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CENTRE NUMBER						CANDIDATE NUMBER			

COMPUTER SCIENCE **0478/11**

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. Any blank pages are indicated.

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1 A student uses a computer and several hardware devices to complete his schoolwork.

The computer has a central processing unit (CPU).

(a) The student uses a keyboard to complete his schoolwork.

Tick (✓) **one** box to show which type of device the keyboard is.

A input ☐

B memory ☐

C output ☐

D storage ☐

[1]

(b) The student uses a printer to print his schoolwork.

Tick (✓) **one** box to show which type of device the printer is.

A input ☐

B memory ☐

C output ☐

D storage ☐

[1]

(c) A component in the CPU sends signals to manage the fetch-decode-execute cycle.

State the name of this component.

..... [1]

(d) The CPU has a clock speed of 2.4 Ghz.

Describe what is meant by a 2.4 Ghz clock speed.

.....

.....

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..... [2]

(e) The CPU contains registers including the memory data register (MDR).

(i) Describe the role of the MDR in the fetch-decode-execute cycle.

.....

.....

.....

..... [2]

(ii) Identify **three** other registers contained in the CPU.

1 .....

2 .....

3 .....

[3]

2 A car park has a payment machine that allows a customer to pay for their parking.

The cost of parking is displayed as a denary number on a screen on the payment machine.

The cost of parking is stored in two 8-bit binary registers.

For the parking cost of $10.50:
- register 1 stores the denary value 10 as binary
- register 2 stores the denary value 50 as binary.

(a) Give the parking cost that would be displayed on the payment machine when the registers store:
- register 1: 00010001
- register 2: 01000110

Parking cost displayed $ ..... [2]

Working space

.....

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(b) The parking cost of $14.98 is displayed on the payment machine.

Give the 8-bit binary numbers that are stored in the registers to display the parking cost.

Register 1 .....

Register 2 .....
[2]

Working space

.....

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.....

(c) The payment machine gives the customer a ticket when they have paid their parking cost. Each ticket has a 4-digit hexadecimal ticket number that is stored as binary.

The binary number 1010000000111101 is stored for a customer's ticket number.

Give the hexadecimal ticket number that would be displayed on this customer's ticket.

Hexadecimal ticket number ..... [4]

Working space

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.....

(d) Explain why data input into the payment machine needs to be converted to binary.

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..... [2]

(e) When a customer is leaving the car park they arrive at a barrier. The customer needs to insert their ticket into a system at the barrier. This system reads the ticket number then checks whether the parking cost has been paid for the car. The barrier is raised if it has been paid.

The system uses a microprocessor.

Describe the role of the microprocessor in the system and how it checks whether the parking cost has been paid.

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..... [4]

3 The table contains **four** descriptions about a computer system.

Complete the table by writing the correct term for each description.

Term	Description
.....	A collective term for the physical components of the computer system.
.....	A type of software that provides services that the user requires and allows the user to perform tasks on the computer.
.....	A type of software that manages the main functions of the computer, including managing files and managing memory.
.....	A type of software that is stored in the read only memory (ROM). It includes the basic input output system (BIOS) and the bootloader.

[4]

4 Data is transmitted between a computer and a printer.

(a) The data is transmitted one bit at a time down a single wire. The computer can transmit data to the printer and the printer can transmit data to the computer, using the same connection.

Circle the **two** data transmission methods that will transmit data in this way.

parallel full-duplex parallel half-duplex parallel simplex

serial full-duplex serial half-duplex serial simplex

[2]

(b) An odd parity check is used to detect errors in the data transmission.

Explain how the odd parity check detects errors.

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..... [4]

(c) Another error detection method sends the data from the computer to the printer, then a copy of the data received is sent back from the printer to the computer. The two sets of data are compared to see if they match.

State the name of this type of error detection method.

..... [1]

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5 A musician is recording herself playing the music for a song on the piano.

(a) Explain how the analogue sound is recorded and converted to digital.

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..... [5]

(b) State **two** ways that the accuracy of the recording could be increased.

1 .....

2 .....
[2]

(c) The musician compresses the sound file using lossless compression instead of lossy compression.

Explain why the musician would choose to use lossless compression instead of lossy compression.

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..... [3]

(d) The musician types the words for the song into a document.

Two character sets that can be used when converting text to digital are the American standard code for information interchange (ASCII) and Unicode.

Explain the differences between the ASCII character set and the Unicode character set.

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..... [4]

6 Draw and annotate a diagram to demonstrate how a firewall works.

[4]

7 Complete the statements about data packets and packet switching.

Use the terms from the list.

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

destination address first footer header

last main data packets payload

routers servers trailer

Data is broken down into packets. A data packet has a packet ..... that contains the packet number and the ..... .

Each packet could take a different path from the sender to the receiver; this is controlled by ..... .

Packets may arrive out of order. Once the ..... packet has arrived, the packets are reordered.

[4]

8 Storage can be described as being magnetic, solid-state or optical.

(a) Give **two** features of magnetic storage.

1 .....

.....

2 .....

.....

[2]

(b) Give **three** features of solid-state storage.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(c) Give **one** example of each type of storage.

Magnetic .....

Solid-state .....

Optical .....

[3]

9 An interrupt is a type of signal that is used in a computer.

(a) State the name of the type of software that manages interrupts.

..... [1]

(b) Describe how interrupts are used when a key is pressed on a keyboard.

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..... [5]

(c) Interrupts can be hardware based or software based.

A key press is one example of a hardware interrupt.

(i) Give **two** other examples of a hardware interrupt.

1 .....

.....

2 .....

.....

[2]

(ii) Give **two** examples of a software interrupt.

1 .....

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2 .....

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[2]

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