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COMPUTER SCIENCE **0478/11**

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 student has an electronic calculator. The calculator has a screen that displays the result of calculations.

The calculator has 8-bit registers.

(a) State the highest denary number that could be stored in a single 8-bit register.

..... [1]

(b) Denary numbers are typed into the calculator. They are converted to binary numbers and stored in the 8-bit registers.

The student types in the denary number 23 and the denary number 168.

Give the 8-bit binary numbers that are stored in the registers for these **two** denary numbers.

23 | | | | | | | | |

168 | | | | | | | | |

[2]

Working space .....

.....

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.....

(c) The result of a calculation that is stored in a register is the binary number 00001011

Give the denary number that will be displayed on the screen for this binary number.

00001011 ..... [1]

Working space

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(d) Another result of a calculation that is stored in a register is the binary number 01000010

Give the denary number that will be displayed on the screen for this binary number.

01000010 ..... [1]

Working space

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(e) Two binary numbers stored in the registers are 01110110 and 00110000

Add the binary numbers using binary addition. Show all your working.

Give your answer in binary.

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

[3]

(f) The result of a calculation could be a negative denary number.

State how the calculator could represent a negative denary number as a binary number.

..... [1]

(g) The electronic calculator is an example of an embedded system.

Explain why it is an example of an embedded system.

.....

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..... [2]

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2 An employee of a company sells houses. He sends images of the houses to his company.

(a) The employee compresses the image files using lossy compression before sending them. Lossy compression reduces the size of the image files.

Give **two** other reductions that lossy compression makes to the images.

1 .....

2 .....

[2]

(b) The image data is broken down into packets to be sent across a network to the company.

The destination internet protocol (IP) address is read by a device in the network. The device uses the IP address to forward the packet towards its correct destination.

(i) State the name of the device that reads the destination IP address.

..... [1]

(ii) Identify the part of the packet where the destination IP address is found.

..... [1]

(c) The IP address has an IPv6 format.

Give **three** characteristics of the IPv6 format.

1 .....

.....

2 .....

.....

3 .....

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[3]

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(d) An echo check is used to check for errors after the image has been transmitted.

Draw and annotate a diagram to show how the echo check would detect any errors.

[3]

(e) The image data is encrypted using symmetric encryption.

(i) Tick (✓) **one** box to show the correct statement about symmetric encryption.

A Encrypted text is known as plain text. ☐

B The most secure form of encryption. ☐

C The encryption key is shared with any device receiving the encrypted data. ☐

D Two different keys are used. ☐

[1]

(ii) Give **one** other type of encryption that could be used.

..... [1]

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3 A student has a portable device. He uses an on-screen keyboard to write messages to his friend.

(a) Explain how the text the student writes is converted to binary to be processed.

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.....

.....

.....

.....

..... [3]

(b) The device has 4 gibibytes (GiB) of random access memory (RAM).

(i) State the amount of RAM the device has in mebibytes (MiB).

..... [1]

(ii) State the amount of RAM the device has in tebibytes (TiB). Your answer can be given rounded to 3 decimal places.

..... [1]

Working space

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(c) Explain why the portable device needs RAM.

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..... [3]

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(d) The device has a fingerprint scanner to allow the student to unlock the portable device.

Circle only **three** terms that can be used to describe the fingerprint scanner.

authentication biometric malware parity check

firewall input device output device storage device

[3]

4 A computer game development company are reviewing their current security solutions.

The company wants employees to be aware of how they can identify phishing.

(a) Describe the process of phishing.

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..... [4]

(b) Give **two** ways an employee could identify phishing.

1 .....

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2 .....

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[2]

(c) The company has installed anti-malware software on all employees' computers.

Give **three** examples of malware that anti-malware software can detect.

1 .....

2 .....

3 .....

[3]

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(d) The computer game developers use a high-level language to create a computer game.

(i) State what is meant by a high-level language.

.....

