OCR
Oxford Cambridge and RSA

Tuesday 16 May 2023 – Afternoon
AS Level Computer Science
H046/01 Computing Principles

Time allowed: 1 hour 15 minutes

Do not use:
• a calculator

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number ☐☐☐☐☐   Candidate number ☐☐☐☐

First name(s) _____

Last name _____

INSTRUCTIONS
• Use black ink.
• Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
• Answer **all** the questions.

INFORMATION
• The total mark for this paper is **70**.
• The marks for each question are shown in brackets **[ ]**.
• Quality of extended response will be assessed in questions marked with an asterisk (*).
• This document has **20** pages.

ADVICE
• Read each question carefully before you start your answer.

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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[4]

(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]**

(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]**

3

(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]**

(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.

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[2]

4

(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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5

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]

(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]

7

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Turn over

8

(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]

(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`.

9

You should write your function using pseudocode or program code.

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.... **[7]**

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

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.... **[2]**

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

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.... **[2]**

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

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[2]

(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]**

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

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.... **[1]**

12

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.

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[2]

(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.

| Customer | | Product |

| Order |

[2]

13

(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]**

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

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.... **[1]**

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

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.... **[1]**

Turn over

14

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]**

(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]**

15

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]**

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

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Turn over

(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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END OF QUESTION PAPER

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