OCR
Oxford Cambridge and RSA

# Wednesday 15 May 2024 – Afternoon

## GCSE (9–1) Computer Science

**J277/01** Computer Systems

**Time allowed: 1 hour 30 minutes**

**Do not use:**
- a calculator

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.

**1**

**(a)** The following table has either the binary or denary value of 3 numbers.

Complete the table by converting the 8-bit binary number into denary and the denary number into 8-bit binary.

| 8-bit Binary | Denary |
|---|---|
| 11110000 | |
| | 105 |
| 00011110 | |

**[3]**

**(b)** Complete the table by writing the answer to each statement.

| Statement | Answer |
|---|---|
| The smallest denary number that can be represented by a 4-bit binary number | |
| The largest denary number that can be represented by a 6-bit binary number | |
| The maximum number of different colours that can be represented with a colour depth of 7-bits | |
| The minimum number of bits needed to represent 150 different characters in a character set | |

**[4]**

**(c)** Show the result of a left binary shift of 4 places on the binary number 00001111.

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

**(d)** Describe how to convert a 2-digit hexadecimal number into denary.

Use an example in your answer.

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.....

.....

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.....

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

**(e)** Add these two 8-bit binary numbers using binary addition.

Show your working out.

```
  0 1 1 0 1 0 1 1
+ 0 0 0 0 1 1 1 1
-----------------
```

**[2]**

**2** An airport has computers that are connected together on a Local Area Network (LAN).

**(a)** Each computer has an IP address and a MAC address.

**(i)** Give **one valid** example of an IPv4 address and **one valid** example of an IPv6 address.

IPv4 .....

.....

IPv6 .....

.....

**[2]**

**(ii)** Describe the format of a MAC address.

.....

.....

.....

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

**(b)** The airport currently has wired connections in their Local Area Network.

**(i)** Describe **two** benefits to the airport of using wired connections in their network.

1 .....

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2 .....

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**[4]**

**(ii)** Explain the reasons why the airport should also allow the network to be accessed using a wireless connection.

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

**(c)** One office in the airport has five computers connected to one switch. There are two printers in the office that can be accessed by all computers.

The computers are connected using a star topology.

**(i)** Draw a diagram to show how the five computers, switch and two printers are connected in a star topology.

**[3]**

**(ii)** Give **one** benefit and **one** drawback of the office using a star topology instead of a mesh topology.

Benefit .....

.....

Drawback .....

.....

**[2]**

**(iii)** Describe the role of the switch in the star topology.

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

**3** A computer has an operating system and utility software.

**(a)** The table contains operating system functions and a task that each function performs.

Complete the table by writing the two missing function names and a task performed by the two given functions.

| Function | Task |
|---|---|
| | Moves data from secondary storage to RAM |
| Peripheral management | |
| | Allows the user to create, name and delete folders |
| User interface | |

**[4]**

**(b)** Complete the description of utility system software using the words provided in the box. Not all words are used.

| | | | | |
|---|---|---|---|---|
| access | amount | apart | compression | consecutive |
| defragmentation | deleted | encryption | key | lock |
| quantity | separate | speed | understood | |

..... software changes data using a ..... . If the changed data is intercepted, it cannot be ..... . This software does not stop the data from being intercepted.

..... software analyses the data on a disk to find files that have been split and stored in separate locations. The split files are moved to be ..... in storage and the free space is moved together. This does not provide more storage space on the disk, instead it makes the ..... of the data faster because the read head does not have to move as far to access the next part of the file.

**[6]**

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**PLEASE DO NOT WRITE ON THIS PAGE**

**4*** A computer programmer has developed a computer game that they want to release for users to download over the internet. The programmer needs to decide whether to release the game as open source or proprietary software.

Discuss the features, benefits and drawbacks of each type of licence for this program and make a recommendation to the programmer.

You should include the following in your answer:
- features of each licence
- legal and ethical issues of each licence
- benefits and drawbacks of each licence. **[8]**

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**5** A musician uses a computer to make and record music.

**(a)**

**(i)** Tick (✓) **one** box to identify the correct description of sound sampling.

- ☐ The frequency of the wave is measured a set number of times each second.
- ☐ The amplitude of the wave is measured at set intervals.
- ☐ The digital sound wave is measured a set number of times each second.
- ☐ The analogue sound wave's resolution is measured at set intervals.

**[1]**

**(ii)** Explain how changing the bit depth will affect the sound file.

.....

.....

.....

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

**(b)** The musician has run out of storage space on their secondary storage device and needs to buy a replacement.

**(i)** Identify whether the musician should buy a magnetic secondary storage device or a solid state secondary storage device for their computer.

Justify your choice.

Type .....

Justification .....

.....

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.....

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**[4]**

**(ii)** Identify **one other** type of secondary storage.

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

**(iii)** Tick (✓) **one** box to identify the smallest secondary storage capacity.

- ☐ 2.1 GB
- ☐ 300 MB
- ☐ 200 000 KB
- ☐ 0.0021 TB

**[1]**

**(iv)** The musician's recordings have an average (mean) file size of 3 MB. The musician has 1000 recordings.

Calculate an estimate of the storage space in GB that the 1000 files will require, assuming they are each 3 MB in size. Show your working out.

Working space:

Answer: ..... GB **[2]**

**6** A computer has a Central Processing Unit (CPU).

**(a)** Describe what happens during the fetch-execute cycle.

.....

.....

.....

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

**(b)** Complete the table by writing the name of **two** registers used in the fetch-execute cycle **and** the purpose of each register.

| Register | Purpose |
|---|---|
| | |
| | |

**[4]**

**(c)** Give **three** characteristics of a CPU that can affect its performance.

1 .....

2 .....

3 .....

**[3]**

**7** A car has a 'Follow Me' system that uses a cruise control feature to allow the car to follow the car in front of it. It will keep the same speed and distance without the driver's intervention. The cruise control system is an example of an embedded system.

**(a)** Explain the reasons why the 'Follow Me' system is an example of an embedded system.

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.....

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

**(b)** The car's system has Read Only Memory (ROM) and Random Access Memory (RAM).

**(i)** State **two** items that will be stored in the ROM for the 'Follow Me' system.

1 .....

2 .....

**[2]**

**(ii)** The RAM will store currently running data and instructions.

State **three** items of data that will be stored in the RAM for the 'Follow Me' system.

1 .....

2 .....

3 .....

**[3]**

**(iii)** Explain why the 'Follow Me' system does not need virtual memory.

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

**END OF QUESTION PAPER**

## EXTRA ANSWER SPACE

If you need extra space use these lined pages. You must write the question numbers clearly in the margin.