Please write clearly, in BLOCK CAPITALS and black ink

Centre number Candidate number

Forename(s)

Surname

Date of Exam Time allowed: 1 hour 45 minutes

GCSE Computer Science

Paper 2: Computing concepts

Total Marks

PAPER 2A

Instructions

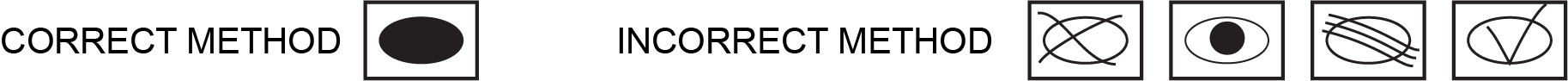
* Write in black ink or black ball-point pen. Use pencil only for drawing.
* Write your answer to each question in the space provided
* Answer all questions
* Do all rough work in this book
* Cross through any work you do not want marked
* **You are not allowed to use a calculator**

Information

* The total mark for this paper is **90**
* The student version of this paper has **18** pages

**Advice**

* For multiple-choice questions, completely fill in the lozenge next to the answer you want to select.



* Icon

  Description automatically generatedTo change your answer, cross out your original answer like this: Icon

  Description automatically generated
* If you want to go back to an answer you previously crossed out, circle the answer you now want to select like this:

**Answer ALL questions.**

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **1** | **.** | **1** |

Convert the decimal number 139 into binary.

[1 mark]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **1** | **.** | **2** |

Convert the decimal number 139 into hexadecimal.

[2 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **1** | **.** | **3** |

Explain why hexadecimal is often used in Computer Science.

[2 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **1** | **.** | **4** |

Shade **one** lozenge to indicate which unit prefix is the largest.

[1 mark]

|  |  |  |
| --- | --- | --- |
| **A** | giga | Icon  Description automatically generated |
| **B** | kilo |  |
| **C** | mega | Icon  Description automatically generated |
| **D** | tera |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **1** | **.** | **5** |

Calculate the result of adding the following three binary numbers together.

0 1 1 0 0 0 1 0 +  
0 0 0 1 1 0 0 1 +  
0 1 0 1 0 0 1 0 \_

[2 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **1** | **.** | **6** |

Explain the effect of applying a right shift to a binary number.

[2 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **1** | **.** | **7** |

The ASCII code for ‘A’ is represented by the number 65.

Shade **one** lozenge to indicate the number that represents ‘A’ in Unicode.

[1 mark]

|  |  |  |
| --- | --- | --- |
| **A** | 1 | Icon  Description automatically generated |
| **B** | 26 |  |
| **C** | 65 |  |
| **D** | 91 |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **2** |  |  |

A digital camera takes images with a colour depth of 24 bits per pixel. Both the width and height of the image is 1000 pixels.

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **2** | **.** | **1** |

Calculate, in megabytes, the file size of one image taken by the digital camera. Show your working.

[3 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **2** | **.** | **2** |

The company that makes the digital camera has released a new camera. It allows photos to be taken with a higher colour depth.

State the effect on file size of upgrading to the camera with a higher colour depth.

[1 mark]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **2** | **.** | **3** |

The following table shows the layout of pixels in a black and white image.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Give the binary representation of this image.

[2 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **2** | **.** | **4** |

The new camera has the ability to compress the photos that it takes.

Explain why it is desirable for the digital camera to be able to compress the data for the photos they take.

[2 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **2** | **.** | **5** |

The camera stores the following data:

0001111110011111001

State the result of compressing the data using run length encoding (RLE).

[2 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **3** | **.** | **1** |

Define the terms hardware and software.

[2 marks]

Hardware:

Software:

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **3** | **.** | **2** |

Give the name of the logic gate shown in **Figure 1**.

[1 mark]



**Figure 1**

Look at the following logic circuit in **Figure 2**.



**P**

**Figure 2**

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **3** | **.** | **3** |

Complete the truth table for the logic circuit in **Figure 2**. Spare columns have been provided for your working.

[3 marks]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A | B | C |  |  | P |
| 0 | 0 | 0 |  |  |  |
| 0 | 0 | 1 |  |  |  |
| 0 | 1 | 0 |  |  |  |
| 0 | 1 | 1 |  |  |  |
| 1 | 0 | 0 |  |  |  |
| 1 | 0 | 1 |  |  |  |
| 1 | 1 | 0 |  |  |  |
| 1 | 1 | 1 |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **3** | **.** | **4** |



Give an expression for the circuit in **Figure 2**.

[3 marks]

**P =**

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **4** | **.** | **1** |

Describe the **three** stages of the fetch-execute cycle.

[4 marks]

A CPU has a clock speed of 2 GHz and two processor cores.

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **4** | **.** | **2** |

State the effect of replacing the processor to one that still has two processor cores but has a clock speed of 4 GHz.

[1 mark]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **4** | **.** | **3** |

A different computer has a processor with the same clock speed and four processor cores. However, when a user runs a particular program, they find that it runs no faster.

Explain how this is possible.

