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Examiners' report

COMPUTER SCIENCE

H046

For first teaching in 2015

H046/01 Summer 2023 series

Version 1

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers is also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

Paper 1 series overview

H046/01 (Computing Principles) is one of two examined components for the GCE AS Level Computer Science. This component focuses on:

- the characteristics of contemporary processors, input, output, and storage devices
- software and software development
- programming
- exchanging data
- data types, data structures, and algorithms
- legal, moral, ethical, and cultural issues.

To do well on this paper, candidates needed to be able to demonstrate and apply knowledge across all the topics listed above in different contexts.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• understood database terminology and concepts for Question 4 (a) and Question 4 (c) • demonstrated a detailed discussion for Questions 1 (e) (ii) and 6 (b) • successfully wrote programming code for Question 2 (b) (ii).	• did not use key terminology for Question 1 (b) and Question 1 (d) • did not complete the entity relationship diagram correctly for Question 4 (b).

Question 1 (a)

1 OCRSystems are designing a new CPU for a computer system that will be used for video rendering. Part of the video rendering process is when the video is exported. This is when the computer combines all of the separate video elements together to form the final video.

(a) Describe **two** factors that affect the performance of the CPU.

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2 .....

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[4]

Most candidates were able to identify two factors that could affect the performance of the CPU, but many were not given all 4 marks as they did not fully describe why each factor would affect the performance. See Exemplar 1, which was given full marks.

Exemplar 1

1 Clock speed, the number of clock cycles that occur per second (in Hertz). The higher the clock speed the more data/instructions executed within a given time frame, increasing performance.

2 The number of cores, the more number of cores a processor has, the more FDE cycles can be conducted simultaneously, so more data/instructions are executed at one point, increasing performance.

[4]

The candidate gives two valid factors that would affect performance and then explains why each of the two factors would affect performance. They use appropriate terminology in their response.

Question 1 (b)

(b) An important design consideration is whether OCRSystems use a CISC processor type or a RISC processor type.

Describe **one** difference between a CISC processor and a RISC processor.

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..... **[2]**

This question was generally answered well with many candidates describing the number of clock cycles required to execute instructions for RISC and CISC. Some candidates were not given the marks because they did not use the correct terminology.

Question 1 (c)

(c) OCRSystems are considering using parallel processing in the computer system that will be used for video rendering.

Describe how parallel processing would increase the performance of this computer system.

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..... **[3]**

To achieve all 3 marks for this question, candidates needed to describe what parallel processing is, and then be clear as to how this would affect the computer system in the question. Many candidates were not given all the available marks as they did not make clear links between parallel processing and the scenario.

Question 1 (d)

(d) The computer system will contain several input and output devices.

Explain the role of device drivers when using input and output devices on a computer system.

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..... **[2]**

This question was generally answered well. Some candidates were not given the second mark as they did not make reference to the operating system.

Question 1 (e) (i)

(e) Before a video is rendered, the user will first capture and edit the individual video elements before they are combined together to form the final video.

(i) State **two** different output devices that could be used when editing the videos.

1 .....

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2 .....

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[2]

Many candidates answered this question correctly, with most selecting a monitor/screen and headphones/speakers which were both valid responses.

Question 1 (e) (ii)*

(ii)* A storage device is used to store the individual video elements while they are being captured in different locations and during the video editing process.

Discuss the suitability of a flash storage device **and** a magnetic storage device for storing the different video elements while they are being collected and edited.

You should refer to the following in your answer:

- the benefits of each type of storage
- the drawbacks of each type of storage
- the suitability of each type of storage.

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..... **[9]**

Candidates were assessed on the quality of their extended response in this question. Most candidates understood the basic differences between flash storage and magnetic storage devices, but did not make clear links to the scenario. Mid-level responses were common, with few candidates giving a balanced discussion and a conclusion with suitable justifications.

Assessment for learning

Questions with the command word 'discuss' require candidates to give a balanced discussion and provided a suitable conclusion which justifies their comments. Opportunities to practise these questions will support candidates to do better on these style questions.

Question 2 (a) (i)

2 A programmer uses a queue data structure to store data.

(a) (i) Tick **one** box that describes how a queue operates.

☐ Last In First Out

☐ First In First Out

[1]

Most candidates correctly identified that a queue is a 'First in First Out' data structure.

Question 2 (a) (ii)

(ii) The figure below shows a queue data structure that contains a list of names. Alex is at the front of the queue.

Alex	Kofi	Ben	Sundip	Tom			

The operations that can be used on the queue are:

- `enqueue()` – This will add data that is passed in as a parameter to the queue.
- `dequeue()` – This will return the first element in the queue.

