Computer Architecture

Tutorial 3 – Number Representation and Binary Arithmetic

1) Convert the following binary numbers to decimal:
   (a) 0110, (b) 1011, (c) 10101010

2) Convert the following binary numbers to hexadecimal:
   (a) 1110, (b) 11011, (c) 1010111101110010

3) Convert the following decimal numbers to binary and hexadecimal:
   (a) 12, (b) 27, (c) 96

4) For an 8-bit group, work out the representation for -37_{10} in

   a) Sign & Magnitude
   b) One's Complement
   c) Two's Complement
   d) Excess-255 (Note: The n in Excess-n does not have to equal $2^m - 1$, where m is the number of bits in the bit-group)
   e) Excess-128

5) Express 9876510 in Binary Coded Decimal

6) Form the negative equivalent of the following 8-bit Two's Complement numbers

   (a) 00011001, (b) 00011110, (c) 01101000, (d) 01110100

   by comparing the resulting bit-patterns to the originals, can you spot a "short cut" method for the conversion?

7) Perform the following 12-bit two's complement subtraction

   1010 1010 1011
   −1011 0000 1101

8) Perform the binary multiplication 10011 x 1101

9) Divide the binary number 1011111 by 101

For questions 7 - 9, check the answer by conversion to decimal