[2 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **4** | **.** | **4** |

Shade **one** lozenge to indicate the purpose of the arithmetic logic unit on a CPU.

[1 mark]

|  |  |  |
| --- | --- | --- |
| **A** | directs the operation of the processor | Icon  Description automatically generated |
| **B** | fetch data from RAM |  |
| **C** | perform calculations such as addition and multiplication |  |
| **D** | store data in RAM |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **4** | **.** | **5** |

Shade **one** lozenge to indicate the component that is the fastest to read or write data to.

[1 mark]

|  |  |  |
| --- | --- | --- |
| **A** | Cache | Icon  Description automatically generated |
| **B** | Solid state hard drive |  |
| **C** | RAM |  |
| **D** | Register |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **4** | **.** | **6** |

ROM is non-volatile. Explain the term non-volatile.

[2 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **4** | **.** | **7** |

A computer makes use of a magnetic hard disk for secondary storage.

Describe how data is stored and retrieved from a magnetic hard disk.

[3 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **4** | **.** | **8** |

Explain **one** advantage of cloud storage when compared to local storage.

[2 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **5** | **.** | **1** |

The table below shows two different types of software.

Complete the table to give **two** examples of each type of software.

[4 marks]

|  |  |
| --- | --- |
| **Application software** | **System software** |
|  |  |
|  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **5** | **.** | **2** |

An operating system is responsible for managing the applications and security of a system.

State **two** other parts of a computer system that an operating system handles.

[2 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **6** | **.** | **1** |

The program in **Figure 3** shows computer code.

**Figure 3**

MOV R0, #7  
MOV R1, #8  
ADD R2, R0, R1  
MOV #9, R2

Shade **one** lozenge to indicate the type of language that has been used.

[1 mark]

|  |  |  |
| --- | --- | --- |
| **A** | A high-level language | Icon  Description automatically generated |
| **B** | Assembly language |  |
| **C** | Machine code |  |
| **D** | Structured Query Language (SQL) |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **6** | **.** | **2** |

Some languages, such as Python, need to be interpreted.

Shade **one** lozenge to indicate an advantage of using an interpreted language.

[1 mark]

|  |  |  |
| --- | --- | --- |
| **A** | It is easier to learn an interpreted language | Icon  Description automatically generated |
| **B** | The programming code can be run on any computer architecture that has an interpreter available |  |
| **C** | The program will run faster |  |
| **D** | It is harder to learn an interpreted language |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **7** | **.** | **1** |

A driver of a car connects their smartphone to the in-car entertainment system using Bluetooth.

State the type of network they have created.

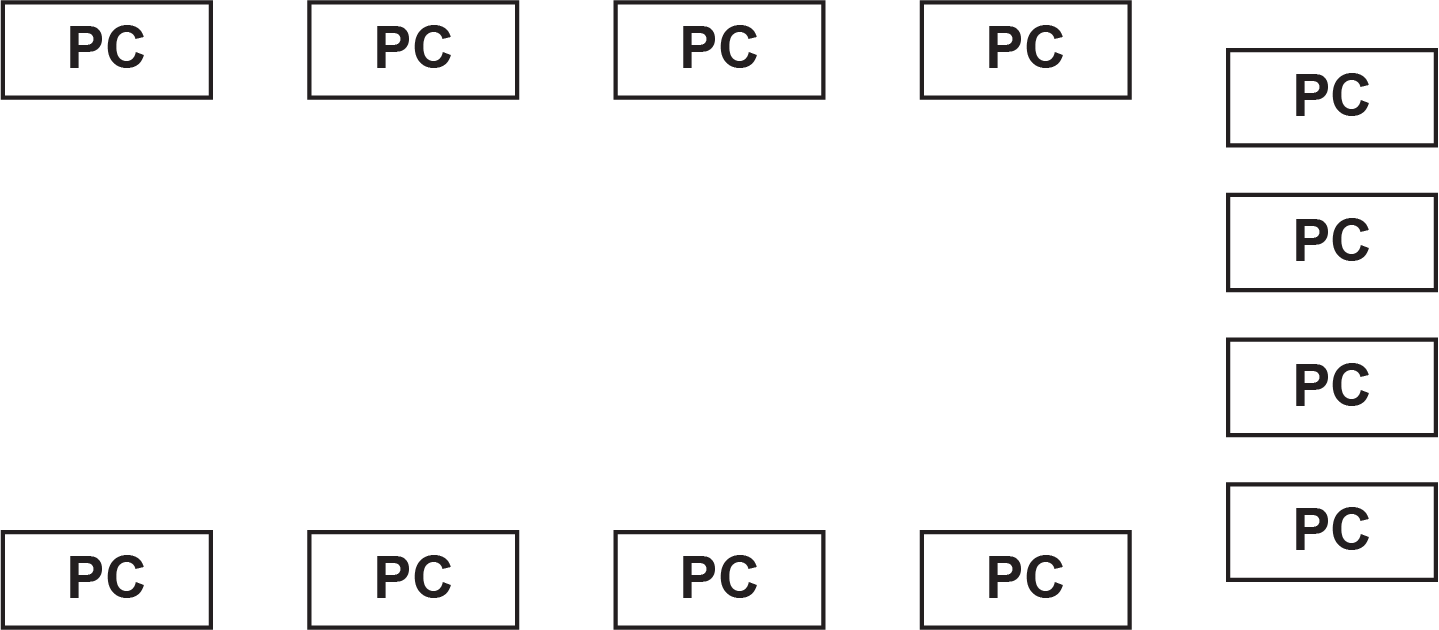
[1 mark]

A school wishes to create a classroom with PCs that are all connected to a wired network in a star topology.

