Tutorial Sheet 1 – *Binary Number Representation*

1. Convert the following decimal numbers to binary:

(i) 23 **(ii)** 101 **(iii)** 56 **(iv)** 88.3125 **(v)** 48.78125

2. Convert the following binary numbers to decimal:

(i) 10001100 **(ii)** 11011101 **(iii)** 10110010

(iv) 1001.101 **(v)** 11011.1101

3. Express the following binary numbers in hexadecimal:

(i) 100111001110 **(ii)** 110110100010

(iii) 111101011100010 **(iv)** 11001110100110

4. Express the following decimals in BCD:

(i) 224 **(ii)** 1098 **(iii)** 756

5. Carry out the following binary arithmetic calculations:

(i) 1101 + 0110 **(ii)** 1110 + 0101 **(iii)** 110011 + 100111

(iv) 1101 – 011 **(v)** 1010 – 110 **(vi)** 1101101 – 0110111

6. Express the following numbers as binary in the **(a)** signed magnitude, **(b)** 1's complement, and **(c)** 2's complement system. *Assume 8 bits are to be used.*

(i) 45 **(ii) –** 45 **(iii) –** 98

(iv) – 120 **(v)** 100 **(vi) –** 25

7. What decimal numbers do the following represent if they are **(a)** signed magnitude, **(b)** 1's complement and **(c)** 2's complement numbers?

(i) 00110110 **(ii)** 10101101 **(iii)** 11110011 **(iv)** 00111011

ANSWERS

1. (i) 10111 (ii) 1100101 (iii) 111000 (iv) 1011000.0101 (v) 110000.11001 2. (i) 140 (ii) 221 (iii) 178 (iv) 9.625 (v) 27.8125
3. (i) $9CE_{16}$ (ii) $DA2_{16}$ (iii) $7AE2_{16}$ (iv) 33A616 4. (i) 1000100100 (ii) 1000010011000 (iii) 11101010110
5. (i) 10011 (ii) 10011 (iii) 1011010 (iv) 1010 (v) 100 (vi) 110110 6. (i) 00101101 (ii) 10101101; 11010010; 11010011
   (iii) 11100010; 10011101; 10011110 (iv) 11111000; 10000111; 10001000; (v) 01100100 (vi) 10011001; 11100110; 11100111
7. (i) 54 (ii) –45; –82; –83 (iii) –115; –12; –13 (iv) 59