Experiment - 1

AiM: Study of Digital ICs and basic concept components like power supply, DSO etc.
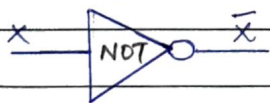
Summary:

Study of basic digital ICs and verifying their functionality, learning the usage of function generator (FG) and digital storage oscilloscope (DSO), and rigging up of circuits

Components used:

IC 7404, 7408, 7432, 7486, 1kΩ resister array, DIP switches, ~~learning usage of function generat~~ breadboard, power supply
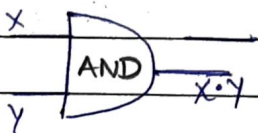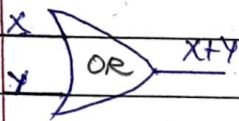
Design Procedure:

→ **NOT gate:**

x —▷○— x̄

X	$\bar{X}$ = NOT X
0	1
1	0

→ **AND gate:**

x, Y — AND — x·y

X	Y	X·Y = X AND Y
0	0	0
0	1	0
1	0	0
1	1	1

→ **OR gate:**

X	y	x+y = X OR Y
0	0	0
0	1	1
1	0	1
1	1	1

x
y → OR → x+y
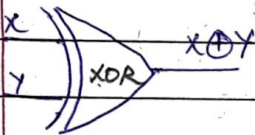
→ **XOR gate:**

X	Y	$X \oplus Y$ = X XOR Y
0	0	0
0	1	1
1	0	1
1	1	0

x
y → XOR → $X \oplus Y$

→ **NAND gate:**
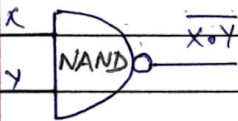
X	Y	$\overline{X \cdot Y}$ = X NAND Y
0	0	1
0	1	1
1	0	1
1	1	0

x
y → NAND → $\overline{X \cdot Y}$
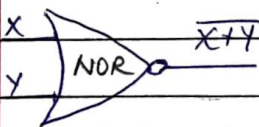
→ **NOR gate:**

X	Y	$\overline{X+Y}$ = X NOR Y
0	0	1
0	1	0
1	0	0
1	1	0

x
y → NOR → $\overline{X+Y}$

→ **XNOR gate:**
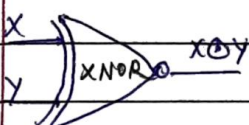
X	Y	$X \odot Y$ = X XNOR Y
0	0	1
0	1	0
1	0	0
1	1	1

x
y → XNOR → $X \odot Y$

Circuit Diagrams.

→ NOT.

VCC

LED

S

1	14
2	13
3	12
4 NOT	11
5 IC	10
6 (7404)	9
7	8

Ground

→ (AND, OR, XOR)

VCC

LED

S1

S2

1	14
2 Gate	13
3	12
4 IC 7408=AND	11
5 7432=OR	10
6 7486=XOR	9
7	8

Ground

VCC

LED

		NOT	
1			14
2			13
3			12
4		NOT	11
5		IC	10
6		(7404)	9
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S1

