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O2792261229

COMPUTER SCIENCE **0478/13**

Paper 1 Computer Systems **October/November 2025**

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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[Turn over

1 A flower shop has a room that has an air-conditioning system. It is used to keep the room at a constant temperature for storing flowers.

The owner uses a keypad to set the temperature for the room.

(a) Tick (✓) **one** box to show whether a keypad is an example of an input, output, process or storage device.

A input ☐

B output ☐

C process ☐

D storage ☐

[1]

(b) The owner of the shop enters a denary number to set the temperature for the room.

The denary number is converted to a binary number to be processed. The binary number is stored in a register in the air conditioning system.

(i) Give the binary number that would be stored when the denary number 24 is entered.

..... [1]

(ii) Give the binary number that would be stored when the denary number 101 is entered.

..... [1]

(iii) The binary number 00010011 is stored in the register.

Give the denary number that has been entered for this binary number to be stored.

..... [1]

(iv) The binary number 00100010 is stored in the register.

Give the denary number that has been entered for this binary number to be stored.

..... [1]

Working space

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(c) If the air-conditioning system detects an error, it displays an error code. The error code is displayed as a hexadecimal number. The binary number for each error code is stored in a register.

(i) Give the binary number that is stored in the register to display the error code 51.

..... [1]

(ii) Give the binary number that is stored in the register to display the error code E3.

..... [1]

(iii) Give the hexadecimal number that is displayed when the binary number 10000010 is stored in the register.

..... [1]

(d) If the owner of the shop wants to make the room very cold, she may need to enter a negative denary number.

The negative denary number could be represented using two's complement.

Give the two's complement 8-bit binary integer that would be stored for the temperature –5.

Show all your working.

Working space .....

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Two's complement 8-bit binary integer .....

[2]

(e) The air-conditioning system uses a temperature sensor and a microprocessor to keep the temperature of the room at a constant level.

(i) Tick (✓) **one** box to show whether the sensor is an example of an input, output, process or storage device.

A input ☐

B output ☐

C process ☐

D storage ☐

[1]

(ii) The temperature sensor continuously sends analogue data to the microprocessor. This data is then converted to digital.

Explain how the microprocessor keeps the temperature of the room at a constant level.

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..... [3]

(f) The air-conditioning system is an example of an embedded system.

Explain why the air-conditioning system is an embedded system.

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..... [2]

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2 A computer with a Von Neumann architecture has a central processing unit (CPU) that carries out the fetch-decode-execute (FDE) cycle.

(a) Give the name of the first register that is used in the fetch part of the cycle.

..... [1]

(b) The CPU has a control unit (CU).

(i) Describe the role of the CU in the CPU.

.....

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..... [3]

(ii) Give the name of the register that is part of the CU.

..... [1]

(c) The computer has primary storage. One example of primary storage is cache.

(i) Tick (✓) **one** box to show the correct statement that describes the purpose of cache.

A It stores important instructions. ☐

B It stores the next instruction to be processed. ☐

C It stores frequently used instructions. ☐

D It stores instructions so they are not lost when the power is turned off. ☐

[1]

(ii) Give **one** other example of primary storage.

Identify the type of data your example would store.

Primary storage .....

Data .....

.....

[2]

(d) The computer also has secondary storage.

Write the name of the type of secondary storage for each description in the table. Each type of secondary storage may be used more than once.

Type of secondary storage	Description
.....	It burns pits and lands onto a disk.
.....	It uses control gates and flow gates.
.....	It uses NAND or NOR technology.
.....	The surface of each platter is divided into tracks and sectors.
.....	It has a read/write arm that moves a laser across a disc.
.....	It controls the flow of electrons using transistors.

