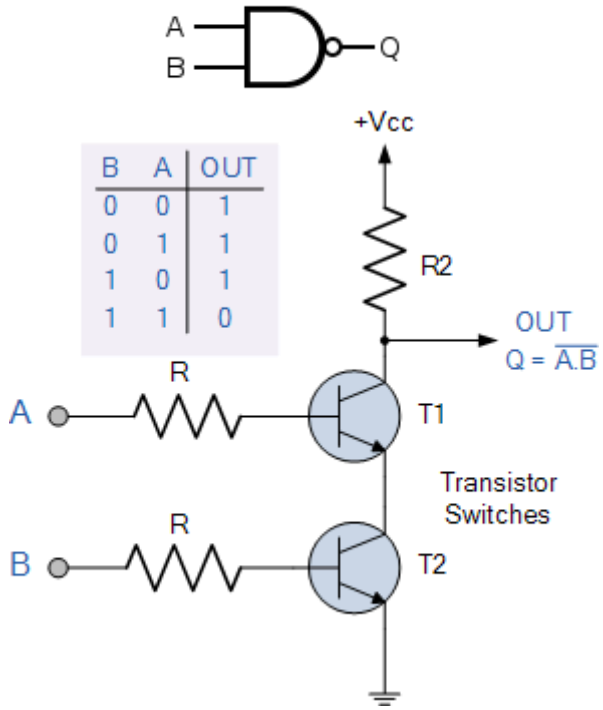
ASSIGNMENT SET - I

A universal gate is a gate which can implement any Boolean function without need to use any other gate type. The NAND and NOR gates are universal gates. In practice, this is advantageous since NAND and NOR gates are economical and easier to fabricate and are the basic gates used in all integrated circuits (IC) digital logic families.

We have given the logical symbol of NAND Gate, Truth Table and the electronic circuit level diagram used for implementing the NAND gate using Transistor Switches.



The objective in Assignment- I is to build all the logic gates presented below. The only building blocks that you can use are primitive **NAND gates** and the composite gates that you will gradually build on top of them.

The only tool that you need for this project is the ModelSim - Intel FPGA Starter Edition. All the chips should be implemented in the HDL language using Verilog code.

ModelSim Could be started from terminal by navigating the installed directory using "cd intelFPGA_lite/18.0/modelsim_ase/linuxaloem/"& executing command ./vsim. User has to be careful that, he / she shouldn't close the terminal till he / she have completed his work with modelsim GUI.

Verilog code for initiating the basic NAND Gate in ModelSim is: ***nand nand_1 (out, in0, in1);***

As the assignment progress, students has to call / use the basic logical functions that is already implemented by him / her for building other logical functions.

The list of questions are shown below. There are 16 different logical functions. Students are expected to use only **Gate-Level Modeling** (**Structural Modeling**) for the implementation of following circuits in the given order.

1. NOT Gate
2. AND Gate
3. OR Gate
4. NOR Gate
5. XOR Gate
6. XNOR Gate
7. 16-BIT NOT
8. 16-BIT AND
9. 16-BIT OR
10. 16-BIT XOR
11. OR(IN0,IN1,...,IN7)
12. MUX
13. DEMUX
14. 16-BIT MULTIPLEXER
15. 16-BIT / 4-WAY MUX
16. 16-BIT / 8-WAY MUX
17. 4-WAY DEMULTIPLEXER
18. 8-WAY DEMULTIPLEXER