

Department of Computer Engineering
Faculty of Engineering, University of Peradeniya

CO221: Digital Design
Lab 2: Pre-lab

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- Each individual should have a written/printed pre-report that answer the following questions when you are attending the second digital design lab.
 - If the answers are clear, readable and clean that is fine and no need to waste your time unnecessarily on neatness.
 - If you have any question regarding the problems put a post in the discussion forum for CO221 in FEeLS.
1. Draw the logic symbols and prepare the truth tables for the following logic gates.
 - a) NOT gate (Inverter)
 - b) 2 input AND gate
 - c) 2 input OR gate
 - d) 2 input NAND gate
 - e) 2 input NOR gate
 - f) 2 input XOR gate
 2. Draw the logic circuit using basic logic gates and the truth table for the following Boolean equation.
$$F = \overline{(A.B + A.\bar{B})}.(A + \bar{A}.B)$$
 3. A room has two switches A and B to light a bulb. If B is closed while A is open, the bulb should NOT light. If B is open and A is closed, again the bulb should NOT light. But if both A and B are closed or A and B are both open, the bulb should light. While representing switches A and B as logic variables write a Boolean equation for the circuit to light the bulb. Draw the circuit using AND, OR and NOT gates and draw the truth table.

4. A logic circuit has to be designed to automatically light a battery operated bulb at **night** when the **main electricity supply is cutoff**. Further, in any situation it should be possible to light the bulb when a certain button is pressed. The circuit has three inputs A, B, C and one output F. The representation of logic variables are as follows.

A = 0 : Button is not pressed

A = 1 : Button is pressed

B = 0 : Noon

B = 1 : Night

C = 0 : Main electricity supply is cutoff

C = 1 : Main electricity supply is available

When the output $F=0$, the bulb is off and when $F=1$ bulb lights up.

- a. Write a Boolean equation for F using A, B and C.
- b. Draw the logic circuit to implement the Boolean equation only using 2 input AND, OR, NOR, NAND gates and 1 input NOT gates.