Modified Enlarged 36pt

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Friday 19 May 2023 – Afternoon

GCSE (9–1) Computer Science

J277/01 Computer Systems
Time allowed: 1 hour 30 minutes
plus your additional time allowance

DO NOT USE:
a calculator

Please write clearly in black ink.

Centre number ☐☐☐☐☐

Candidate number ☐☐☐☐

First name(s) _____

Last name _____

READ INSTRUCTIONS OVERLEAF

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 (*).

ADVICE

Read each question carefully before you start your answer.

1   Computers represent data in binary form.

(a) Tick (✓) ONE box to identify the statement about binary that is true. [1]

☐   Binary digits can only be the values 0, 1 and 2

☐   The left-most bit of a binary integer has the smallest value

☐   Binary is used because computers are made of switches that can only be on or off

☐   The smallest whole number that can be stored in 8 bits is the number 1

(b) Complete the table by writing the missing denary, 8-bit binary or hexadecimal values. [4]

Denary	8-bit binary	Hexadecimal
	00000111	7
49		31
	01100110	66
244	11110100	

(c) Tick (✓) ONE box to identify the largest file size. [1]

☐ 2 000 000 bytes

☐ 2300 KB

☐ 200 MB

☐ 0.1 GB

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(d) Tick (✓) TWO boxes to identify the two file sizes that are equal to each other. [1]

☐ 4 500 000 bytes

☐ 450 KB

☐ 4.5 MB

☐ 0.45 GB

(e) Complete the binary addition by adding these two 8-bit binary numbers. [2]

Show all your working.

```
    0  1  1  1  0  0  0  1
+   1  0  0  1  1  1  1  0
_____
```

(f) Identify the binary shift that has been applied to the 8-bit binary number 10110000 to get the result 10000000.

_____

_____ [2]

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2 A student is performing a range of actions on the internet using their computer.

(a) A range of protocols are used for the transmission of data by the student's computer, and the web servers they are accessing.

(i) Complete the table by identifying the most appropriate protocol for each of the tasks the student is performing. [4]

Task	Protocol
Requesting to view a news webpage from a web server	
Entering a username and password to access their bank account	
Downloading a text document from a web server	
Checking for new emails in their inbox	

(ii) Some protocols have layers.

Give TWO reasons why protocols have layers.

1 _____

_____

2 _____

_____

[2]

(b) The student's computer is part of their home Local Area Network (LAN). The LAN currently only has wired connections.

(i) One characteristic of a LAN is that they are set up over a small geographical area.

Give ONE other characteristic of a LAN.

_____

_____ **[1]**

(ii) **Describe the benefits of the student changing their home LAN to include wireless connections.**

_____

_____

_____

_____

_____

_____

_____ **[4]**

(iii) **State TWO drawbacks of changing their home LAN to include wireless connections.**

1 _____

_____

2 _____

_____

[2]

3 Binary numbers can represent different forms of data.

(a) One form of data is characters.

Complete the description of how computers represent characters in binary using the given list of terms. Not all terms will be used. [5]

2	4	8
9	16	32
256	71	72
74	76	78
80	81	
all	different	identical
one	repeated	similar
some	unique	

A character set stores

_____ of the characters

that the computer can represent. Each

character is given a _____

binary code. Lower-case and upper-case

letters in a character set are given

_____ binary codes.

One example of a character set

is ASCII. This character set uses

_____ bits for each

character. If the code value for the

character 'F' is 70 then the code value for

the character 'L' is _____ .

(b) Binary numbers can also represent images.

The table shows the colours that are used in an image and the binary value for each colour.

Colour	Binary value
Red	0000
Green	0010
Blue	1000
Purple	0110

The metadata states that the image is 3 pixels wide by 4 pixels high.

The data in the file starts in the top left of the image and goes from left-to-right, top-to-bottom.

(i) **State what is meant by METADATA in an image file.**

_____

_____ **[1]**

(ii) **The binary data stored for the image is given:**

00000000011010000010100001100110011000000101000

A grid is given for the image. Each square is one pixel.

Write the name of the colour in each square that the pixel will show for this image. [2]

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(iii) A colour depth of 4 is used. This means 4 bits are used to store the colour for each pixel.

State the maximum number of different colours that can be represented in 4-bits.

_____ [1]

(iv) The colour depth is increased to 2 bytes.

State TWO effects that this change can have on the image.

1 _____

_____

2 _____

_____

[2]

(c) **A student has a text document and an image file that need to be compressed separately.**

The student needs to reduce the file size of both of these files as much as possible.

(i) **Identify the most suitable type of compression for the TEXT document. Justify your choice.**

Type of compression _____

Justification _____

_____

_____

_____

[3]

(ii) **Identify the most suitable type of compression for the IMAGE file. Justify your choice.**

Type of compression _____

Justification _____

_____

_____

_____

[3]

4 **(a)** **Tick (✓) ONE OR MORE boxes on each row to identify all of the methods that can help to prevent each threat. [4]**

Threat	Anti-malware	Penetration testing	Encryption	Firewall
Spyware				
Brute-force attack				
Data interception				
SQL injection				

(b) Name AND describe ONE threat to a computer system that is not given in QUESTION 4(a).

Threat _____

Description _____

_____

_____

_____

[3]

5 An artist has a computer that they use to create images.

Their computer has both hardware and software.

(a) The hardware includes primary and secondary storage.

   (i) Explain why a computer needs both primary AND secondary storage.

_____

_____

_____

_____ **[2]**

(ii) Give ONE example of a secondary storage device that the artist's computer will have AND an example of the data that will be stored on it.

Secondary storage device

_____

Example data _____

_____

[2]

(iii) The computer has Virtual Memory (VM).

The table has four statements about VM. Not all of the statements are correct.

Tick (✓) the TRUE column for the statements that are correct.

Re-write any statement that is incorrect in the FALSE column by changing the statement to make it true. [4]

Statement	True (✓)	False – rewrite the statement to make it true
A section of primary storage is partitioned to act as virtual memory		
Data from ROM is transferred into VM		
VM is needed when RAM is full, or nearly full		
Data from VM is transferred back to secondary storage when needed		

(b) The computer has an operating system and utility software.

State the need for utility software in a computer.

_____

_____ [1]

(c) The artist uploads images to be displayed on a website. This is a client-server relationship.

 (i) Identify the computer that is acting as the client in this scenario AND justify your choice.

Client computer _____

Justification _____

_____

_____

_____

[3]

(ii) **Identify the computer that is acting as the server in this scenario AND justify your choice.**

Server computer _____

Justification _____

_____

_____

_____

[3]

(d) The artist is working with a programmer on the development of a new piece of software.

The software will allow users to edit images on devices such as mobile telephones.

They are considering releasing the software as open source instead of proprietary.

(i) Describe TWO benefits to the artist and programmer of releasing the software as proprietary. [4]

1 _____

_____

_____

_____

2 _____

_____

_____

_____

(ii) **Describe ONE benefit to the users of releasing the software as open source.**

_____

_____

_____

_____ **[2]**

6* **A shopping centre has a security system that includes CCTV cameras to record activities in the centre. The security system is being upgraded to include the use of facial recognition to identify, track the movements of and record individuals throughout the shopping centre.**

Discuss the positive and negative impacts of this upgrade including:
ethical issues
privacy issues
legal issues [8]

_____

_____

_____

_____

_____

_____

7 A car comes with many embedded systems, for example parking sensors.

Identify ONE other embedded system that could be found in a car and explain why this is an embedded system.

Example embedded system

_____

Explanation _____

_____

_____

_____

[3]

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).

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