Cs101

Assignment 5

1. If a=1, b=2, and c=3. What is the value of each of the following Boolean expressions?
   * 0(f)
   * 0(f)
   * 0(f)
   * 1(t)
   * 1(t)
2. Using AND, OR, and NOT gates to implement the following circuits
   * Input a,b --- AND gate --- NOT gate
   * Input a,b --- a --- NOT gate --- OR gate
3. Build a majority-rules circuit. This is a circuit with three inputs and one output. The value of its input is 1 if and only if two or more of its inputs are 1; otherwise, the output of the circuit is 0. For example, if the inputs are 0, 1,1, your circuit should output a 1. If its inputs are 0, 1, 0, it should output a 0.



1. Given the following circuit which has two inputs and four outputs, give its truth table and try to give an example where this circuit might be used (Hint: treat the two inputs as a binary number).

Up and down

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 0 | 0 | 1 | 0 | 0 | 0 |

1. At a minimum, how many bits are needed in the MAR with each of the following memory sizes?
   * B
2. A memory unit that is said to be 640KB would actually contain how many memory cells? What about 512MB? What about 2G bytes?
   * 10\*2^16
   * 2^9\*2^20=2^29
   * 2^31
3. Describe how MAR and MDR are used to find out the value of a specific memory cell? What about storing a value into a memory cell?
   * The MAR holds the address of the cell to be fetched or stored. Because the MAR must be capable of holding any address, it must be at least N bits wide, where 2^n is the address space of the computer
   * The MDR contains the data value being fetched or stored. We might be tempted to say that the MDR should be W bits wide, where W is the cell size. However, as mentioned earlier, on most computers the cell size in only 8 bits and most data values occupy multiple cells. Thus the size of the MDR is usually a multiple of 8. Typical values of MDR width are 32 and 64 bits, which would allow us to fetch, in a single step, either an integer or a real value.
   * Store(address, value)
     1. Load the address into the MAR
     2. Load the value into the MDR
     3. Decode the address in the MAR
     4. Store the contents of the MDR into that memory location.