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1862262853

COMPUTER SCIENCE **0478/12**

Paper 1 Computer Systems **February/March 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 **16** pages. Any blank pages are indicated.

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1 Computers can be infected with malware. Spyware is one example of malware.

(a) Tick (✓) **one** box to show a correct definition of spyware.

A Software that activates a webcam and transmits the video to a third party that outputs it live on a website. ☐

B Software that detects when a password is being entered and then emails the password to a third party. ☐

C Software that records all data entered into a computer, analyses this data to find email addresses and passwords, then posts these to a website. ☐

D Software that records all key presses and transmits these to a third party. ☐

[1]

(b) Complete the table by identifying and describing **two** other examples of malware.

	Malware	Description
1	....	....
2	....	....

[6]

(c) Proxy-servers and firewalls have some similar functions.

Identify **two** similarities and **one** difference between proxy-servers and firewalls.

Similarity 1 .....

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Similarity 2 .....

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Difference .....

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[3]

2 A programmer has designed a three-dimensional (3D) interactive computer game. They are going to develop a program for the game. The program needs to run efficiently, but it must also be developed as soon as possible.

(a) Tick (✓) **one** box to identify whether the programmer should use a high-level language or a low-level language to develop the program.

Explain the reasons for your choice.

High-level language ☐

Low-level language ☐

Reasons for your choice .....

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..... [4]

(b) If the programmer chooses a high-level language, they can use a compiler or an interpreter to translate the high-level language into a low-level language.

Describe the operation of a compiler and of an interpreter.

Compiler .....

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Interpreter .....

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[4]

3 A new computer comes with primary and secondary storage.

(a) Data storage is measured using binary denominations.

Complete each conversion.

8 bytes = ... nibbles

512 kibibytes (KiB) = ... mebibytes (MiB)

4 gibibytes (GiB) = ... mebibytes (MiB)

1 exbibyte (EiB) = ... pebibytes (PiB)

[4]

Working space

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(b) Random access memory (RAM) is an example of primary storage.

Give **three** examples of data that is commonly stored in RAM.

1 .....

2 .....

3 .....

[3]

(c) Describe the purpose of secondary storage.

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.....

.....

..... [2]

4 A wildlife photographer stores their digital images on a computer.

(a) Complete the table by defining each term about images.

Image term	Definition
pixel	....
resolution	....

[2]

(b) One of the images has a resolution of 1000 × 1000 and a colour depth of 2 bytes.

Calculate the file size of the image. Give your answer in bytes.

Show your working.

Working space .....

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File size ..... bytes

[2]

(c) The photographer decides to purchase a solid-state storage device to back up their images.

Complete the description of solid-state storage.

Use the terms from the list.

Some of the terms in the list will **not** be used. You should only use a term once.

binary denary electrons grid neutrons

non-volatile RAM star transistors virtual volatile

Solid-state storage is ..... . This means that the data is **not** lost when the power is turned off.

Solid-state storage is made of ..... that are laid out in a ..... .

Gates are used to control the flow of the ..... through the transistors. This changes the data in the transistors from 1 to 0, or from 0 to 1.

[4]

(d) The photographer compresses an image file before it is emailed.

Give **one** reason why a file is compressed.

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..... [1]

5 A website allows users to purchase items.

Computer A sends a request for the homepage to the website's server.

(a) The request is sent using packet switching.

The structure of a packet of data has three elements. One element is the packet header.

(i) Identify **two** items of data contained in a packet header.

1 .....

2 .....
[2]

(ii) Identify the **two** other elements of a packet.

1 .....

2 .....
[2]

(b) Computer A needs to be directly connected to a router that is located in a different room.

(i) Tick (✓) **one** box to identify whether serial data transmission or parallel data transmission is more suitable for this connection.

Explain the reasons for your choice.

Serial data transmission ☐

Parallel data transmission ☐

Reasons for your choice .....

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..... [3]

(ii) The connection will also use full-duplex data transmission.

Define full-duplex data transmission.

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..... [2]

(c) The data transmission will use parity checks.

(i) The bytes need to be sent using an even parity byte check.

Complete the parity bit for each byte.

	Parity bit							
Byte A		1	1	0	0	0	1	1
Byte B		0	0	0	0	0	0	0

[2]

(ii) A parity block check can be used instead of a parity byte check.

Explain how a parity block check might detect an error in transmission that would **not** be detected by a parity byte check.

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..... [2]

(iii) The data was sent using an even parity block check. One of the bits has been transmitted incorrectly.

	Parity bit	**Bit 1**	**Bit 2**	**Bit 3**	**Bit 4**	**Bit 5**	**Bit 6**	**Bit 7**
Byte 0	1	1	1	0	1	0	0	0
Byte 1	0	0	1	0	0	1	0	0
Byte 2	1	0	1	1	0	0	0	1
Byte 3	1	1	0	0	1	1	1	1
Byte 4	1	0	1	0	0	0	1	0
Byte 5	0	0	0	0	0	0	0	0
Byte 6	0	1	1	1	1	0	0	0
Parity byte	0	1	1	0	1	0	1	0

Identify the bit number and the byte number of the incorrect bit.

Bit number .....

Byte number .....

[2]

(d) The website allows the user to set up an account to log on and purchase items. The website is accessed and displayed using a web browser.

(i) Two functions of the web browser are to render hypertext markup language (HTML) to display web pages and to store cookies.

Identify **two** other functions of a web browser.

1 .....

2 .....
[2]

(ii) Identify **two** ways that cookies can be used to enhance the user's experience of this website.

1 .....

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2 .....

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[2]

6 A company is involved in robotics.

One of its robots is designed to make a specific movement depending on a binary value.

(a) The table gives some of the movements for the robot.

Complete the table by writing the missing binary, denary or hexadecimal value for each movement.

Movement	Binary	Denary	Hexadecimal
forward 1 step	00011111	31	
back 1 step		140	8C
turn right	01011010		5A
turn left		120	78

[4]

Working space

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(b) Describe what is meant by robotics.

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..... [2]

(c) The robot has a sensor and a microprocessor.

The robot will move forward continuously until it detects an object that is less than or equal to 10 cm in front of it.

If an object is less than or equal to 10 cm in front of it, the robot turns 90 degrees right. It then tries to move forward again.

Explain how the sensor and the microprocessor are used to automate this robot.

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(d) The robot needs to find its way through different puzzles. Each puzzle has a series of paths that the robot needs to follow to find its way to the end of the puzzle. The puzzle contains dead ends and obstacles, so the robot needs to decide which way to go.

The robot's program will use artificial intelligence (AI).

(i) Describe the characteristics of AI.

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(ii) Explain how the program will use AI.

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..... [4]

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