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COMPUTER SCIENCE **0478/12**

Paper 1 Computer Systems **October/November 2023**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [ ].
- No marks will be awarded for using brand names of software packages or hardware.

This document has **12** pages.

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1 Malware can be used to corrupt data stored on a computer.

(a) Tick (✓) **one** box to show which cyber security threat is **not** a type of malware.

A Phishing ☐

B Ransomware ☐

C Virus ☐

D Worm ☐

[1]

(b) Identify **one** other example of malware than those given in **part 1(a)**.

..... [1]

(c) Identify the type of software that is used to find and remove malware from a computer.

..... [1]

2 A register stores the binary number:

1	1	1	0	0	0	1	1

(a) Give the denary number for the binary number stored in the register.

..... [1]

Working space

.....

.....

.....

(b) Give the hexadecimal number for the binary number stored in the register.

..... [2]

Working space

.....

.....

.....

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(c) A logical left shift of **two** places is performed on the binary number stored in the register.

Complete the binary register to show its contents after this logical left shift.

[1]

(d) The negative denary number −99 needs to be stored in the register.

Complete the register to show the binary number that would be stored, using two's complement. Show all your working.

Working space .....

.....

.....

.....

Register:

[2]

(e) The number 01001100 is added to 11100011

Add the two 8-bit binary numbers, using binary addition.

Give your answer in binary. Show all your working.

.....

.....

.....

.....

.....

..... [4]

3 A user's computer has a central processing unit (CPU) that has a clock speed of 2 GHz.

She wants to change it to a CPU that has a clock speed of 3 GHz.

(a) (i) State what is meant by clock speed.

.....

..... [1]

(ii) Explain the effect this change will have on the performance of the CPU.

.....

.....

.....

..... [2]

(b) The CPU contains a memory address register (MAR).

Describe the role of the MAR in the fetch–decode–execute cycle.

.....

.....

.....

..... [2]

(c) The CPU has a list of all the machine code commands it can process.

State the name of this list of commands.

..... [1]

4 A washing machine is an example of an embedded system.

(a) Give **two** characteristics of an embedded system.

1 .....

.....

2 .....

.....

[2]

(b) Circle **three** other examples of an embedded system.

freezer laptop

personal computer (PC) security light system smartphone

vending machine web server

[3]

5 A band is recording their new song. They need to consider the sample rate and sample resolution of their recording.

(a) Give **one** benefit of using a higher sample rate to record the song.

.....

..... [1]

(b) Give **one** drawback of using a higher sample rate to record the song.

.....

..... [1]

(c) Describe what is meant by sample resolution.

.....

.....

.....

..... [2]

(d) The band wants to compress the sound file, but they do **not** want any data to be permanently removed.

Identify the compression method that should be used.

..... [1]

6 The table contains descriptions about data transmission methods.

Complete the table by identifying which data transmission methods are described.

Data transmission method	Description
.....	Data is transmitted down a single wire, one bit at a time, in one direction only.
.....	Data is transmitted down multiple wires, multiple bits at a time, in both directions, but only one direction at a time.
.....	Data is transmitted down a single wire, one bit at a time, in both directions at the same time.
.....	Data is transmitted down multiple wires, multiple bits at a time, in one direction only.

[4]

7 A train station has a ticket inspector who checks each customer's ticket before they are allowed to get on the train.

The train station wants a system that will allow the tickets to be automatically checked.

(a) Identify **two** suitable input devices that can be used to automatically read the tickets.

1 .....

2 .....

[2]

(b) The train driver pushes a button to close the train door when all passengers have boarded the train. The train door will only close when there are no passengers in the doorway.

The system to check there are no passengers in the doorway uses a sensor and a microprocessor.

Explain how the sensor and the microprocessor are used to check whether the train door can be closed.

.....

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.....

..... [6]

8 **(a)** Draw and annotate a diagram that demonstrates the cyber security threat of data interception.

[4]

(b) Identify **one** security solution that will help keep data safe from data interception and state why it will help keep the data safe.

.....

.....

.....

..... [2]

9 The table contains terms and descriptions about the internet.

Complete the table with the missing terms and descriptions.

Term	Description
.....	the collective name for all the web pages available
.....	a small text file, stored by the web browser, that can store a user's personal data
uniform resource locator (URL)	....
web server	....
.....	the language used to create a website. Example tags are <head> and <body>
.....	a protocol that is used to request and send web pages

[6]

10 A business has a system that is described as having artificial intelligence (AI).

(a) State **one** of the main characteristics of an AI system.

.....

..... [1]

(b) An AI system is an expert system.

Explain how an expert system operates.

.....

.....

.....

.....

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.....

.....

.....

.....

.....

..... [6]

11 A manufacturing company uses an automated system in its manufacturing process.

(a) The automated system uses a flow sensor.

Identify what a flow sensor measures.

.....

..... [1]

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(b) Explain **one** advantage to employees of using an automated system in manufacturing.

.....

.....

.....

..... [2]

(c) Explain **one** disadvantage to the company owner of using an automated system in manufacturing.

.....

.....

.....

..... [2]

12 Digital currency can be used to pay for products and services.

Digital currencies are often tracked using digital ledgers.

(a) Give **two** other features of digital currency.

1 .....

.....

2 .....

.....
[2]

(b) Identify the process that uses a digital ledger to track the use of digital currency.

..... [1]

13 Storage and memory are important components of a computer system.

(a) Primary storage is one type of storage in a computer system.

(i) Tick (✓) **one** box to show which is an example of primary storage.

A compact disk (CD) ☐

B hard disk drive (HDD) ☐

C random access memory (RAM) ☐

D solid-state drive (SSD) ☐

[1]

(ii) Give **one** characteristic of primary storage.

..... [1]

(b) Virtual memory can be created in a computer system.

Complete the description about virtual memory.

Use the terms from the list.

Some of the terms in the list will **not** be used. Some terms may be used more than once.

binary hard disk drive (HDD) hexadecimal operating system

pages random access memory (RAM) read only memory (ROM)

sectors software tracks virtual memory

Virtual memory is used when the ..... is full. It is created by partitioning the ..... . Data is divided into ..... that can be sent from ..... to the ..... to be temporarily stored until they are required.

[5]

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