DIGITAL LOGIC DESIGN

Lab Manual – 02

Topic:

1. DeMorgan's Theorem and its implementation in Boolean algebra

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1) Demorgen's Theorem:

De Morgan's Theorem, is a powerful tool in digital design. The theorem explains:

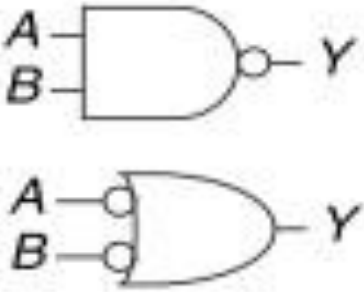
1. the complement of the product(AND) of all the terms is equal to the sum(OR) of the complement of each term.
   (A.B.C. …)' = A'+B'+C'+ …
2. The complement of the sum(OR) of all the terms is equal to the product(AND) of the complement of each term.
   (A+B+C+ …)' = A'.B'.C'. …

Therefore,

According to De Morgan's theorem,

1. A NAND gate is equivalent to an OR gate with **inverted** inputs.
2. A NOR gate is equivalent to an AND gate with **inverted** inputs.

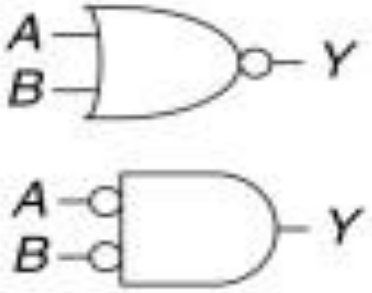
NAND



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

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

NOR



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

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

Lab Tasks:

1. Prive the followint identities:
    a. A'.B' = (A+B)'
    b. A'+B' = (A.B)'
2. Implement NOR gate using NAND gate.
3. Implement NAND gate using NOR gate.

Home Task:

Circuit diagrams of implementations of all gates using NAND and NOR gates separately.

Instructions:

- **Show your work:** Make sure you have shown your work to respective TA in the lab before leaving it.
- **Clean Up Workspace:** Ensure your workstation is clean and organized. Clear away any papers, or materials used during the lab session.
- **Turn Off Equipment:** Power down all equipment.
- **Secure Components:** Place all physical components such as wires, ICs at their designated places. Do not leave components lying around on the workbench.
- **Return Borrowed Equipment:** Return the ICs and other equipment taken from server room.
- **Save Work:** Follow the instruction given in the lab regarding saving your work.
- **Dispose of Waste:** Dispose of any non-recyclable items, in the designated waste bins. Recycle any recyclable materials according to lab guidelines.
- Follow any additional instructions provided by the lab instructor or TAs regarding lab cleanup and departure procedure.
- Do the home task on sheets, and submit it in the Google Classroom. The name of your file must be YourRollNumber_HTLab02.pdf
    - (i.e. BCSF23M5XX_HTLab02.pdf/ BSDSF23XXXX_HTLab02.pdf).