**Week1 Exercises**

1. How many different numbers can be represented with 16 bits?
2. What is the largest unsigned 32-bit binary number?
3. What is the largest 16-bit binary number that can be represented with
   1. Unsigned numbers?
   2. Two’s complement numbers?
   3. Sign/magnitude numbers?
4. Convert the following hexadecimal numbers to decimal. Show your work.
   1. A516
   2. 3B16
   3. FFFF16
   4. ED3A16
5. Repeat Exercise 4, but convert to unsigned binary.
6. Convert the following two’s complement binary numbers to decimal.
   1. 10102
   2. 1101102
   3. 011100002
   4. 100111112
7. Repeat Exercise 6, but convert to 8-bit sign/magnitude numbers.
8. Convert the following 4-bit two’s complement numbers to 8-bit two’s complement numbers.
   1. 01012
   2. 10102
9. Perform the following additions of unsigned binary numbers. Indicate whether or not the sum overflows an 8-bit result.
   1. 100110012 + 010001002
   2. 110100102 + 101101102
10. Repeat Exercise 9, assuming that the binary numbers are in two’s complement form.
11. Convert the following decimal numbers to 8-bit binary numbers and add them. Indicate whether or not the sum overflows a 8-bit result.
    1. 2710 + 3110
    2. −410 + 1910
    3. 310 + −3210
    4. −1610 + −910
12. Perform the following additions of unsigned hexadecimal numbers. Indicate whether or not the sum overflows an 8-bit (two hex digit) result.
    1. 716 + 916
    2. 1316 + 2816
    3. AB16 + 3E16
    4. 8F16 + AD16
13. In a binary coded decimal (BCD) system, 4 bits are used to represent a decimal digit from 0 to 9. For example, 3710 is written as 00110111BCD.
    1. Write 28910 in BCD.
    2. Convert 100101010001BCD to decimal
    3. Convert 01101001BCD to binary
    4. Show BCD adjust operations on 9210 + 2510
    5. Show BCD adjust operations on 3810 + 2210
    6. Show BCD adjust operations on 7810 + 3210
14. How many different truth tables exist for Boolean functions of *N* variables?
15. Create the following logic functions out of NAND gates:

15.1. NOT, 15.2. AND, 15.3. OR, 15.4. NOR, 15.5 XOR 15.6 XNOR

1. Show a 3-input XOR gate with the help of its Truth Table.
2. Show how a 2-iput XOR gate can act as a NOT and BUFFER functions.