ESE-2005 Assignment 1 Number system

Exercise

1. An analog voltage is in the range of 0–5V. If it can be measured with an accuracy of ± 50mV, at most how many bits of information does it convey?

2. What is the largest 8-bit binary number that can be represented with
   (a) unsigned numbers?
   (b) two's complement numbers?
   (c) sign/magnitude numbers?

3. Convert the following unsigned binary numbers to decimal. **Show your process**.
   (a) 1010_2
   (b) 110110_2
   (c) 11110000_2
   (d) 000100010100111_2

4. Convert the following unsigned binary numbers to hexadecimal. **Show your process**.
   (a) 1010_2
   (b) 110110_2
   (c) 11110000_2
   (d) 000100010100111_2

5. Convert the following hexadecimal numbers to decimal. **Show your process**.
   (a) $4E_{16}$
   (b) $7C_{16}$
   (c) $ED3A_{16}$
   (d) $403FB001_{16}$

6. Convert the following two's complement binary numbers to decimal.
   (a) 1100_2
   (b) 100001_2
   (c) 01001100_2
   (d) 10110101_2

7. A particular DSL modem operates at 768 kbits/sec. How many bytes can it receive in 1 minute? USB 3.0 can send data at 5 Gbits/sec. How many bytes can it send in 1 minute?

8. Estimate the value of 2^{31} without using a calculator. **Show your process**.

9. Perform the following additions of unsigned binary numbers. Indicate whether or not the sum overflows an 8-bit result.
   (a) $10011001_2 + 01000100_2$
   (b) $11010010_2 + 10110110_2$

10. Perform the following additions of two's complement binary numbers. Indicate whether or not the sum overflows an 8-bit result.
    (a) $10011001_2 + 01000100_2$
    (b) $11010010_2 + 10110110_2$