3.5. Data Representation – Test 2

1. The following questions should be carried out without using a calculator. Show your working.

   a) Convert 204 (base 10) to binary and hexadecimal.

      i.   Binary: [1]

      ii. Hex: [1]

   b) Convert 11000111 (base 2) to denary and hexadecimal.

      i.   Binary: [1]

      ii. Hex: [1]

   c) Convert E7 (base 16) to denary and binary.

      i.   Binary: [1]

      ii. Hex: [1]

   d) What is $\dfrac{-3}{16}$ in two's complement notation? [1]

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   e) If 1100.1100 is a two's complement fraction, what is it in denary? [2]

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2. ASCII and Unicode are both methods of storing characters in a computer.

    a) Knowing that A is character 65 (base 10) in ASCII, give the ASCII codes for the following letters:

        i. F   ……………………………………………………………………………………………   [1]

        ii. M   ……………………………………………………………………………………………   [1]

        iii. X   ……………………………………………………………………………………………   [1]

    b) How many ASCII characters are in the following phrase? Explain how you arrived at your answer.
        I love AQA Computer Science!   [2]

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    c) The ASCII code for the letter 'E' is 100 0101. State the ASCII binary for the letter J.   [1]

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    d) Give an advantage of ASCII over Unicode.   [1]

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    e) Give an advantage of Unicode over ASCII.   [1]

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    f) How many characters can 7-bit ASCII represent?   [1]

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3. a) Using an example, describe how bit patterns can represent other forms of data such as graphics or
        sound.   [2]

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    b) A digital photograph has a resolution of 640 pixels by 480 pixels, and a file size of 1200 KB.
        Assuming the file is a simple raw bitmap (i.e. it contains no header or other extras), calculate the
        colour depth of the image. Show your working.   [3]

    c) Give examples of two pieces of information typically found in the metadata of a bitmapped graphic. [2]

        1…………………………………………………………………………   2…………………………………………………………………………

4. Encryption is incredibly important in the modern age. Two popular methods of encryption are the Caesar Cipher and the Vernam Cipher.

a) Encrypt the phrase 'I love computing' using the Caesar Cipher and a key of 5. [2]

b) Decrypt the phrase 'kwux akq zwksa' using the Caesar Cipher and a key of 8. [2]

c) Give two disadvantages of a standard Caesar cipher as a method of encryption. [2]

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d) The Vernam Cipher is highly regarded – why is that? [1]

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e) Explain how the Vernam Cipher works. You may assume a computer is carrying out the encryption, and binary is being used to represent each character. [4]

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f) Aside from keeping the key text safe and secure, what other two rules must be followed to preserve the security of this Vernam Cipher? [2]

1...

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2...

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Total marks =   /38