Exercise 1 Problems

Do NOT use a calculator on this assignment. You will not be allowed to use one on the test or quizzes.

1. Convert the following binary numbers to decimal.
   a. 10011_2
   b. 01101_2
   c. 10001110_2
   d. 11011101_2
   e. 110101111_2
   f. 101010101_2
   g. 10011_{2c}
   h. 01111_{2c}
   i. 10101101_{2c}
   j. 01101011_{2c}
   k. 100011111_{2c}
   l. 011011011_{2c}

2. Convert the following decimal numbers to unsigned 5-bit binary, 8-bit binary, and 9-bit binary or state that a conversion is not possible (i.e. the decimal number cannot be represented with the given number of bits). Represent your answers in binary then convert the binary representations to hexadecimal.
   a. 9_{10}
   b. 19_{10}
   c. 45_{10}
   d. 67_{10}
   e. 88_{10}
   f. -90_{10}
   g. 124_{10}
   h. 201_{10}
   i. 300_{10}
   j. 405_{10}

3. Convert the following decimal numbers to signed 5-bit binary, 8-bit binary, and 9-bit binary or state that a conversion is not possible (i.e. the decimal number cannot be represented with the given number of bits). Represent your answers in binary then convert the binary representations to hexadecimal.
   a. -12_{10}
   b. -9_{10}
   c. 11_{10}
   d. -50_{10}
   e. -99_{10}
   f. 78_{10}
   g. 130_{10}
   h. 103_{10}
   i. -233_{10}
   j. -333_{10}

4. Convert the following decimal numbers directly to hexadecimal.
   a. 27_{10}
   b. 45_{10}
   c. 58_{10}
   d. 83_{10}
   e. 120_{10}
   f. 180_{10}
   g. 210_{10}
   h. 235_{10}
   i. 240_{10}
   j. 255_{10}

5. For each of the systems listed, convert the hexadecimal value directly to decimal and directly to binary.
   a. 5-bit unsigned binary
      i. $0A_{16}$
      ii. $1F_{16}$
      iii. $0E_{16}$
      iv. 17_{16}
   b. 8-bit unsigned binary
      i. ED_{16}
      ii. $8F_{16}$
      iii. $B4_{16}$
      iv. $6A_{16}$
   c. 9-bit unsigned binary
      i. $0A7_{16}$
      ii. 079_{16}
      iii. 101_{16}
      iv. 155_{16}
   d. 5-bit signed binary
      i. $0A_{16}$
      ii. $1A_{16}$
      iii. $1F_{16}$
      iv. 08_{16}
   e. 8-bit signed binary
      i. AE_{16}
      ii. $7F_{16}$
      iii. $5D_{16}$
      iv. CC_{16}
   f. 9-bit signed binary
      i. $0AE_{16}$
      ii. $1AE_{16}$
      iii. $08A_{16}$
      iv. $1FF_{16}$

6. Negate the following binary numbers.
   a. 00001_{2C}
   b. 10011_{2C}
   c. 01101_{2C}
   d. 00110101_{2C}
   e. 01001000_{2C}
   f. 00000000_{2C}
   g. 100101000_{2C}
   h. 011110111_{2C}
   i. 10000000_{2C}
   j. 01111010_2

7. Extend the following numbers to 16 bits. Then, convert both the value listed and the 16-bit answer to hexadecimal.
   a. 01001_2
   b. 10111_2
   c. 10111_{2c}
   d. 00110101_2
   e. 00110101_{2c}
   f. 10110011_2
   g. 100010011_{2c}
   h. 011011100_{2c}

8. Truncate each value listed to 9, 8, and 5 bits or state that the truncation is not valid.
   a. $0000\ 0000\ 0001\ 1011_2$
   b. $1111\ 1111\ 1110\ 0111_{2c}$
   c. $1111\ 1111\ 1011\ 1000_{2c}$
   d. $0000\ 0000\ 1010\ 0011_{2c}$
   e. $1111\ 1100\ 0011\ 1111_{2c}$

9. For each problem, generate the result using the correct number of bits and state whether or not overflow occurs.
   a. $00110_2 + 10111_2$
   b. $00110_2 - 10100_2$
   c. $11000_{2c} + 11111_{2c}$
   d. $00111_{2c} - 10101_{2c}$
   e. $11001_{2c} + 11010_{2c}$
   f. $01110_{2c} - 10111_{2c}$
   g. $01101011_2 + 10011011_2$
   h. $01000000_2 + 01110000_2$
   i. $11001100_{2c} + 11001111_{2c}$
   j. $01110101_{2c} + 10111111_{2c}$
   k. $01101101_2 - 01101111_2$
   l. $10011110_2 - 01100000_2$
   m. $10011110_{2c} - 01100000_{2c}$
   n. $10110101_{2c} - 11001011_{2c}$
   o. $01010000_{2c} + 01110000_{2c}$
   p. $01010000_{2c} - 01110000_{2c}$
   q. $11000110_2 + 1110_2$
   r. $01011101_2 - 0101_2$
   s. $01110000_{2c} + 1111_{2c}$
   t. $11110110_{2c} - 0111_{2c}$