

## COM1006/COM1090 Devices and Networks (Autumn)

### Tutorial Sheet #2: Computer Arithmetic I

1. Using 8-bit arithmetic throughout, express the following decimal numbers in two's complement representation:
  - a) 5
  - b) -4
  - c) 0
  - d) -42
  - e) 127
  - f) -128
2. Distinguish between *overflow* and *carry* when these terms are applied to two's complement arithmetic on  $n$ -bit words.
3. Perform the following additions of 4-bit binary numbers:
  - a)  $0011 + 1100$
  - b)  $1111 + 0001$
  - c)  $0110 + 0111$
  - d)  $1100 + 1010$

Comment on the validity of your results if the numbers above are regarded as (i) unsigned binary integers and (ii) two's complement integers. (You can answer (i) and (ii) without converting binary numbers into decimal.)

4. Convert the following binary numbers into decimal, regarding them as integers in biased form, with bias 3:

- a) 101
- b) 000
- c) 011
- d) 010

5. Show that decimal 100.125 converted to IEEE 754 single precision (32-bit) is:

0 10000101 100100001000000000000000

6. Convert the following IEEE 754 single precision (32-bit) number to decimal:

1 01111100 110000000000000000000000