to the Ex-OR designed circuit.

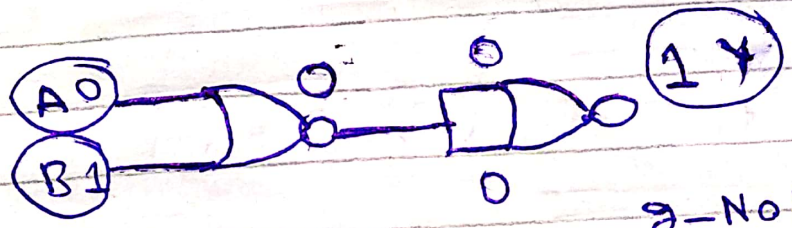
(NOR GATE)

(1) NOT GATE using NOR GATE



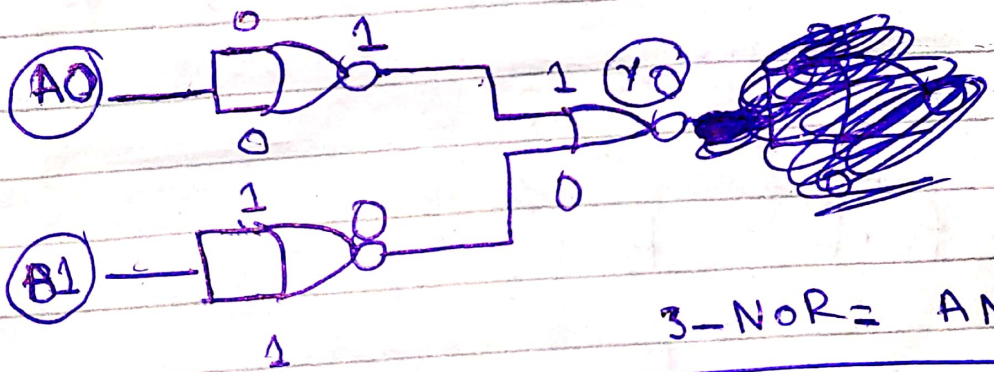
=> just short

(2) OR GATE using NOR GATE



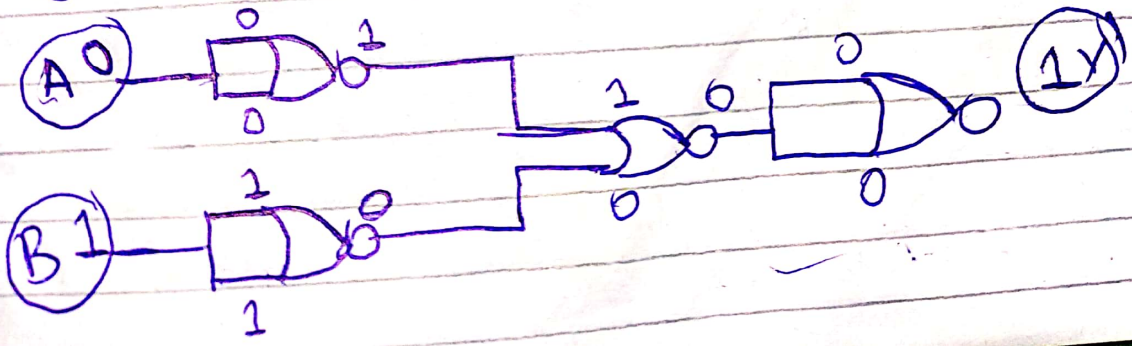
2-NOR = OR

(3) AND GATE with NOR GATE

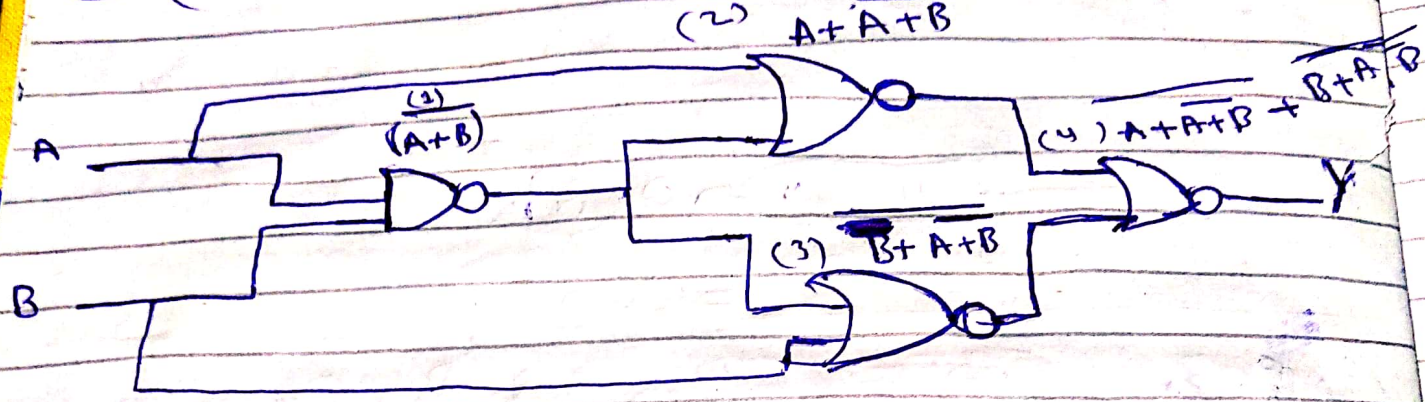


3-NOR = AND

(4) NAND GATE with NOR GATE



(5) (X-NOR - GATE) — (using NOR GATE)



(1) $\overline{A+B}$ (2) $\overline{A+\overline{A+B}}$ (3) $\overline{B+\overline{A+B}}$

(4) $\overline{\overline{A+\overline{A+B}} + \overline{B+\overline{A+B}}}$

Now Demorgans law is

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

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

(Solving eq 4)

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

(801)

using De Morgan law

$$\Rightarrow \bar{A} \cdot \overline{\overline{A+B}} + \bar{B} \cdot \overline{\overline{A+B}}$$

$$\bar{A} \cdot (A+B) + \bar{B}(A+B)$$

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

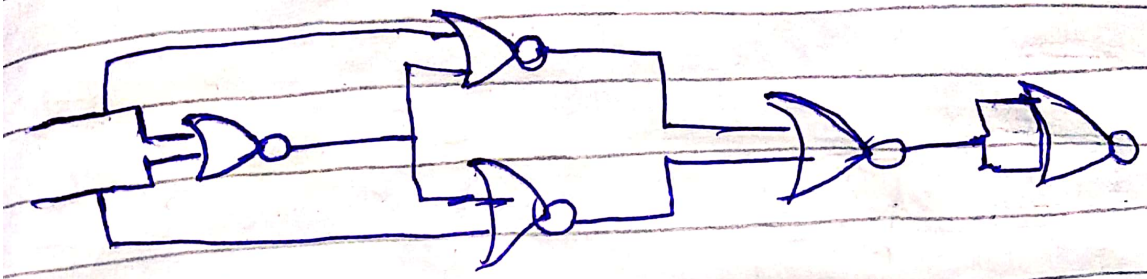
Now $A \cdot \bar{A} = 0$ and $B \cdot \bar{B} = 0$

$$\Rightarrow \bar{A} \cdot B + \bar{B} A$$

Now this equation is equal to the ex-NOR eq

$$A \oplus B$$

X-OR GATE using NOR



$\Rightarrow$ XNOR + NOT = XOR