INFORMATION REPRESENTATION QUESTIONS

1.

Complete the binary addition. Show your working.

```
  10011110
  01100001
+ 00011001
```

[3]

2.

A computer stores binary data.

(a) Tick (✓) **one** box only to identify the **largest** file size.

- ☐ 3300 kibibytes
- ☐ 0.3 megabytes
- ☐ 3 mebibytes
- ☐ 3300 kilobytes

[1]

(b) Subtract the denary number 10 from the denary number 100 using binary subtraction.

Show your working.

Working .....

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.....

.....

Answer .....

[3]

(c) Convert the hexadecimal number C0F into denary.

Show your working.

Working .....

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.....

Answer .....

[2]

3.

(a) Complete the following description.

A kibibyte has a ..... prefix. Three kibibytes is the same as ..... bytes.

A megabyte has a ..... prefix. Two terabytes is the same as ..... gigabytes.

[4]

(b) Convert the denary number 241 to hexadecimal.

.....

..... [1]

(c) State what is meant by an **overflow in binary addition**.

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..... [1]

(d) Computers use character sets when representing characters in binary.

(i) Complete the table by identifying the number of bits each of the character sets allocates to each character.

Character set	Number of bits
ASCII	
extended ASCII	
Unicode	

[1]

(ii) Explain how the word 'Clock' is represented by a character set.

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..... [2]

4.

A photograph is stored as a bitmap image.

(a) The photograph has a resolution of 4000 pixels wide by 3000 pixels high. The bit depth is 4 bytes.

Calculate an estimate for the file size of the photograph in megabytes.

Show your working.

Working .....

.....

.....

Answer ..... megabytes

[2]

(b) The photograph is compressed before being uploaded to a web server.

(i) Give **three** benefits of this photograph being compressed using lossy compression instead of lossless compression.

1 .....

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2 .....

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3 .....

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[3]

(ii) Explain how run-length encoding (RLE) will compress the photograph.

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..... [2]

(c) Identify **two** elements of a bitmap image that can be changed to reduce its file size.

1 .....

.....

2 .....

.....

[2]

5.

(a) State **one** difference between a tebibyte and a gigabyte.

.....

..... [1]

(b) **(i)** Convert the unsigned binary integer into hexadecimal.

110001100111

Answer ..... [1]

(ii) Convert the two's complement binary number into denary.

100110010111

Answer ..... [1]

(iii) Convert the Binary Coded Decimal (BCD) into denary.

010101110011

Answer ..... [1]

(c) Subtract the denary number 23 from the two's complement binary number 01001010

Perform this calculation using binary subtraction.

Show your working.

Working .....

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Answer .....

[2]

(d) State **one** reason why binary addition and subtraction can result in overflow.

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..... [1]

6.

The student compresses the file before it is emailed to their teacher as an attachment.

(i) Explain the benefits to the teacher of the attachment being a compressed file.

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..... [3]

(ii) Describe **one** lossless method of compressing a text file.

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..... [3]

7.

(a) A real-time video of a music concert needs to be streamed to subscribers.

Tick (✓) **one** box to identify the most appropriate type of compression **and** justify your answer.

Lossy	Lossless

Justification .....

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..... [3]

(b) Explain the impact of changing the sampling resolution on the accuracy of a sound recording.

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..... [3]

(c) A bitmap image has a resolution of 2048 pixels wide and 1024 pixels high.

The image has a bit depth of 10 bits per pixel.

Estimate the file size of the bitmap image in mebibytes. Show your working.

Working .....

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.....

.....

Estimated file size in mebibytes .....

[2]

8.

A student takes a photograph of a science experiment.

(a) The photograph is saved as a bitmapped image.

(i) Define the following bitmap terms.

Colour depth .....

.....

File header .....

.....

[2]

(ii) Explain why changing the image resolution will affect the image quality and file size.

Image quality .....

.....

.....

File size .....

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[2]

(iii) Identify **one** lossless method of compressing an image.

..... [1]

(b) The student draws a picture on paper that is scanned into the computer and saved as a vector graphic.

Define the vector graphic terms property and drawing list.

Property .....

.....

Drawing list .....

.....

[2]

9.