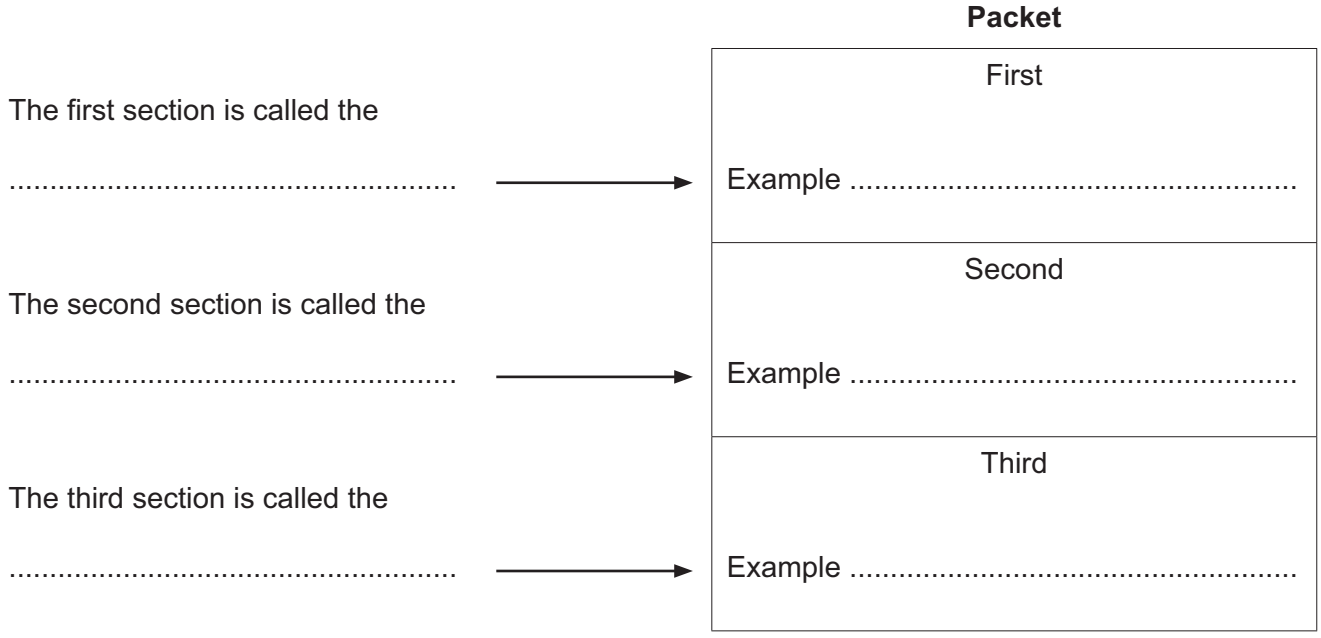
[6]

3 Data is split into packets before it is transmitted across a network.

(a) The diagram shows a packet with **three** sections.

Complete the diagram by writing the name of each section of the packet.

Write an example in each section of what would be stored in that part of the packet.



[6]

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(b) Packets can be sent across a network using different methods of data transmission.

Explain how data is transmitted in the **two** given methods of data transmission.

(i) Serial full-duplex

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..... [4]

(ii) Parallel half-duplex

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..... [4]

4 A cyber security company specialises in security solutions that help prevent hackers being successful.

(a) Identify **two** security solutions that can be provided to help prevent hackers being successful.

Explain how each solution helps prevent hackers being successful.

Solution 1 .....

Explanation .....

.....

.....

.....

Solution 2 .....

Explanation .....

.....

.....

.....

[6]

(b) The company also has a web page that provides information to improve people's awareness of social engineering.

Describe what is meant by social engineering.
Include an example of social engineering in your answer.

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..... [3]

(c) The company's website uses both session cookies and persistent cookies.

(i) State **one** similarity between session cookies and persistent cookies.

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..... [1]

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(ii) Explain **one** difference between session cookies and persistent cookies.

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..... [2]

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5 Text, images and sound are represented as binary to be processed by a computer.

(a) Complete the table by writing the missing terms and descriptions about representing text, images and sound as binary.

Term	Description
character set	....
.....	This is the number of samples taken each second when recording sound.
pixel	....
resolution	....
.....	This is the number of bits used to represent a colour in an image.

[5]

(b) The size of an image file is 1000 bytes.

Give the size of the image file in bits.

..... [1]

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(c) The size of a sound file is 4096 mebibytes (MiB).

Give the size of the file in gibibytes (GiB).

..... [1]

Working space

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6 A computer game is programmed to use artificial intelligence (AI) to create the movements and actions of the computer-controlled characters in the game.

(a) Describe what is meant by AI.

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..... [3]

(b) Explain how the AI can be used to improve the movements and actions of the computer-controlled characters.

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..... [3]

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(c) The computer game is programmed using a high-level language.

Explain **one** difference between a high-level language and a low-level language.

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..... [2]

(d) The programmer uses translators to translate the high-level language source code into machine code.

Identify the name of the translator that would be used for each of the statements. Each name may be used more than once.

(i) Translates and executes the source code one line at a time.

..... [1]

(ii) Translates the source code and will not execute it if errors are found. It instead produces a full report of the errors in the source code.

..... [1]

(iii) Translates the source code and produces an executable file.

..... [1]

(iv) Stops execution of the machine code where an error is found and will resume execution of the machine code once the error is fixed.

..... [1]

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