..... [1]

(ii) One benefit of using a high-level language is that the code is easy to debug.

Give **two** other benefits of using a high-level language.

1 .....

.....

2 .....

..... [2]

(iii) One drawback of using a high-level language is that it must be converted to a low-level language before it can be run.

Give **one** other drawback of using a high-level language.

.....

..... [1]

(iv) The computer game developers use an interpreter instead of a compiler when developing the computer game.

Explain why an interpreter would be more appropriate for developing the computer game.

.....

.....

.....

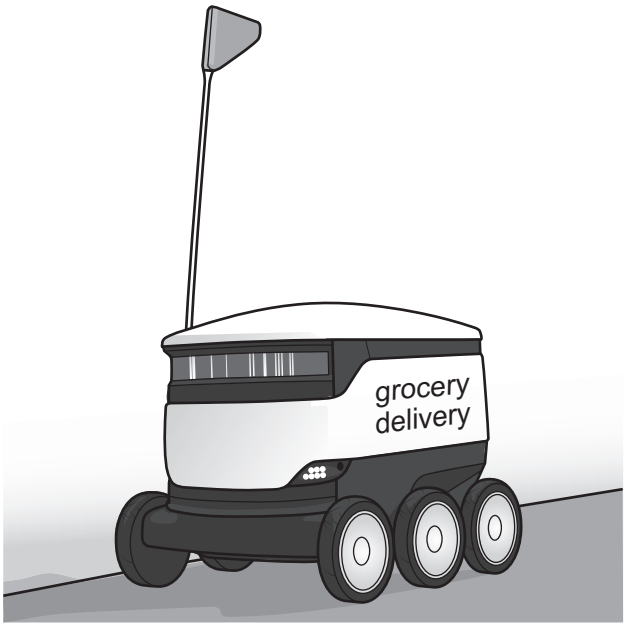
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..... [3]

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5 A supermarket wants to start delivering groceries to local elderly people, using robots.



(a) Describe the characteristics of a robot.

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.....

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..... [3]

(b) Explain **one** benefit to the supermarket of using robots to deliver groceries to elderly customers.

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..... [2]

(c) Explain **one** drawback to the elderly customers of robots being used to deliver their groceries.

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..... [2]

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(d) Each robot has a media access control (MAC) address.

Tick (✓) **one** box to show the correct statement about a MAC address.

A It is assigned by the manufacturer. ☐

B It is assigned by the product. ☐

C It is assigned by the router. ☐

D It is assigned by the user. ☐

[1]

(e) The robots have artificial intelligence (AI).

Give **three** ways the robots could make use of AI.

1 .....

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2 .....

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3 .....

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[3]

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6 A computer with a Von Neumann architecture has a central processing unit (CPU).

(a) Complete the statements about the operation of the CPU.

Use the terms from the list. **Not** all terms will need to be used. You should only use each term once.

accumulator arithmetic logic unit character set

control unit current instruction register cipher decoding set

instruction counter instruction set memory address register

memory data register memory instruction register next instruction register

program counter program register

The ..... stores the address of the next instruction to be fetched. This address is then sent to the ..... .

This address is the location in RAM where the instruction can be found. The instruction is retrieved from RAM and immediately stored in the ..... .

The instruction is then sent to the ..... where it is decoded by the ..... . The instruction is decoded using an ..... .

[6]

(b) Handling interrupts is one function of an operating system.

(i) An interrupt is sent to the CPU every time a key is pressed on the keyboard.

Give the name of this type of interrupt.

..... [1]

(ii) Give the name of the program that services the interrupt.

..... [1]

(iii) Give **one** other function of an operating system.

..... [1]

7 A theatre has a microphone on stage that is connected by cables to several speakers around the theatre. A person speaks into the microphone and their voice is output from the speakers.

Identify the most appropriate data transmission method for this purpose. Explain your choice.

Data transmission method .....

Explanation .....

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[5]

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