(a) A character set is used to represent characters in a computer.

Identify **and** describe **one** character set.

Character set .....

Description .....

.....

[2]

(b) The colour of each pixel in a bitmapped image is represented by 8 bits.

(i) State the largest number of different colours that can be represented by 8 bits.

..... [1]

(ii) State **one** drawback of increasing the number of bits that represents each pixel in the bitmap image.

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..... [1]

(iii) A bitmap image can be compressed using lossy compression.

Explain the reasons why lossy compression is often suitable for a bitmap image.

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..... [2]

(c) **(i)** Explain how an analogue sound wave is converted into digital data.

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..... [2]

(ii) Describe **one** method of compressing a sound file using lossy compression.

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..... [2]

10.

(a) Convert the hexadecimal number 1FAB into denary.

Working .....

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.....

Denary value ..... [1]

(b) Explain how to convert the two's complement integer 10011111 into denary. Give the denary value after conversion.

Explanation .....

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Denary value .....

[3]

(c) Describe the difference between a right logical binary shift and a right arithmetic binary shift.

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..... [2]

11.

(a) Draw **one** line from each vector graphic term to its most appropriate description.

Term	Description
drawing list	a component created using a formula
drawing object	defines one characteristic of a component
property	data required to create all components in the graphic

[2]

(b) State what is meant by the **bit depth** of a bitmap image **and** explain how changing the bit depth affects the image.

Definition .....

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Explanation .....

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[3]

(c) Explain why a bitmap image is often compressed before it is attached to an email.

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..... [2]

12.

(a) State **one** difference between a kibibyte and a megabyte.

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..... [1]

(b) **(i)** Convert the denary value into a 12-bit two's complement binary integer.

−196

Answer ..... [1]

(ii) Convert the Binary Coded Decimal (BCD) into denary.

100001100101

Answer ..... [1]

13.

(a) State what is meant by **analogue data**.

..... [1]

(b) Draw **one** line from each term to its most appropriate description.

Term	Description
sampling	the number of samples taken per second
sampling rate	taking measurements at regular intervals and storing the values
sampling resolution	the number of bits used to store each sample

[2]

14.

(a) Describe the impact of increasing the image resolution on the quality of a bitmap graphic.

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..... [2]

(b) Calculate the file size of a bitmap image using the following information:

- image resolution of 2048 pixels wide and 1024 pixels high
- bit depth of 16 bits.

Give your answer in kibibytes. Show your working.

Working .....

.....

.....

.....

.....

Answer in kibibytes .....

[2]

15.

Images are being created to advertise holidays.

Some of the images are bitmap images and some are vector graphics.

(a) Complete the table by defining the image terms.

Term	Definition
Drawing list	....
Pixel	....
Colour depth	....

[3]

(b) The bitmap images are photographs of the holiday locations.

(i) Colour depth and image resolution are both included in the file header of a bitmap image.

Identify **two other** items that could be included in the file header of each photograph.

1 .....

2 .....

[2]

(ii) One of the photographs has a bit depth of 8 bytes and an image resolution of 1500 pixels wide and 3000 pixels high.

Calculate the file size of the photograph in megabytes. Show your working.

Working .....

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.....

.....

File size ..... MB

[2]

(c) The photographs are compressed before they are uploaded to a web server. Customers download the photographs from this web server.

(i) Explain the reasons why compressing the photographs will benefit the customers.

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..... [3]

(ii) An image can be compressed using run-length encoding (RLE).

Explain the reasons why RLE may **not** reduce the file size of a bitmap image. Give **one** example in your answer.

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..... [3]

16.

The computer stores data in binary form.

(i) State the difference between a kibibyte and a kilobyte.

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..... [1]

(ii) Convert the denary number 964 into Binary Coded Decimal (BCD).

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..... [1]

(iii) Convert the positive binary integer 11110010 into hexadecimal.

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..... [1]

(iv) Give the smallest **and** largest two's complement binary number that can be represented using 8 bits.

Smallest .....

Largest .....
[2]

(v) Add the following two binary integers using binary addition. Show your working.

```
  10110000
+ 00011011
```

[2]

(vi) Show the result of a 3-place right logical shift on the binary number:

11001100

..... [1]