



University of British Columbia
Electrical and Computer Engineering
Digital Design and Microcomputers
CPEN312

Lab 1 - Logic Gates

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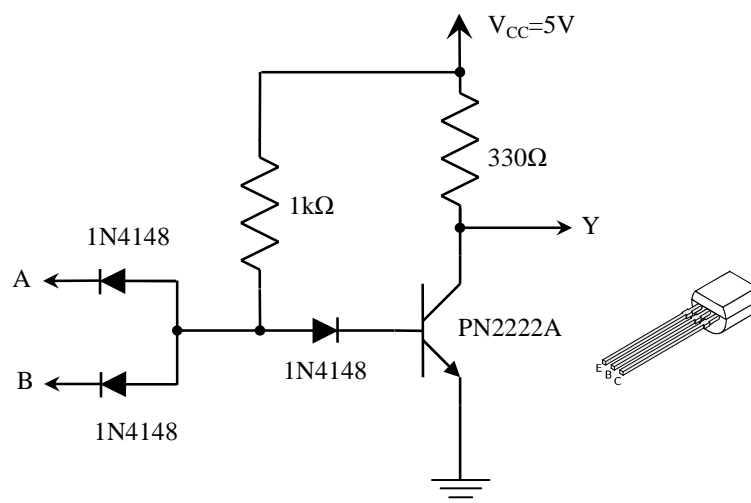
In this laboratory you will implement a simple digital system using logic gate integrated circuits.

Tools and Parts Needed

1. Wire stripper, pliers, wire, and breadboard which are available in the lab. If you don't own these tools, you can use the ones available in the lab.
2. 1 x PN2222A NPN transistor, 3 x 1N4148 diodes, 1 x 330 Ω resistor, 1 x 74HC00 or 74LS00 4-NAND gate IC, 74HC04 or 74LS04 6-NOT gate IC, 8 x 1k resistors, as well as the common anode 7-segments display LSHD-F101. These parts will be provided either at lecture time or in the lab.

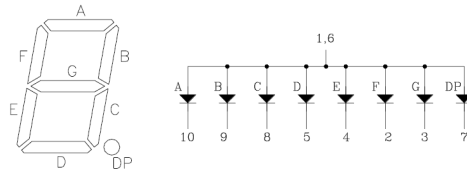
Activities

- 1) Find the pin out of the 74HC00/74LS00, 74HC04/74LS04 integrated circuits (ICs) and the LSHD-F101 display. Draw the top view of the ICs and display on a piece of paper showing all the gates and power supply connections.
- 2) Assemble and test the NAND gate built with discrete components as show in the diagram below. The inputs are labeled 'A' and 'B'. The output is labeled 'Y'. Measure the voltages at the inputs and output using the lab multimeter in order to assess their logic state. Show this circuit and the test results together with the results of point 4) bellow to one of the teaching assistants on duty.



- 3) Design and simulate with Multisim a 2-bit decoder that displays the letters A, b, c, d using a 7-segment display as indicated in the table below. The segments are turned on with logic 0. Use ONLY 2-input NAND as well as NOT gates.

Inputs		Segments On
B	A	
0	0	All but D
0	1	All but A, B
1	0	D, E, G
1	1	All but A, F



- 4) The logic gate integrated circuits we have for this lab need a 5V DC power supply to operate. Insert the 74HC00/74LS00 and 74HC04/74LS04 ICs into the breadboard and wire both the power and ground pins. Assemble and test the circuit you designed in point 3) above. Remember to limit the maximum current per segment by adding a 1k resistor in series as it was shown in the lecture. Demonstrate your results to the teaching assistant on duty in order to get a grade for your work. Be prepared to provide details about your design as well as run simulations upon the teaching assistant request. Also, the teaching assistant may ask you to disassemble your circuit before assigning you a grade.