EC0319 : Digital Electronics Date:_____

PRACTICAL-6

AIM: To Verify NAND & NOR as Universal Gate using Truth Table and Logic Diagram

- To verify NAND and NOR as universal gate using truth table and Logic diagram :
- The NAND gate can be used to create any basic logic gate (AND, OR, NOT) and any combinational logic circuit.
- The NOR gate, like NAND is a universal gate that can be used to create the basic logic gates (AND, OR, NOT) and any combinational logic circuit.

i). Boolean Expression :-

a). NAND :-

i). NOT :

$A' = A \text{ NAND } A$

ii). AND :

$A \cdot B = (A \text{ NAND } B)'$

iii). OR :

$A + B = (A' \text{ NAND } B')$

b). NOR :-

i). NOT :

$A' = A \text{ NOR } A$

ii). AND :

$A \cdot B = (A' \text{ NOR } B')'$

iii). OR :

$A + B = (A \text{ NOR } B)'$

ii). Truth Table :-

a). NAND :

A	B	A NAND B
0	0	1
0	1	1
1	0	1
1	1	0

b). NOR :-

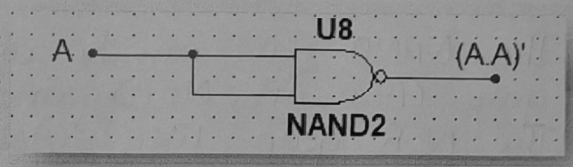
A	B	A NOR B
0	0	1
0	1	0
1	0	0
1	1	0

iii). Logic circuit diagram :-

a). NAND :-

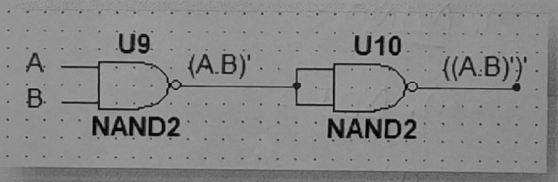
i). NOT using NAND gate :

A	A·A	$\overline{A \cdot A}$	A'
0	0	1	1
1	1	0	0



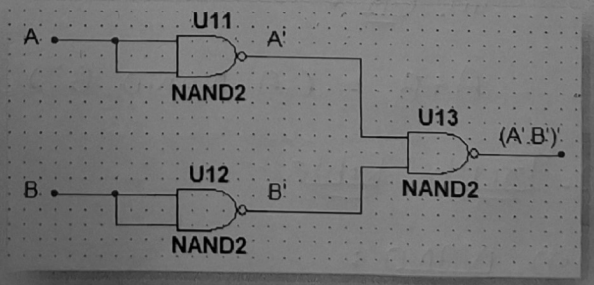
ii). AND using NAND gate :

A	B	A·B	$\overline{A \cdot B}$	$\overline{\overline{A \cdot B}}$	AB
0	0	0	1	0	0
0	1	0	1	0	0
1	0	0	1	0	0
1	1	1	0	1	1



iii). OR using NAND gate :

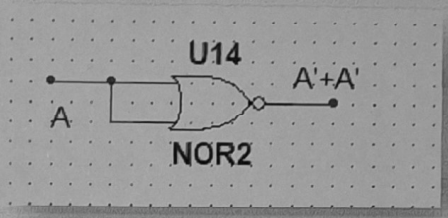
A	B	$\bar{A}$	$\bar{B}$	$\bar{A} \cdot \bar{B}$	$\overline{\bar{A} \cdot \bar{B}}$	A+B
0	0	1	1	1	0	0
0	1	1	0	0	1	1
1	0	0	1	0	1	1
1	1	0	0	0	1	1



b). NOR :-

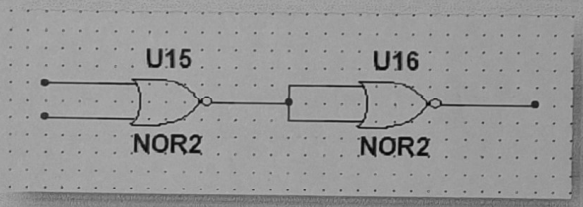
i). NOT using NOR gate :

A	A'+A'	A + A
0	1	0
1	0	1



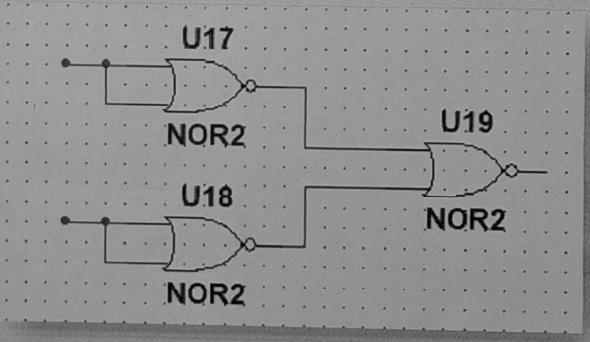
ii). AND using NOR gate :

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



iii). OR using NOR gate :

A	B	A'	B'	$\overline{A' \cdot B'}$
0	0	1	1	0
0	1	1	0	1
1	0	0	1	1
1	1	0	0	1



Conclusion :-

In these experiment, we had verify NAND and NOR as universal gate using its truth table and logic diagram.