Cambridge IGCSE™

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COMPUTER SCIENCE **0478/01**

Paper 1 Computer Systems **For examination from 2023**

SPECIMEN PAPER **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.

[Turn over

v2

1 A school network has several computers.

Each computer in the network has a media access control (MAC) address.

Hexadecimal is used for MAC addresses.

Part of a MAC address is given.

97–5C–E1

Each pair of digits is stored as binary in an 8-bit register.

(a) Complete the binary register for these two pairs of digits.

97	1	0	0	1	0	1	1	1

5C	0	1	0	1	1	1	0	0

[4]

(b) Describe what is meant by a MAC address.

A unique address that identifies a device, set by the manufacturor

It never changes

The first part is the manufacturer ID

The second part is the serial number

[4]

(c) Give **two other** uses of hexadecimal in computer science.

1 Colour codes im html/css

2 IPv6 addresses [2]

(d) Another value is stored as binary in a register.

0	1	0	1	0	0	1	0

logical left shift = add zeros to the right

(i) A logical left shift of two places is performed on the binary value.

Complete the binary register to show its contents after this logical left shift.

0	1	0	0	1	0	0	0

[1]

(ii) State **one** effect this logical shift has on the binary value.

....

The value becomes smaller as left most bits are lost

.... [1]

(e) Negative **denary** numbers can also be represented as binary using two's complement.

Complete the binary register for the denary value −54.

You must show all your working.

Working space ....

-128 64 32 16 8 4 2 1

1 1 0 0 1 0 1 0

....

....

....

Register:

1	1	0	0	1	0	1	0

[2]

2 A company has a website that is stored on a web server.

(a) The website data is broken down into packets to be transmitted to a user.

Describe the structure of a data packet.

....

Contains a header with origin address, destination address and
packet number

....

....

....

....

....

.... [4]

(b) The website hosts videos that users can stream. The company uploads new videos to the website.

(i) The videos are compressed before they are uploaded to the website.

Tick (✓) **one** box to show which statement is a benefit of compressing the videos.

A Data is encrypted. ☐

B Duration of each video will be reduced. ☐

C Less storage space on the web server is required. ☑

D More bandwidth is required when viewing the videos. ☐

[1]

(ii) Give **two** methods of compression that could be used to compress the videos.

1 Lossy ....

2 Lossless .... [2]

(iii) The company uses parallel half-duplex data transmission to transmit the data for the new videos to the web server.

Explain why parallel half-duplex data transmission is the most appropriate method.

....

Data can be uploaded and downloaded -but not necessarily at the same time...

....

Data does not have to travel a long distance, so no skewing

....

....

Parallel transmission allows for fast transmission of a large amount of data...

....

.... [4]

(c) The company is concerned about a distributed denial of service (DDoS) attack.

(i) Describe what is meant by a DDoS attack.

....

Large number of requests are sent to a server by bots at the same time...

....

The server is unable to respond to all of the requests, and as...
a result the server fails

....

....

.... [4]

(ii) Suggest **one** security device that can be used to help prevent a DDoS attack.

Firewall
.... [1]

3 **(a)** A web server has an internet protocol (IP) address.

(i) Give **three** characteristics of an IP address.

1 ....Unique address..

2 ....Has numeric values from 0-255..

3 ....These values are separated by full stops or colons............................. [3]

(ii) Identify the network component that uses the IP address to send data only to its correct destination.

..................router.. [1]

(b) The website has a uniform resource locator (URL).

An example of a URL is given.

https://www.cambridgeassessment.org.uk/index.html

Complete the table to identify the name of each section of the URL.

URL section	Name
https	protocol
cambridgeassessment.org.uk	domain name
/index.html	file name

[3]

4 A computer has a Von Neumann architecture.

(a) Circle **three** components that are part of the central processing unit (CPU) in this computer.

accumulator (ACC)   hard disk drive (HDD)   memory address register (MAR)

program counter (PC)   random access memory (RAM)

read only memory (ROM)   sensor   sold state drive (SSD)
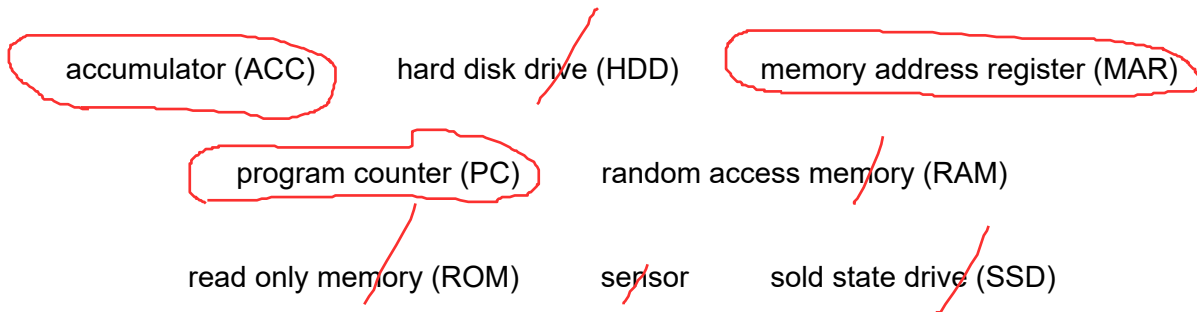
[3]

(b) Describe the purpose of the control unit (CU) within this computer.

