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Cambridge Assessment International Education

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CANDIDATE NAME

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1077057498

COMPUTER SCIENCE **0478/12**

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

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[Turn over

1 **(a)** Complete the sentences about number systems.

Use the items from the list.

Some of the items in the list will **not** be used. You should only use an item once.

A	B	C	D	E	F	G
H	W	X	Y	Z	0	1
2	4	8	10	16	127	128
255	256					

The binary number system is base ..... . The smallest denary number that can be represented as an 8-bit binary number is ..... . The largest denary number that can be represented as an 8-bit binary number is ..... .

The hexadecimal number system is base ..... . Each hexadecimal digit is equivalent to ..... bits. The numbers 1 to 9 are used and the number 10 is represented by ..... . The hexadecimal number system continues up to the number 15, which is represented by ..... .

[7]

(b) Two 8-bit binary numbers are given.

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

Give your answer in binary. Show all your working.

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  1 0 0 1 1 0 1 1
+ 0 0 0 1 0 0 1 1
```

[3]

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(c) Binary addition can result in overflow.

Tick (✓) **one** box to show the correct definition of overflow in binary addition.

A The answer has created a negative number that cannot be represented in binary addition. ☐

B The answer is the result of a logical shift that cannot be performed in binary addition. ☐

C The answer is too large to represent in the number of bits available. ☐

D The answer is too small to represent in the number of bits available. ☐

[1]

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2 An artist creates an image on a computer.

(a) State what is meant by the colour depth of an image.

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..... [1]

(b) Describe the relationship between the resolution of the image and the file size of the image.

.....

.....

.....

..... [2]

(c) The artist compresses the image file before uploading it to their website. Users can download the image file from the website to print as a poster.

The image file is compressed using lossless compression.

(i) Explain the reasons why the artist chose lossless compression instead of lossy compression to compress this image file.

.....

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..... [3]

(ii) Identify **one** lossless method of compressing an image.

Describe your chosen method.

Method .....

Description .....

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[3]

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(d) The artist emails the image file to their friends.

(i) Explain how a file is broken down into packets and transmitted over a network.

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..... [5]

(ii) The packets can use many different methods of data transmission to travel.

Complete and annotate the diagram to show the difference between serial full-duplex transmission between two computers and parallel simplex transmission between two computers.

Serial full-duplex transmission:



Parallel simplex transmission:



[3]

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3 A computer has a central processing unit (CPU), memory and secondary storage.

(a) The computer has a Von Neumann architecture.

Circle **three** registers that are found in the Von Neumann architecture.

accumulator	arithmetic register	binary counter
binary register	control register	current data register
current instruction register	data counter	instruction counter
logical register	program counter	storage register

[3]

(b) State the purpose of the CPU in the computer.

.....

..... [1]

(c) Computer A has a 2.1 GHz quad-core processor.

Computer B has a 2.5 GHz dual-core processor.

Computer C has a 5.2 GHz single-core processor.

(i) Identify which computer is most likely to execute more instructions simultaneously.

Justify your answer.

Computer .....

Justification .....

.....

.....

.....

[3]

(ii) Explain why Computer C can execute more instructions per second than Computer B.

.....

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..... [2]

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(d) All three computers have the same instruction set.

Define the term instruction set.

.....

..... [1]

4 An automated teller machine (ATM) is a device where a person inserts their bank card and can request to withdraw money. The ATM also allows the person to check how much money they have in their bank account.

(a) A sensor is used to detect when a person stands within 1 metre of the ATM. When a person is detected, a welcome message is displayed on the screen.

(i) Identify an appropriate sensor for the ATM to use to detect a person.

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..... [1]

(ii) Describe the role of the microprocessor in detecting the person.

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..... [3]

(b) Describe the features of the ATM that identify it as an embedded system.

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..... [2]

(c) The ATM has a touch screen and a keypad.

The ATM may need to be used by people who are unable to see.

Identify **one** other input device and **one** other output device that can be built into the ATM to help people who are unable to see.

Input .....

Output .....

[2]

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5 A computer is connected to a network.

(a) The computer has a network interface card (NIC) that has a media access control (MAC) address.

(i) One purpose of the NIC is to provide the computer with a MAC address.

Describe the other purposes of the NIC.

.....

.....

.....

..... [2]

(ii) Identify **three** characteristics of a MAC address.

1 .....

.....

2 .....

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3 .....

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[3]

(b) The network allocates an internet protocol (IP) address to the computer.

(i) Tick (✓) **one** box to identify a valid IPv4 address.

A 110:255:2:1 ☐

B 1.30.2FF.A9 ☐

C 3.162.74.3 ☐

D 8.0.257.6.8 ☐

[1]

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(ii) Identify the device in a network that can automatically assign an IP address to a computer, each time the computer connects to the network.

..... [1]

(c) A user accesses the world wide web using a web browser.

(i) Define the term world wide web.

.....

..... [1]

(ii) The uniform resource locator (URL) for a website includes the protocol hypertext transfer protocol secure (HTTPS).

Explain how HTTPS makes the transmission of data secure.

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..... [4]

(iii) The protocol is one part of a URL.

Give the other **two** parts of a URL.

1 .....

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2 .....

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[2]

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6 A search engine uses artificial intelligence (AI) to identify the most relevant web pages for the user.

(a) One characteristic of AI is the ability to learn.

Identify **three** other characteristics of AI.

1 .....

.....

2 .....

.....

3 .....

..... [3]

(b) The search engine uses machine learning.

Explain how machine learning is used by the search engine.

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..... [3]

7 Programs can be written in a high-level language or a low-level language.

(a) Machine code is one type of low-level language.

Identify **one** other type of low-level language.

Identify the translator that is needed for the type of low-level language you have identified.

Type of low-level language .....

Translator .....

[2]

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(b) A high-level language can be translated into a low-level language, using a compiler or an interpreter.

Describe the advantages of using an interpreter instead of a compiler during software development.

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..... [4]

(c) Integrated development environments (IDEs) provide translators.

Identify **three** other common functions of an IDE.

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3 .....

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[3]

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