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COMPUTER SCIENCE

0478/11

Paper 1 Computer Systems

May/June 2024

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

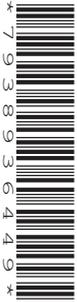
INSTRUCTIONS

- 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.



1 A student has a portable tablet computer.

(a) Identify **two** input devices that could be built into the portable tablet computer.

1

2

[2]

(b) Identify **one** output device that could be built into the portable tablet computer.

..... [1]

(c) Identify **one** type of storage device that could be built into the portable tablet computer.

..... [1]

2 Hypertext markup language (HTML) colour codes can be represented as hexadecimal.

(a) Tick (✓) **one** box to show which statement about the hexadecimal number system is incorrect.

A It uses the values 0 to 9 and A to F.

B It can be used as a shorter representation of binary.

C It is a base 10 system.

D It can be used to represent error codes.

[1]

(b) Denary numbers can be converted to hexadecimal.

Convert the **three** denary numbers to hexadecimal.

20

32

165

[3]

Working space

.....
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3 The binary number 10100011 is stored in random access memory (RAM).

A logical left shift of **three** places is performed on the binary number.

(a) Give the 8-bit binary number that will be stored after the shift has taken place.

..... [1]

(b) Tick (✓) **one** box to show which statement about a logical left shift of **two** places is correct.

A It would divide the binary number by 2.

B It would multiply the binary number by 2.

C It would divide the binary number by 4.

D It would multiply the binary number by 4.

[1]

(c) 10100011 can be stored as a two's complement integer.

Convert the two's complement integer 10100011 to denary. Show all your working.

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..... [2]

(d) The binary number is measured as a byte because it has 8 bits.

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

..... [1]

4 Data packets are transmitted across a network from one computer to another computer.

(a) Describe the structure of a data packet.

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..... [3]

(b) Packet switching is used to transmit the data packets across the network.

Identify the device that controls which path is taken by each data packet.

..... [1]

(c) Serial data transmission is used to transmit the data packets across the network.

Explain why serial data transmission is used to transmit the data packets.

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..... [3]

6 A computer needs firmware and system software to operate.

(a) State the purpose of firmware.

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..... [1]

(b) Give **one** example of firmware.

..... [1]

(c) Give **two** examples of system software.

1
2 [2]

7 Data is encrypted to keep it safe during transmission.

Complete the paragraph about asymmetric encryption.

Use the terms from the list.

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

- asymmetric
- certificate
- cipher text
- decrypted
- encrypted
- parallel key
- plain text
- private key
- protected
- public key
- serial key
- symmetric

..... is encrypted into
using a The encrypted data is then transmitted from the
sender to the receiver. The encrypted data is then decrypted using a
..... . [4]

8 A farmer uses an automated robot to plant seeds in the field.

(a) State what is meant by the robot being automated.

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..... [1]

(b) Give **three** characteristics of a robot.

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..... [3]

(c) The robot plants seeds and stops when it reaches a fence. It then turns and continues planting seeds. The robot uses sensors and a microprocessor to know when it reaches a fence.

Explain how the robot uses sensors and a microprocessor to know it has reached a fence.

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..... [6]

(d) Give **two** advantages of the farmer using an automated robot to plant seeds.

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2

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[2]

(e) Give **two** disadvantages of the farmer using an automated robot to plant seeds.

1

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[2]

(f) The robot is adapted to have machine learning capabilities.

Explain how this will improve the robot.

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[2]

- 9 A company owner has installed a new network. Data is correct before it is transmitted across the network.

The company owner is concerned that data might have errors after transmission.

- (a) Explain how the data might have errors after transmission.

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..... [3]

- (b) The company owner decides to introduce an error detection system to check the data for errors after transmission.

The error detection system uses an odd parity check and a positive automatic repeat query (ARQ).

- (i) Describe how the error detection system operates to check for errors.

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..... [8]

(ii) Give **two** other error detection methods that could be used.

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2 [2]

(c) The company owner also installs a firewall to help protect the network from hackers and malware.

(i) Explain how the firewall operates to help protect the network.

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..... [5]

(ii) Give **two** examples of malware that the firewall can help protect the network from.

1

2 [2]

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