



5.6 Representing images, sound and more part 2

Name: _____

Class: _____

Date: _____

Time: **97 minutes**

Marks: **64 marks**

Comments:

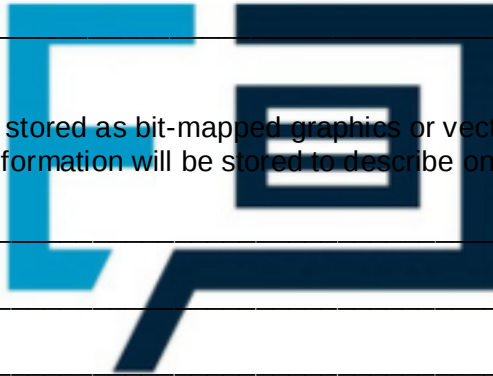
Q1.

Computer systems store not just information representing numbers and characters, but also sounds and images.

- (a) A microphone converts sound into an electrical signal which may be recorded.
- (i) Explain how the electrical signal from the microphone is converted into a form which can be stored in a computer system.

(3)

- (ii) What piece of hardware is required to convert the digitally recorded sound before it is amplified and played back through speakers?



(1)

- (b) Images can be stored as bit-mapped graphics or vector graphics. If vector graphics is used, what information will be stored to describe one straight line?

(2)

EXAM PAPERS PRACTICE (Total 6 marks)

Q2.

A recent government white paper proposes a national identity (ID) card scheme backed by a central national database for all citizens who are legally resident in the UK.

- (a) Describe **two** different ways that basic information such as *name*, *address* and *unique personal number* could be recorded on an identity card in machine-readable form.

1.

2.

(2)

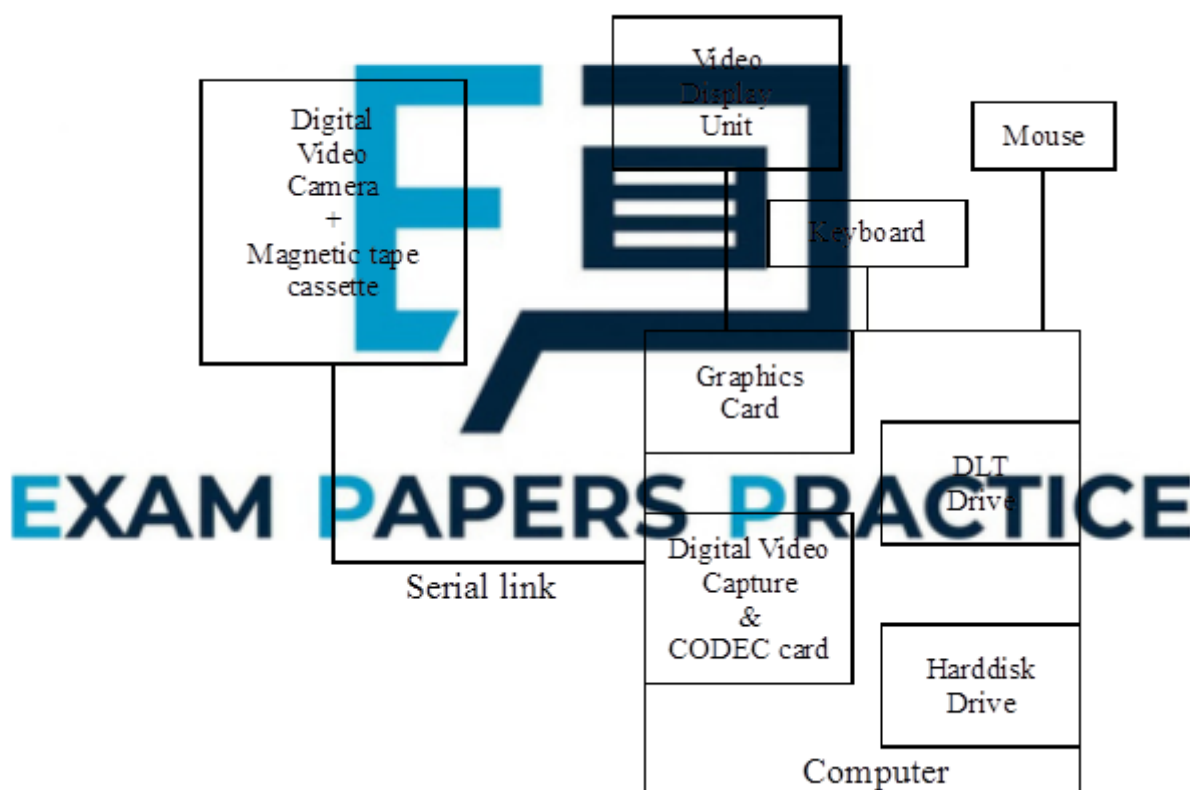
- (b) If an identity card containing just the basic information mentioned in part (a) was stolen, it would be easy for someone to use another person's identity. Describe **one**

way that the proposed scheme – ID card, card reader and central database - could be improved to make it much harder for someone to pass as someone else.