Show the contents of the queue after these operations have been performed:

```
enqueue("Charlie")
dequeue()
enqueue("Ling")
dequeue()
enqueue("Sara")
```


[2]

This question was generally answered well with most candidates achieving both marks. Some candidates did not correctly dequeue from the front of the queue, or enqueue to the rear.

Question 2 (b) (i)

(b) A stack is another type of data structure.

A stack is implemented using these variables:

- `items` – This is used to store an array that contains the data.
- `top` – This is an integer value pointing to the last item of data that was inserted.

`pop()` is one operation that can be performed on a stack. This will remove an item from the top of the stack, or –1 if the stack is empty.

(i) Complete the pseudocode function for the `pop()` operation.

```
function pop()
   if top == ..... then
      return -1
   else
      item = items[.....]
      top = top - .....
      return .....
   endif
endfunction
```

[4]

Many candidates were given full marks for this question, although some did not correctly return 'item' and incorrectly stated 'items' would be returned.

Question 2 (b) (ii)

(ii) A function called `reverse` uses a stack called `theStack` to reverse data that is passed in as a parameter called `name`. For example, the `name` "Jack" would be returned as "kcaJ" by the function.

`theStack` uses these operations which are already defined as global scope in the program:

- `push()` – This will add data that is passed in as a parameter to the stack.
- `pop()` – This will remove and return the item on top of the stack.

Write the function `reverse` so that it:

- accepts the `name` as a parameter
- uses `push()` to add each character in the `name` to `theStack` separately
- uses `pop()` to return each character from `theStack` and add it to a variable called `reverseName`
- outputs the variable `reverseName` once all characters have been popped from `theStack`.

You should write your function using pseudocode or program code.

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..... **[7]**

Although some candidates answered this question well, others were only given 1 or 2 of the available 7 marks. Many candidates that lost marks did not push and/or pop characters correctly, and many did not return a value for the final mark. Candidates should also be reminded that the correct spelling and case of identifiers are required in questions of this type. Some candidates added spaces in identifier names or used a different case to the identifiers stated in the question and therefore, were not given marks.

Assessment for learning

Candidates need to understand the importance of maintaining the spelling, case and use of spaces etc in identifiers in questions which ask for functions to be written.

Question 3 (a)

3 (a) Describe what is meant by the term 'character set'.

.....

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..... **[2]**

Most candidates were given at least 1 mark for this question. Some did not gain the second mark as they missed stating that each character has a unique binary value.

Question 3 (b) (i)

(b) (i) Convert the hexadecimal number 66 into a denary number. Show your working.

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..... **[2]**

This question was generally answered well. Candidates tended to be awarded either full or no marks. If the working was correct for calculating the denary value, the response was usually correct as this only required simple addition.

Question 3 (b) (ii)

(ii) State **two** reasons why a programmer would prefer to use hexadecimal numbers rather than binary numbers.

1 .....

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2 .....

.....

[2]

Many candidates achieved 1 mark for this question. Many candidates correctly stated that hexadecimal numbers are easier/faster to read/write, but were not given the second mark as they didn't state that hexadecimal numbers are shorter than binary numbers.

Question 3 (c)

(c) Show the denary value 6.25 as a floating point binary number representing the mantissa and exponent. Both of these should be stored in two's complement representation.

You should use as few bits as possible.

Show your working.

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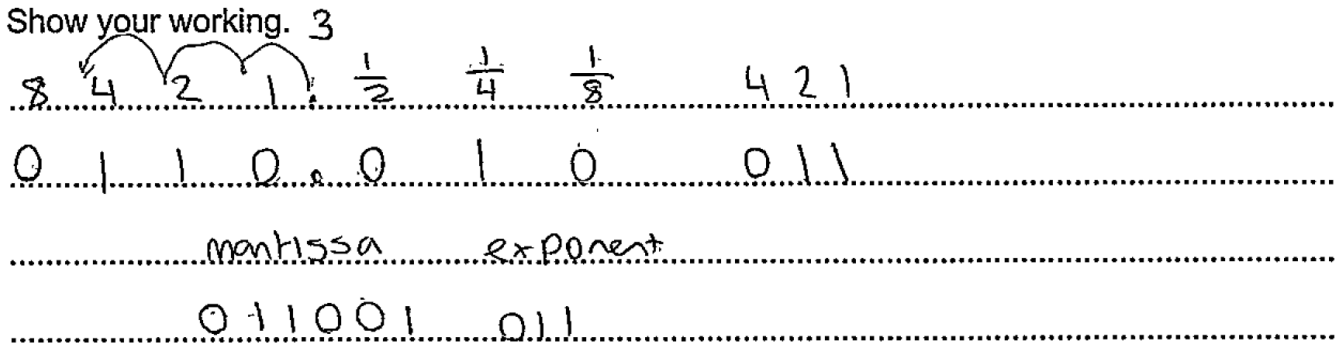
..... **[3]**

Many candidates were given the first mark by working out the fixed-point equivalent of 6.25 (0110.01) but were not given further marks because they did not read the question correctly. The question states the response must use as few bits as possible. Although some candidates correctly calculated the mantissa, many had extra digits in the exponent which could have been removed. See Exemplar 2 which was given full marks.

