4.5. Data Representation – Test 1

1. a) Denary numbers are each represented by a pattern of bits which progress sequentially. For example: 0000, 0001, 0010, 0011 [1]

   b) *1 mark for five correct answers and 2 marks for a complete set of correct answers in each column* [4]

Denary	Binary	Hexadecimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F
16	10000	10

2. a) [1]

   0111
   + 0010
   1001

   b) *3 marks only if all working is shown* [3]

   1011
   * 111
   1011
   + 10110
   + 101100
   1001101

3. a) Correct
   b) Correct
   c) False [3]
   b) A checksum is a count of the number of bits in a transmission unit that is included with the unit (1) so that the receiver can check to see whether the same number of bits arrived (1). If the counts match, it's assumed that the complete transmission was received (1). [3]

4. a) Sounds are analogue signals (1). In order to record them to the computer, the sound wave must be converted to a discrete form that can be represented on a computer (1). [2]

   b) A midi file is a set of instructions that can be executed by some compatible device to produce a certain piece of music (1). There are no details of the actual sound stored, simply the 'recipe' for how to create the sound (1). A wave file is a digitised version of the wave form that is produced (1). It has a constant sampling rate and is not compressed in any way; this is why it is often called the raw sound file by computer musicians (1). MP3s are compressed WAV files (1). [max 3]

   c) Lossy compression results in the loss of some of the sound when it is decompressed for playback. This results in a smaller file size but worse sound quality (1). Lossless does not require any sound information to be lost; however, it results in much larger file sizes (1). A lossy compression scheme will generally be used for data streaming as it results in much faster buffering times for the user, and reduces the bandwidth used by the server for each user significantly (1). [3]

5. a) i. 102
ii. 185
iii. 197 [3]

b) i. 01001110
ii. 01111011
iii. 11100100 [3]

c) i. 45
ii. –89
iii. –1 [3]

d) i. 4.75
ii. 3.875
iii. 11.5625 [3]

6. a) ['G', 2, 'O', 5, 'D', 2, 'B', 1, 'Y', 3, 'E', 5] [2]

b) Dictionary coding (1). A table containing sequences of symbols that occur in the source is built (1). Every time a sequence of symbols is detected it is replaced with an index into the table (1). [3]