(2)
(Total 4 marks)

Q3.

The diagram below shows part of a video editing computer system. The digital video camera records video and audio onto magnetic tape cassette using a digital format called **DV**. When the video camera is set to play mode the video and audio data are retrieved from the magnetic tape cassette at a rate of 3.6 Megabytes per second (MB/s). The storage capacity of a DV tape is 13 Gigabytes (GB).



The table below shows typical characteristics of four storage media, DLT magnetic tape, magnetic hard disk, Compact Disk-Recordable, Digital Versatile Disk-Recordable.

Medium	Data Transfer Rate Megabytes per second	Storage Capacity Gigabytes
Digital Linear Tape (DLT)	6	40
Magnetic Hard Disk	100	30

CD-R	0.176	0.635
DVD-R	1.25	4.37

- (a) Which of the four media shown in the table is most suitable for storing the video and audio data stream obtained by the computer from the video camera in real time, without compression, so that the data can be accessed for editing purposes using random access? Justify your answer.

Medium: _____

Justification: _____

(2)

- (b) A CODEC (Coder-Decoder) is often used to compress (and decompress) video and audio data.

- (i) On some video-capture and editing systems the CODEC is entirely software-based whereas in others the CODEC is implemented in hardware and software on a plug-in board. Why is the hardware and software CODEC preferred to the software only CODEC?

(1)

- (ii) Why must a CODEC be used if a movie from the video camera is to be stored on DVD-R?

EXAM PAPERS PRACTICE

(1)

- (c) What purpose might the DLT drive be used for?

(1)

(Total 5 marks)

Q4.

In vector graphics the type, dimension and position of every graphic element making up an image are recorded, such as the start and end points, the thickness and colour of a line.

- (a) How is a colour image represented in bit-mapped graphics?

(2)

- (b) Give **one** advantage of vector graphics over bit-mapped graphics.

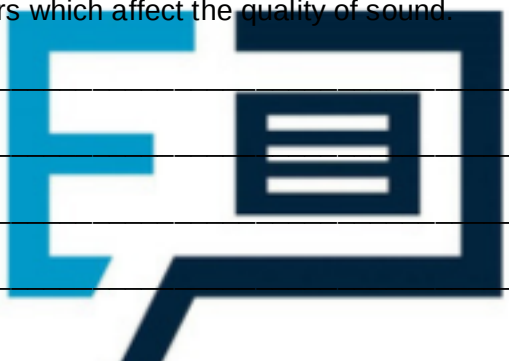
(1)

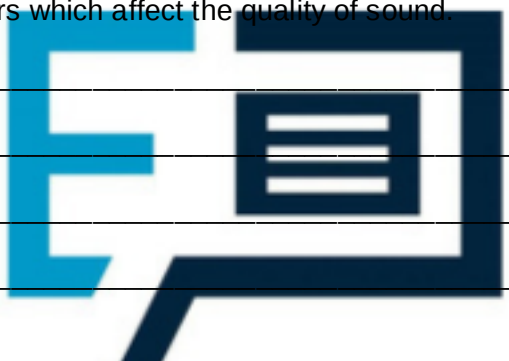
(Total 3 marks)

Q5.

Traditionally, sound was recorded in analogue form, such as on vinyl records. For digital audio systems, the signals received from the microphone are sampled and the measurement of the amplitude can be stored as digital data. To reproduce the sound, the digital data is fed through a digital-to-analogue converter.

- (a) Give **two** factors which affect the quality of sound.

1. 

2. 

(2)

- (b) What is possible when using the digital method of representing sound that could **not** be done with the sound recorded in analogue form?

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(1)

- (c) What is sound synthesis?

(1)

(Total 4 marks)

Q6.

E-mail may be more easily intercepted and altered than paper mail without the knowledge of either the sender or the recipient.

- (a) Give **one** reason that supports **this** statement.

(1)

- (b) A single shared key system to encrypt and decrypt messages is not generally used for encrypted mail sent across the Internet. Instead, a two key system is used consisting of:

- A *public* key, which is made publicly available.
- A *private* key which is held only by its owner and should never be publicly enclosed.

- (i) How is this two-key system used to encrypt and decrypt e-mails?

(2)

- (ii) Holders of a digital certificate can digitally sign an e-mail to prove its origin and authenticity. How is this two-key public/private key system used to digitally sign an e-mail?

(2)

(Total 5 marks)

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Q7.

Bit patterns can be interpreted in a number of different ways. A computer word contains the bit pattern 0011 0110.

- (a) What is its decimal value if it represents a pure binary integer

(1)

- (b) (i) The ASCII value for the character '2' is 50. What is the character stored in the computer word 0011 0100?

(2)

- (ii) Name **one** other standard coding system for coding information expressed in character or text-based form.