Exemplar 2



The candidate clearly shows the fixed-point value of 6.25 to gain the first mark. The second mark is given for showing the mantissa with six bits and the final mark for showing the exponent with three bits. All of these values are displayed clearly, and the candidate uses arrows to demonstrate the movement of the decimal point as additional working.

Question 3 (d)

(d) State the benefit of using a normalised form when representing data as a floating point number.

.....

..... **[1]**

This question was not answered well as many candidates seemed to misread the question. The majority of candidates that answered this question correctly stated that normalised form allowed for greater accuracy/precision from the number of bits.

Question 4 (a)

4 OCRConfectionery is a sweet manufacturing company.

They want to use a relational database to store details of the orders their customers make.

(a) State **two** benefits of using a relational database instead of a flat file database.

1 .....

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2 .....

.....

[2]

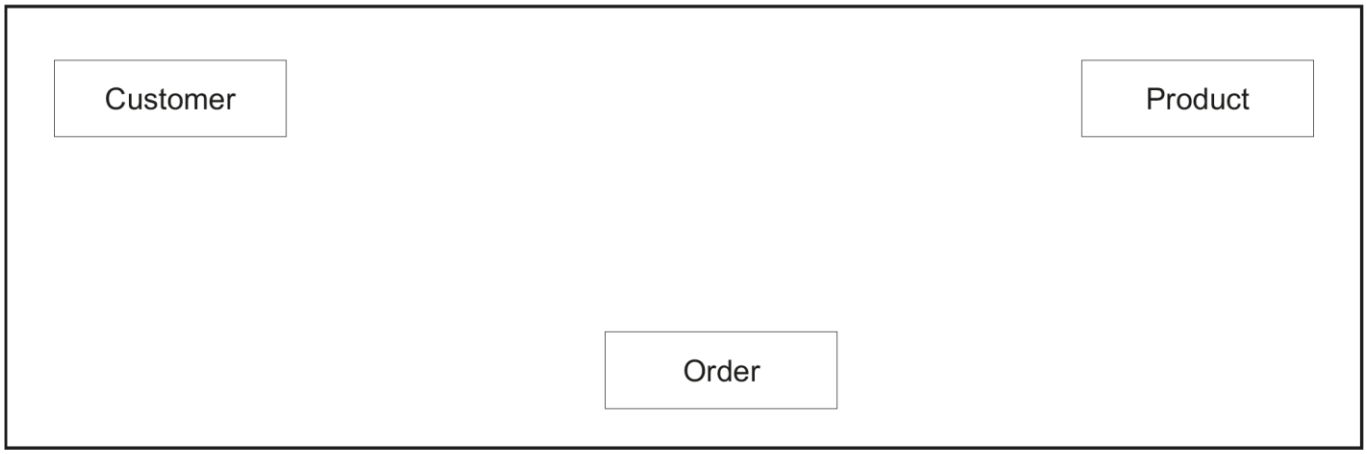
This question was generally answered well, although some candidates did not use the correct terminology and therefore could not be given all the available marks.

Question 4 (b)

(b) One customer can order as many different products as they like in the same order. A customer can also place as many orders as they like.

One product can be ordered multiple times in the same order or ordered by multiple different customers.

Complete the entity relationship diagram to show the relationships between the Product, Customer and Order entities.



[2]

This question required candidates to correctly draw the relationships between the entities as explained in the question.

Candidates were expected to indicate the relationships. Some candidates used either words or other symbols to indicate the relationships, therefore not achieving either of the available marks.

Some candidates used a link entity to avoid a many to many relationship between product and order or indicated a relationship of one product to many orders. Either of these responses were acceptable.

Assessment for learning

Appendices 5c in the specification shows the symbols used for entities and their relationships. Students need to be taught these to use in the exam.

Question 4 (c) (i)

(c) The order table has these fields.

OrderID
OrderDate
OrderAmount
CustomerID
ProductID

(i) State the difference between a primary key and a foreign key.