....

Sends control signals so to manage transfer of data/instructions within CPU

....

.... [2]

(c) The computer has a single core CPU.

(i) State **one** purpose of a core in a CPU.

....

Process instructions

.... [1]

(ii) The computer is upgraded to a dual core CPU.

Explain how the upgrade can affect the performance of the computer.

....

Theoretically, it processes two instructions simultaneously, so increasing the performance as instructions are executed faster

....

.... [2]

(d) The computer uses a bootstrap.

Tick (✓) **one** box to show the part of a computer of which the bootstrap is an example.

A application software ☐ ✗

B firmware ✓

C hard disk drive ☐ ✗

D MAC address ☐ ✗

[1]

5 A programmer uses a high-level language to create a computer program.

(a) (i) Identify **two** advantages to the programmer of using a high-level language instead of a low-level language.

1 Easier to understand ....

2 Easier to debug .... [2]

(ii) Suggest **one** disadvantage to the programmer of using a high-level language instead of a low-level language.

Have to wait for translation before running

.... [1]

(b) The programmer uses an integrated development environment (IDE) when creating the computer program.

State what is meant by an IDE.

....

A piece of software that assists a programmer by providing functions

.... [1]

6 Robots are used in a factory to build cars.

(a) One characteristic of a robot is its mechanical structure.

State **two other** characteristics of a robot.

1 Has electrical structure ....

2 Is programmable .... [2]

(b) Suggest **two** advantages of using robots, instead of humans, to build cars in the factory.

1 More efficient - work 24 hours ....

2 Reduce cost as no wage .... [2]

7 The Unicode character set is used to represent text that is typed into a computer.

(a) Describe what is meant by a character set.

....

Contains all characters that are represented by a computer system
....
Each character is assigned a unique value
....

.... [2]

(b) One disadvantage of using the Unicode character set, instead of the ASCII character set, is that the text stored takes up more storage space.

Give **one** reason why it takes up more storage space.

....

More bits are used to represent each character (unicode 16, ASCII 7)
.... [1]

8 (a) Draw a diagram to represent how virtual memory is created and used.

transfer of
pages

HDD

RAM

VM

partition
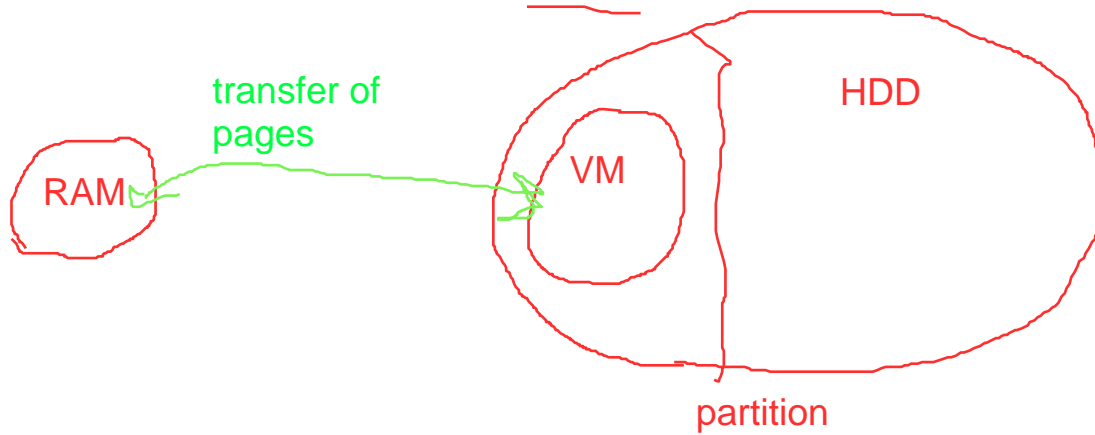
[4]

(b) A student is using software to create 3D models. This process often requires the use of virtual memory.

Explain why virtual memory is needed for this process.

....

Extends the capacity of RAM, to prevent crashing of software when the physical RAM is full

So, allows the computer to process the data required for modelling

....

.... [3]

9 Complete the sentences about symmetric 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.

algorithm   cipher   copied   delete   key   plain

private   public   standard   stolen   understood   unreadable

The data before encryption is known as ....plain........................ text.

To scramble the data, an encryption ....key........................, which is a type

of ....algorithm......................, is used.

The data after encryption is known as ....cipher..................... text.

Encryption prevents the data from being ....understood................... by a hacker. [5]

10 An art gallery uses secure socket layer (SSL) to provide a secure connection when selling art on its website.

Describe the process of SSL and explain how it provides a secure connection.

....

SSL is a protocol which encrypts data it receives

....

It uses digital certificats which are sent to the user's browser,
containing gallerys PUBLIC KEY

....

Once the certificate is authenticated, communication for
transaction can begin

....

....

....

....

....

....

.... [6]

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