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COMPUTER SCIENCE **0478/12**

Paper 1 Computer Systems **May/June 2024**

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. Any blank pages are indicated.

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[Turn over

1 Data can be measured in bits.

(a) Give the name of the data storage measurement that is equal to 8 bits.

..... [1]

(b) State how many bits there are in a kibibyte (KiB).

..... [1]

(c) Give the name of the data storage measurement that is equal to 1024 gibibytes (GiB).

..... [1]

(d) A 16-bit colour image has a resolution of 512 pixels wide by 512 pixels high.

Calculate the file size of the image in kibibytes (KiB). Show all your working.

.....

.....

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.....

.....

Answer ..... KiB

[3]

2 Data can be transmitted from one device to another.

(a) Tick (✓) **one** box to show which of the terms is **not** a method for transmitting data.

A serial ☐

B simplex ☐

C parallel ☐

D parity ☐

[1]

(b) Data is broken down into smaller units to be transmitted from one device to another.

Give the name of the unit that data is broken down into.

..... [1]

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(c) Data is often encrypted when it is transmitted from one device to another.

(i) Explain how data is encrypted using symmetric encryption.

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..... [4]

(ii) Give the purpose of encryption.

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..... [1]

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3 Binary is a base 2 number system.

(a) Give the name of the number system that is base 16.

..... [1]

(b) **Three** denary numbers are entered into a computer. The computer converts the numbers and stores them as binary.

(i) Give the binary number that would be stored for each of the denary numbers.

10 .....

50 .....

201 .....

[3]

Working space

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(ii) Explain why the data is converted to binary by the computer.

.....

.....

.....

..... [2]

(c) The two binary integers 00110000 and 01100110 are added together.

Add the binary integers using binary addition and show your answer in binary. Show all your working.

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..... [3]

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(d) The denary integer –32 is stored as a two's complement integer.

Calculate the two's complement integer that would be stored.

Show all your working.

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..... [2]

4 A student uses both system software and application software on their computer.

(a) Give **one** example of system software.

..... [1]

(b) Give **two** examples of application software.

1 .....

2 .....

[2]

(c) Describe the difference between system software and application software.

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..... [2]

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5 Instructions are processed by a central processing unit (CPU) in a computer.

(a) Complete the paragraph about fetching an instruction into the CPU to be processed.

Use the terms from the list.

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

address arithmetic logic unit (ALU) binary control unit (CU)

current instruction register (CIR) data denary driver

fetch interrupt memory address register (MAR)

memory data register (MDR) random access memory (RAM)

read only memory (ROM) secondary storage signal

The program counter contains the ……

of the next instruction to be processed; this is then sent to the

…… using the address bus. The address is then

sent to the …… .

Once the address is received, the instruction stored at the location is

sent to the ……, using the

…… bus. The instruction is then

sent to the …… that is built into the

…… .

[7]

(b) The CPU uses an instruction set to decode the instruction.

State what is meant by an instruction set.

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..... [1]

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6 The table contains statements about error detection methods.

Complete the table by giving the correct error detection method for each statement.

error detection method	statement
.....	An odd or even process can be used.
.....	A value is calculated from the data, using an algorithm. This happens before and after the data is transmitted.
.....	A copy of the data is sent back to the sender by the receiver.
.....	Acknowledgement and timeout are used.
.....	A value is appended to data that has been calculated using the data. This value is checked on data entry.

[5]

7 A computer has both a media access control (MAC) address and an internet protocol (IP) address.

(a) Tick (✓) **one** box to show which of the statements is correct about the MAC address.

A It is assigned by the manufacturer. ☐

B It is assigned by a router. ☐

C It can be static or dynamic. ☐

D It is made up of three different parts. ☐

[1]

(b) An IP address can have an IPv4 or IPv6 format.

(i) Give an example of an IP address that has an IPv4 format.

..... [1]

(ii) Give **two** characteristics of the IPv6 format.

1 .....

.....

2 .....

.....

[2]

8 A company has a website that is suffering a distributed denial of service (DDoS) attack.

(a) Draw and annotate a diagram to show the process of the DDoS.

[5]

(b) Identify a solution that can be used to help prevent the DDoS attack being successful.

..... [1]

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9 A company uses both solid-state and optical secondary storage.

(a) Explain why a computer needs secondary storage.

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..... [2]

(b) Describe **three** differences between solid-state and optical storage.

1 .....

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.....

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2 .....

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3 .....

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[6]

10 A garage uses an expert system to help diagnose any problems with cars that need repair.

(a) The expert system is an example of artificial intelligence (AI).

Describe what is meant by AI.

.....

.....

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..... [2]

(b) A car has a problem with its braking system, so it is brought into the garage.

Explain how the expert system operates and how it is used to help diagnose the problem.

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..... [5]

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11 A company has a website. Users use the internet and the world wide web to access the website.

(a) Describe the difference between the internet and the world wide web.

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.....

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..... [2]

(b) The website has a uniform resource locator (URL). The URL has three different parts.

Identify the **three** different parts that are included in the URL.

1 .....

2 .....

3 .....

[3]

(c) One function of a web browser is to provide an address bar for a user to enter a URL.

Give **three** other functions of a web browser.

1 .....

2 .....

3 .....

[3]

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