(1)

(c) One method of storing graphics in a computer system is as vector graphics.

(i) Name **one** other method.

(1)

(ii) Describe how a black-and-white image would be stored using your method.

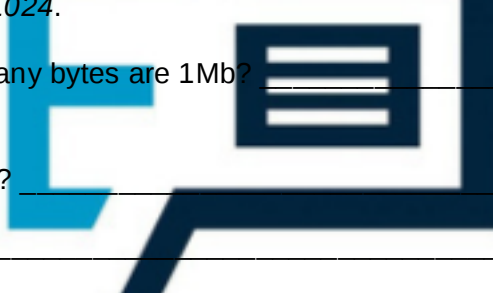
(2)

(Total 7 marks)

Q8.

Video RAM (VRAM) is separate memory on the graphics card, into which the processor writes screen data which are then read to the screen for display. A computer has a colour monitor and 1Mb (Megabytes) of VRAM, and its screen display has been set to a resolution of 1024×1024 .

(a) Exactly how many bytes are 1Mb?



(1)

(b) What is a pixel?

(1)

(c) (i) What does a resolution of 1024×1024 mean?

EXAM PAPERS PRACTICE

(1)

(ii) How many bytes would be available to represent each pixel in the above computer system?

(1)

(iii) How many colours can this computer system display? _____

(1)

(Total 5 marks)

Q9.

To convert sound into a form which can be stored in a computer system, a device called an A-to-D converter is required.

- (a) What type of signal is sound?

_____ (1)

- (b) What does an A-to-D converter do?

(1)
(Total 2 marks)

Q10.

In some countries government agencies routinely monitor the content of e-mail routed over the Internet.

- (a) Give **two** reasons why some governments may allow this to happen.

1. _____ (1)

2. _____ (1)

- (b) Suggest **one** way in which an individual may make it difficult for any such agency to read the content of a particular e-mail sent over the Internet.

EXAM PAPERS PRACTICE (1)
(Total 3 marks)

Q11.

Computer systems store not just information representing numbers and characters. Sound and graphics are also frequently stored.

- (a) When sound from a microphone is recorded, how is it converted into a form which can be stored in a computer system?

_____ (2)

- (b) (i) How can a black and white image be represented as a bit-mapped graphic?

(2)

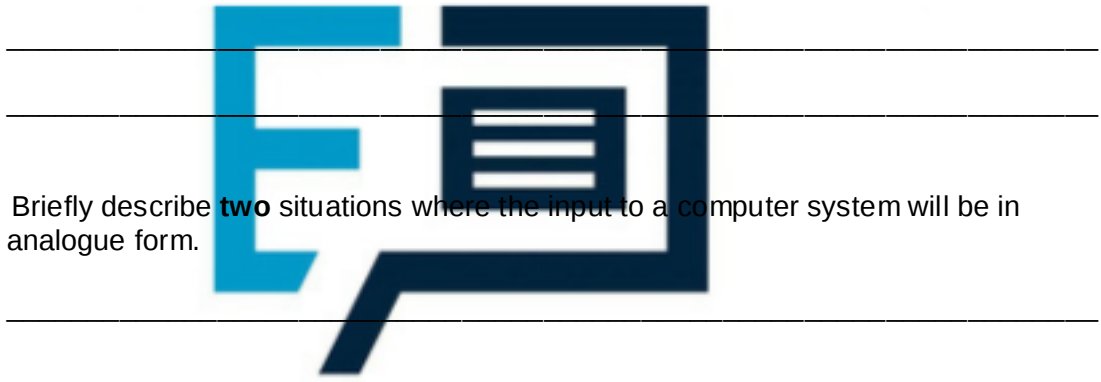
- (ii) What change needs to be made to (b) (i) to represent a coloured image?

(1)

(Total 5 marks)

Q12.

- (a) What is the difference between analogue and digital signals?



(2)

- (b) Briefly describe **two** situations where the input to a computer system will be in analogue form.

EXAM PAPERS PRACTICE

(2)

(Total 4 marks)

Q13.

Data may be recorded as *analogue* or *digital* signals.

- (a) Explain or show by diagram the difference between analogue and digital signals.

(2)

A computer system programmed in an object-oriented language is capable of displaying time in both analogue and digital form.

Three classes have been identified.

Clock

Digital Clock

Analogue Clock

The classes Digital Clock and Analogue Clock are related by single inheritance to the class Clock.

(b) In object-oriented programming what is meant by:

(i) class;



(1)

(ii) inheritance?

(1)

EXAM PAPERS PRACTICE

(c) Draw an inheritance diagram for the given classes.

(3)

(Total 7 marks)

Q14.

A particular location in computer memory holds 32 bits.

(a) Give **three** different interpretations that may be associated with this pattern of bits.

1. _____

2. _____

3. _____

(3)

(b) How does the computer “decide” which interpretation to use?

(1)

(Total 4 marks)



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