OCR
Oxford Cambridge and RSA

# Monday 16 May 2022 – Afternoon

## GCSE (9–1) Computer Science

**J277/01** Computer Systems

**Time allowed: 1 hour 30 minutes**

**Do not use:**
- a calculator

*J277701*

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

**INSTRUCTIONS**
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.

**INFORMATION**
- The total mark for this paper is **80**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has **16** pages.

**ADVICE**
- Read each question carefully before you start your answer.

Answer **all** the questions.

**1** Computers represent data in binary form.

**(a)** Tick (✓) **one** box in each row to identify the binary unit equivalent of each of the given file sizes.

| File size | 2 megabytes | 2 petabytes | 2 kilobytes | 2 bytes | 2 gigabytes |
|---|---|---|---|---|---|
| 2000 bytes | | | | | |
| 2000 terabytes | | | | | |
| 16 bits | | | | | |
| 4 nibbles | | | | | |

**[4]**

**(b)** Convert the denary number 221 into 8 bit binary. Show your working.

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..... **[2]**

**(c)** Convert the hexadecimal number 2F into denary. Show your working.

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..... **[2]**

**(d)** Convert the binary number 10110000 into hexadecimal.

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..... **[1]**

**(e)** Identify how many unique values can be represented by 4 bits.

..... **[1]**

**(f)** Perform a binary shift of 3 places right on the binary number 10001110.

..... **[1]**

**2** Complete the table by writing the missing definition or name of each of the common CPU components and registers.

| CPU component or register | Definition |
|---|---|
| | Stores the address of the next instruction to be fetched from memory. Increments during each fetch-execute cycle. |
| CU (Control Unit) | |
| | Stores the address of the data to be fetched from or the address where the data is to be stored. |
| | Performs mathematical calculations and logical operations. |

**[4]**

**3** A library has a LAN (Local Area Network).

**(a)** The LAN allows access by both wired and wireless devices.

Users have reported that the network sometimes runs very slowly.

**(i)** Explain why the number of devices using the network at the same time can affect the performance of the network.

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..... **[3]**

**(ii)** Identify **one** other factor that can affect the performance of the network.

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..... **[1]**

**(b)** Users can access websites from the library computers.

Complete the description of accessing websites using the given list of terms. Not all terms will be used.

0 1 127 128 255 256 Colon

Domain Name Server Embedded systems File server Full stop

Hyphen Internet protocol MAC address Router

Uniform Resource Locator Web server Clients

A website is hosted on a ..... . The computers that access the websites are called ..... .

The user enters the ..... into a web browser. The web browser sends a request to the ..... for the matching IP (Internet Protocol) address. If found the IP address is returned. A request is then sent to this IP address.

An IPv4 address is made of 4 groups of digits. Each group can be between the denary values ..... and ..... . The groups of digits are separated by a ..... .

**[7]**

**(c)** The wired connection is an Ethernet connection. Ethernet is considered a standard.

Explain why Ethernet is a standard.

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..... **[2]**

**(d)** The network has several routers.

Identify **three** tasks carried out by a router.

1 .....

.....

2 .....

.....

3 .....

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**[3]**

**(e)** The library does not use encryption when data is transmitted through the network.

Give **two** reasons why the library should use encryption.

1 .....

.....

2 .....

.....

**[2]**

**(f)** Protocols are used to transmit data through the network and over the internet.

Identify **one** protocol that can be used to perform each of the following tasks:

Send an email .....

Access a website securely .....

**[2]**

**4*** Social networking websites use artificial intelligence (AI) to monitor posts from users.

Discuss the positive and negative uses of AI by social networking websites including:

- Legal issues
- Ethical issues
- Privacy issues

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..... **[8]**

**5** A software development company wants to protect their computer systems and data from unauthorised access.

**(a)** Identify **two** methods of physical security that the company could use to protect their computer systems.

1 .....

.....

2 .....

.....

**[2]**

**(b)** Identify **and** describe **two** software-based security methods that the company can use to protect their computer systems and data.

Method 1 .....

Description .....

.....

.....

.....

Method 2 .....

Description .....

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**[6]**

**(c)** Tick (✓) **one** box on each row to identify the legislation that would cover each of the given events.

| Event | The Data Protection Act (2018) | Computer Misuse Act (1990) | Copyright Designs and Patents Act (1988) |
|---|---|---|---|
| A company transmits personal data to another company without the individual's permission. | | | |
| A school accidentally publishes their students' addresses on the school website. | | | |
| The interface for a piece of software is replicated by a rival company. | | | |
| A user leaves a computer logged on and another person leaves them a message on their desktop. | | | |
| A student guesses their teacher's password and accesses their computer account. | | | |

**[5]**

**6** A student is creating a range of documents for a school project.

**(a)** The student records a podcast about computer science.

**(i)** Describe how an analogue sound wave is converted into digital form.

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..... **[3]**

**(ii)** Tick (✓) **one or more** boxes on each row to identify the effect(s) that each change will have on the sound file.

| Change | File size increases | File size decreases | Accuracy increases | Accuracy decreases |
|---|---|---|---|---|
| Duration changes from 10 minutes to 20 minutes | | | | |
| Sample rate changes from 44 kilohertz to 8 kilohertz | | | | |
| Bit depth changes from 8 bits to 16 bits | | | | |

**[3]**

**(b)** The student writes a report about volcanoes.

**(i)** The computer stores text using the ASCII character set.

Part of the ASCII character set is shown:

| Character | ASCII denary code |
|---|---|
| M | 77 |
| N | 78 |
| O | 79 |
| P | 80 |
| Q | 81 |

Identify the character that will be represented by the ASCII denary code 84.

..... **[1]**

**(ii)** Identify a second character set.

..... **[1]**

**(c)** The student takes a photograph of their science experiment. The image file includes metadata.

Identify **three** pieces of metadata that is often stored with an image.

1 .....

2 .....

3 .....

**[3]**

**(d)** The student compresses all their documents before emailing them to their teacher.

**(i)** Give **two** benefits of compressing the data before it is emailed.

1 .....

.....

2 .....

.....

**[2]**

**(ii)** Explain why lossy compression may **not** be appropriate to compress all of the student's files.

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..... **[2]**

**7** A smart television allows the user to search the Internet and watch videos online.

**(a)** The smart television has both RAM and ROM.

**(i)** State the difference between RAM and ROM.

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..... **[1]**

**(ii)** Give **two** examples of data that the smart television could store in RAM.

1 .....

2 .....

**[2]**

**(b)** The smart television has secondary storage.

**(i)** State, using an example, why the smart television needs secondary storage.

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..... **[2]**

**(ii)** Identify **one** appropriate type of secondary storage for the smart television. Justify your choice.

Secondary storage type .....

Justification .....

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**[4]**

**END OF QUESTION PAPER**

## ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).