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..... **[2]**

Many candidates were able to state what a primary key is, but did not state the difference between this and a foreign key and therefore did not achieve both marks.

Question 4 (c) (ii)

(ii) State **one** foreign key in the order table.

.....

..... **[1]**

This question was generally answered well, although some candidates lost marks for mis-spelling the foreign key or adding spaces, both of which are not permitted.

Question 4 (c) (iii)

(iii) State why CustomerID would not make a suitable primary key in the order table.

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..... **[1]**

This question was generally answered well with many candidates gaining the mark.

Question 5 (a)

5 Amaya is an amateur photographer and has bought an old second-hand computer to edit her photographs. The specifications of this computer are shown below.

Processor: Dual Core 1.8 GHz
RAM: 1 GB
HDD: 500 GB

(a) State the role of RAM in a computer system.

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..... **[1]**

This question was answered well, although some candidates stated the role of cache rather than RAM.

Misconception

That RAM and cache are the same thing within a computer system.

Question 5 (b)

(b) Explain what is meant by the term 'virtual memory' and why this may be needed when Amaya is editing her photographs.

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..... **[2]**

Most candidates achieved both of the available marks for this question and linked the scenario in well when writing their response.

Question 6 (a) (i)

6 Zac has an accountancy business. He is moving into an office that has enough space for up to five members of staff. Zac would like to install a Local Area Network (LAN) to allow his staff to work together.

(a) (i) A LAN uses packet switching.

Describe **one** difference between packet switching and circuit switching.

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..... **[2]**

Many candidates achieved both marks for this question with most of the responses describing the different routes taken by the data. The candidates who did less well on this question did not understand differences between packet switching and circuit switching.

Question 6 (a) (ii)

(ii) Explain why packet switching is more suitable for a computer network than circuit switching.

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..... **[2]**

Many candidates lost marks for the second part of Question 6 (a) (ii), despite achieving both marks for the first part 6 (a) (i). A lot of incorrect answers gave a very similar response to the first part of the question instead of explaining why the differences that packet switching has, make it more suitable for a computer network. Common correct answers explained that packet switching can route around hardware failures as the data is not sent along a single route.

Question 6 (b)*

(b)* Zac has hired a company that will advise him on what type of LAN he should set up.

Discuss how Zac could set up a peer-to-peer network and a client-server network.

You should refer to the following in your answer:

- how the computers in each type are connected
- the benefits of each type
- the drawbacks of each type
- the suitability of each type.

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..... **[9]**

Candidates were assessed on the quality of their extended response in this question. Although most candidates were able to give a few advantages and disadvantages of the different types of network, few made suitable links to the scenario.

Some candidates discussed different topologies which was not relevant to the question. Candidates that were given high marks for this question focused more on the scenario, and made clear links between this and the benefits and drawbacks of the different solutions.

Exemplar 3

~~A peer to pee~~ In a peer-to-peer network, computers are connected directly to each other, all connecting to each other either directly or through another computers. This method allows data to be shared easily between computers as ~~there~~ is the data can be sent directly. One of the main benefits of peer-to-peer is that there ~~are~~ is no reliance on a server, this means that, as each computer is independent, if one node fails, the network is still ~~an~~ working. Also, peer to peer networks require little extra hardware so are cheaper to set up. However, security and backups are harder to implement as each computer needs to be backed up individually. The security of data may be important to the firm as they may hold sensitive information such as bank details.

In a Client-Server Network, ~~there~~ all the client computers are connected to a centrally managed server. The main advantage of a client-server network is that it has centralised management. This means that backups are easily done as they can be done centrally. Also, security measures are easily put in place as the data is all stored ~~on~~ in one place. However, these ~~netw~~

types of network are more expensive as there is extra hardware required and often, specialist skills are required to manage a server so someone needs to be employed to run the server. Also, there is a huge reliance on the server because if the server fails, the whole network will fail.

For Zac's business, I think that a peer-to-peer network is more suitable. This is because there are not many people in the office so a peer-to-peer network would be much easier to set up as peer-to-peer networks are only complicated to set up when they are lots of nodes connected. Also, using a peer-to-peer network saves them the added expense of setting up a client-server network. The use of a peer-to-peer network also means they can communicate frequently with their clients without having to worry about the reliance on a server.

The candidate response is well structured. The candidate has firstly highlighted how the computers are connected for each type of network and discussed the advantages and disadvantages. The advantages and disadvantages are well balanced and there are clear links to the scenario throughout.

The candidate has made a recommendation on the most suitable type of network for the scenario, highlighting the key advantages and showing clear reasoning.

The conclusion emphasises the key points and gives a clear justification.

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