

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Tuesday 16 May 2023 – Afternoon

AS Level Computer Science

H046/01 Computing Principles

Time allowed: 1 hour 15 minutes

plus your additional time allowance

**DO NOT USE:
a calculator**

Please write clearly in black ink.

Centre number

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Candidate number

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First name(s)

Last name

READ INSTRUCTIONS OVERLEAF



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 (*).

ADVICE

Read each question carefully before you start your answer.

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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.

1 _____

2 _____

[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.

[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.

[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.

[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.**

1 _____

2 _____

[2]

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

(a) (i) Tick ONE box that describes how a queue operates. [1]

Last In First Out

First In First Out

(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]
```

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(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. [4]

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

- (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`.

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

[2]

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

[2]

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

1 _____

2 _____

[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.

[3]

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

[1]

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 _____

2 _____

[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 opposite to show the relationships between the Product, Customer and Order entities. [2]

Product

Order

Customer

(c) The order table has these fields.

OrderID
OrderDate
OrderAmount
CustomerID
ProductID

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

[2]

(ii) State ONE foreign key in the order table.

[1]

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

[1]

- 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.

_____ [1]

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

_____ [2]

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.

[2]

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

[2]

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