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **7** | **.** | **2** |

Draw the network topology below. Include any other hardware required to make the network in the diagram.

[3 marks]



|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **7** | **.** | **3** |

Give **one** advantage to using a bus topology when setting up a classroom’s network.

[1 mark]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **7** | **.** | **4** |

Wireless networks are now commonly used in schools, businesses, cafes, and homes.

Discuss the advantages and disadvantages of wireless networks as opposed to wired networks.

In your answer you should include an explanation of the reasons wireless networks are now commonly used and consider any legal, ethical and environmental issues related to the use of wireless networks.

[9 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **8** | **.** | **1** |

One method of network security is a firewall.

State **two** other methods of network security.

[2 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **8** | **.** | **2** |

Describe how a firewall helps to improve the security of a network.

[3 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **8** | **.** | **3** |

Define the term network protocol.

[1 mark]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **8** | **.** | **4** |

State **two** protocols that are used in the sending and receiving of email.

[2 marks]

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **9** | **.** | **1** |

The table below shows three weak passwords.

Complete the table to give a reason why each is a poor choice of password.

[3 marks]

|  |  |
| --- | --- |
| **Password** | **Reason it is a poor choice of password** |
| admin |  |
| 123456 |  |
| Performance |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **9** | **.** | **2** |

Shade **one** lozenge that shows the correct definition of white-box penetration testing.

[1 mark]

|  |  |  |
| --- | --- | --- |
| **A** | Makes use of a common set of malware to penetrate  the system | Icon  Description automatically generated |
| **B** | Simulates an external hacking or cyber warfare attack |  |
| **C** | The penetration tester has knowledge of and basic credentials for the target system they are testing |  |
| **D** | The penetration tester has **no** knowledge or credentials for the target system they are testing |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **9** | **.** | **3** |

Shade **one** lozenge that shows a cyber security threat that is **not** a type of malware.

[1 mark]

|  |  |  |
| --- | --- | --- |
| **A** | Computer virus | Icon  Description automatically generated |
| **B** | Phishing |  |
| **C** | Spyware |  |
| **D** | Trojan |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **0** | **9** | **.** | **4** |

One security measure that helps to prevent cyber security threats is the use of password systems.

State **one** other security measure that is used to detect or prevent cyber security threats.

[1 mark]

|  |  |  |  |
| --- | --- | --- | --- |
| **1** | **0** |  |  |

A relational database is used in a new website for a personal trainer who takes online bookings.

Customers are able to make a booking on a certain date and time for a duration between 0.5 and 2 hours.

As the website is new, only a small number of customers and bookings have been added to the tables so far.

The contents of the tables are shown in **Figure 3**.

**Figure 3**

**Bookings**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **BookingID** | **CustomerID** | **Date** | **Time** | **Hours** |
| 22 | 4 | 21/06/21 | 10:00 | 0.5 |
| 23 | 1 | 21/06/21 | 11:00 | 1.0 |
| 24 | 2 | 21/06/21 | 16:00 | 1.5 |
| 25 | 4 | 22/06/21 | 14:00 | 0.5 |
| 26 | 3 | 22/06/21 | 16:00 | 2.0 |

**Customers**

|  |  |  |  |
| --- | --- | --- | --- |
| **CustomerID** | **Name** | **Age** | **PhoneNumber** |
| 1 | Patrick | 18 | 01184960243 |
| 2 | Sia | 32 | 07700900194 |
| 3 | Elisa | 25 | 01632960246 |
| 4 | Jay | 19 | 01184960855 |
| 5 | Rebecca | 28 | 07700900549 |

|  |  |  |  |
| --- | --- | --- | --- |
| **1** | **0** | **.** | **1** |

State the field in the **Customers** table that is the primary key.

[1 mark]

|  |  |  |  |
| --- | --- | --- | --- |
| **1** | **0** | **.** | **2** |

State the most suitable data type for the PhoneNumber field.

[1 mark]

|  |  |  |  |
| --- | --- | --- | --- |
| **1** | **0** | **.** | **3** |

Write an SQL query that finds the Name, Time and Hours for all customers who have a booking on 21/06/21.

[5 marks]

Patrick has rung to cancel all his bookings due to an injury.

A query has been created to remove all Patrick’s bookings and is shown in **Figure 4**.

**Figure 4**

DELETE FROM Bookings

WHERE CustomerID > 1

|  |  |  |  |
| --- | --- | --- | --- |
| **1** | **0** | **.** | **4** |

The query contains one error. Refine the query in **Figure 4** to correct the error.

[1 mark]