S2

1			14
2	Gate		13
3	IC		12
4	7408=AND		11
5	7432=OR		10
6	7486=XOR		9
7			8

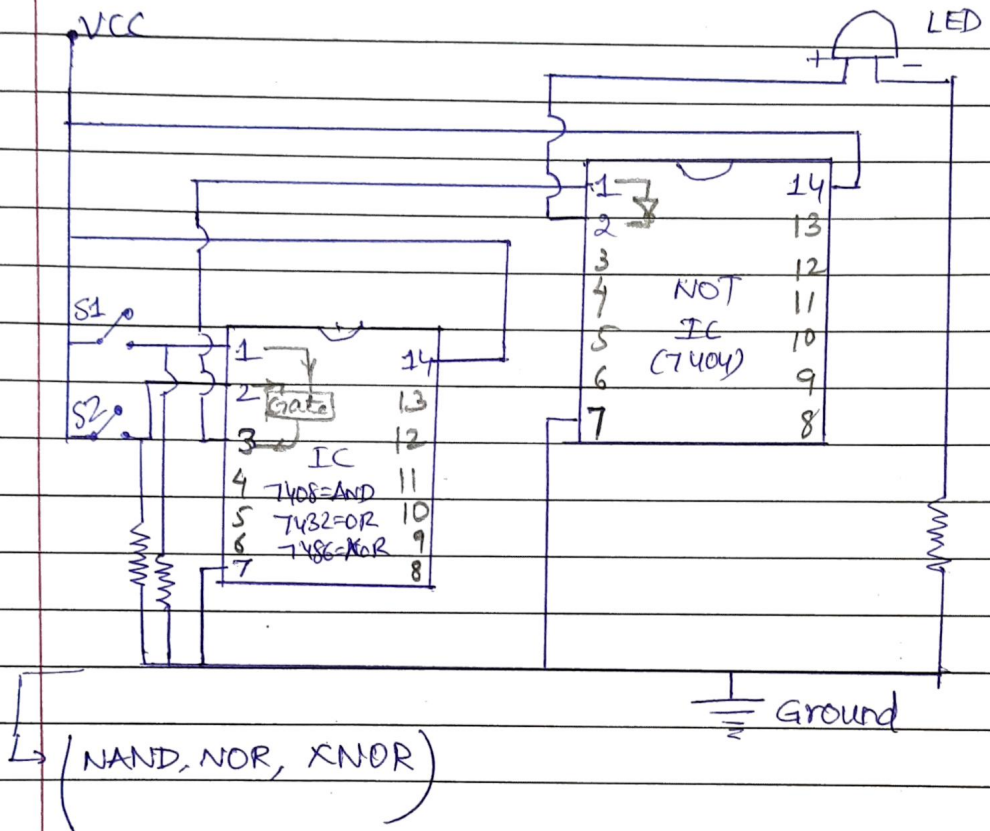Ground
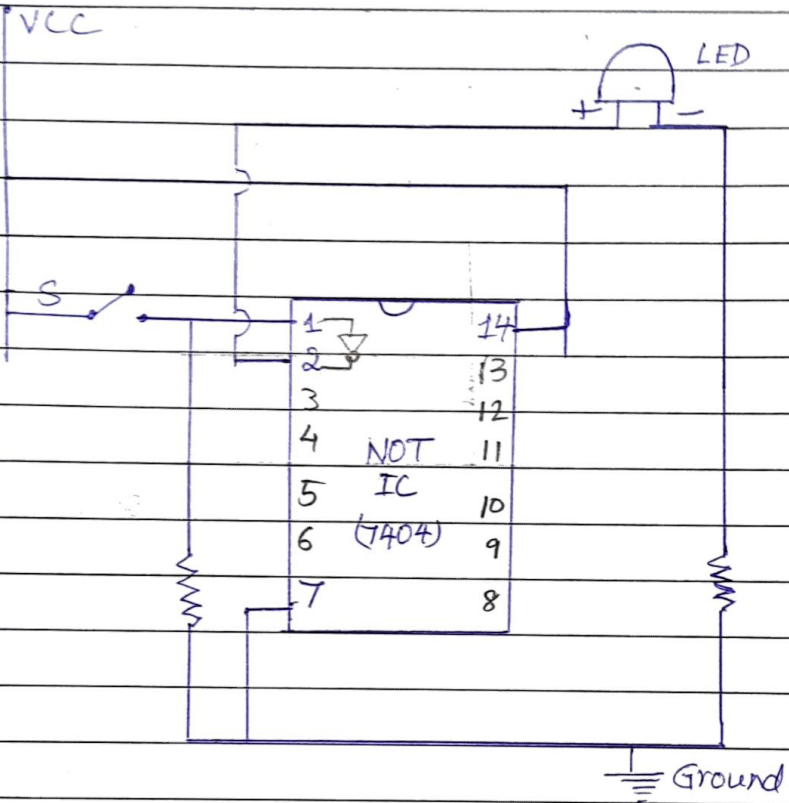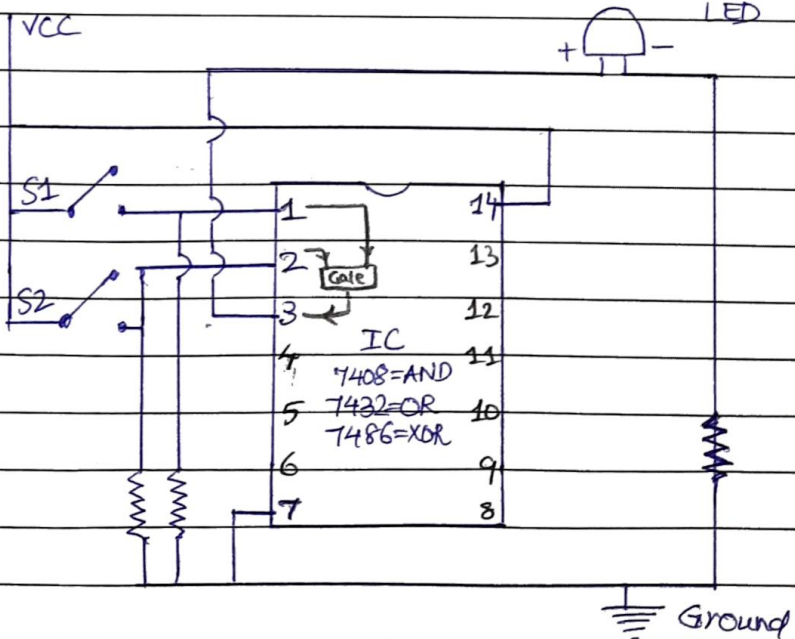
(NAND, NOR, XNOR)

Results and Discussions.

1. We can verify the outputs obtained using truth tables.

2. We have constructed complex logic gates (NAND, NOR, XNOR) using the more basic logic gates (NOT, AND, OR, XOR)

Conclusion

→ We have verified functionality of basic digital integrated circuits (ICs)