

**Homework #5**  
**Number Systems, Boolean Algebra and Logic Gates**  
*Due: 14 April*

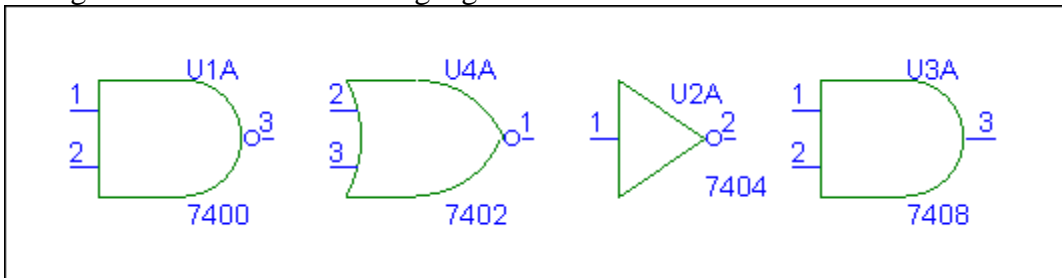
1. Number Systems: Convert the decimal numbers to binary and vice-versa (do not look them up in the table.):

| Binary | Decimal |
|--------|---------|
| 0101   |         |
| 1101   |         |
|        | 6       |
|        | 15      |
|        |         |

2. Boolean Algebra: Determine which boolean operation is represented by the following table:

| B | A | Result |
|---|---|--------|
| 0 | 0 | 0      |
| 0 | 1 | 1      |
| 1 | 0 | 1      |
| 1 | 1 | 1      |

3. Logic Gates: What kind of logic gate is each of these devices?:



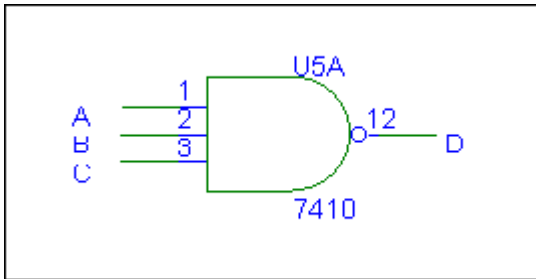
4. Boolean Algebra: Simplify the expression below.

$$D = (C + 0) \cdot (A + (\overline{A \cdot B}))$$

5. Combinational Logic: Draw a logic circuit that performs the following function.

$$D = A \cdot (C + (\overline{B \cdot A}))$$

6. Fill in the truth table for the circuit below.



| C | B | A | D |
|---|---|---|---|
| 0 | 0 | 0 |   |
| 0 | 0 | 1 |   |
| 0 | 1 | 0 |   |
| 0 | 1 | 1 |   |
| 1 | 0 | 0 |   |
| 1 | 0 | 1 |   |
| 1 | 1 | 0 |   |
| 1 | 1 | 1 |   |

Some reference materials:

<http://www.ied.edu.hk/has/phys/de/de-ba.htm>

<http://www.dgp.utoronto.ca/people/van/courses/csc258/bool.html>

7. Design a monostable multivibrator that outputs a single 10msec pulse using a 555 timer. Perform a PSpice simulation of your circuit to show that it works. Some useful links follow.

<http://www.uoguelph.ca/~antoon/circ/monovib.htm>

<http://www.hobby-electronics.com/MonostableMultivibrator.htm>