Oxford Cambridge and RSA

Tuesday 13 May 2025 – 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 **16** pages.

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

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1 The table shows the steps of the **Fetch** stage only of the Fetch-Decode-Execute cycle. The names of the registers are referred to as A, B, C and D.

1	The contents of the ***Register A*** are copied into the ***Register B***.
2a	RAM is read at the location specified by the ***Register B*** and its contents are copied into the ***Register C***.
2b	***Register A*** is incremented by 1.
3	The contents of the ***Register C*** are copied into the ***Register D***.

(a) State the name of each register in the table.

Register A	
Register B	
Register C	
Register D	

[4]

(b) Describe how the performance of the Fetch-Decode-Execute cycle changes when increasing:

(i) The number of cores

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

(ii) The clock speed

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

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2* OCR Accountants is a firm of 30 employees. Each employee handles financial matters for many local businesses.

The organisation runs a single large server which hosts their email, website and files about businesses they work with.

Discuss the different functions of an operating system and why they are essential to the management of this single server.

You should refer to the following in your answer:

- the different functions of an operating system
- how these functions can be used to manage the OCR Accountants' server and why they are essential?

[9]

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3 Ben works for a company that conducts national public surveys. The surveys are given to 10 people at a time and each question has **three** different options to choose from: A, B or C. For each question people select **one** option only.

(a) Identify **two** data methods that Ben could use to capture the data and identify a benefit of each.

METHOD 1

Method .....

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Benefit .....

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METHOD 2

Method .....

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Benefit .....

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[4]

(b) When the data is collated, the answers for each question are stored in separate 2-dimensional arrays. Question 1 is stored in an array called `resultsQ1`.

Each person is stored on a separate row. Each row contains three Boolean values. `True` is used if that option was selected or `False` if that option was not selected.

For example, the results for `resultsQ1` are:

Option A	Option B	Option C
False	False	**True**
False	**True**	False
True	False	False
True	False	False
False	False	**True**
False	**True**	False
False	False	**True**
False	False	**True**
False	False	**True**
False	**True**	False

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In the example shown, the first person selected Option C for question one, the second person selected option B, the third person selected option A, and so on.

Write pseudocode or program code that will:

- count and output which option A, B or C was selected the most in the array `resultsQ1`
- output how many people selected the most popular option.

You may assume that no two options have the same number of votes.

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

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4* A major online retailer is looking to improve how they deliver their products. They currently use delivery companies to deliver their products to customers.

They intend to use drones to deliver any products that weigh below 5 kilograms. Heavier products will be delivered using electric self-driving vehicles.

Discuss the drawbacks of implementing this system.

You should refer to the following in your answer:

- moral and ethical issues
- legal considerations
- environmental considerations.

[9]

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5

(a) Convert the denary number 183 into a hexadecimal number.

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

(b) Calculate the binary addition of these two 8-bit (unsigned) binary numbers.

Show your working.

$$\begin{array}{r} 01010011 \\ \underline{+11101011} \end{array}$$

[2]

(c) Calculate the binary subtraction of these two 8-bit (unsigned) binary numbers.

Show your working.

$$\begin{array}{r} 11011001 \\ \underline{-00100101} \end{array}$$

[2]

(d) Tick (✓) **one** box for each piece of data to show if it is an example of a **String**, **Float** or **Character** data type.

	String	Float	Character
3.14			
“j”			
“Hello World”			

[3]

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6 Beth records how many steps she has completed over a seven-day period.

She stores the total number of steps for each day in a text file. For example:

```
"9000" , "13680" , "11254" , "8258" , "12326" , "9244" , "7542"
```

Beth would like a program that will take the values from the text file and then calculate the average number of steps per day.

(a) Beth has realised that she will need to convert the data from the text file to another data type.

State the data type the values will need to be converted to and state the reason why.

Data type .....

.....

Reason .....

.....

[2]

(b) The values from the text file are copied into a 1d-array called `steps` when the program starts. For example:

9,000	13,680	11,254	8,258	12,326	9,244	7,542

Beth passes the array `steps` into a function called `findAverage` which will return the average number of steps.

(i) An alternative data structure Beth could have used is a list.

Describe **two** differences between a list and an array.

1 .....

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2 .....

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[4]

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(ii) Write the function `findAverage` that will accept the array steps as a parameter and then return the average number of steps.

You should write your answer using pseudocode or program code.

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..... **[5]**

(c) Beth needs to translate her code using a compiler or an interpreter.

Describe **one** benefit to Beth of using a compiler instead of an interpreter.

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

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7 A common method for representing characters is the Unicode character set. This was developed to improve the ASCII character set.

(a) Explain **one** benefit of using Unicode instead of ASCII.

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

(b) Explain **one** drawback of using Unicode instead of ASCII.

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

8 Eve has designed a logic circuit. The expression she has created for the logic circuit is:

$Q = (\neg C \wedge D) \vee (\neg C \wedge \neg D) \vee (A \wedge C \wedge \neg B)$

(a) Complete the Karnaugh map for this expression and state the simplified expression.

You should draw groups around the cells you are using to simply this expression.

Show your working.

CD \ AB	00	01	11	10
00				
01				
11				
10				

Simplified expression:

.....

..... **[4]**

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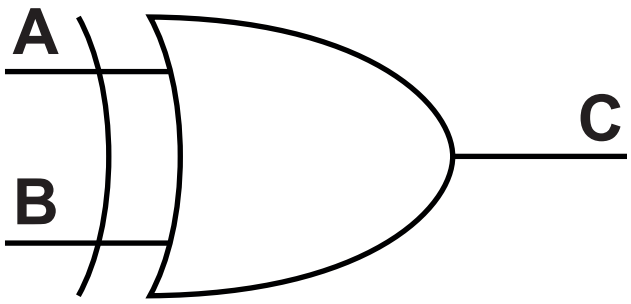
(b) A logic gate is shown here:



(i) State the name of this logic gate.

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

(ii) Complete the truth table for this logic gate.

A	B	C
0	0	
0	1	
1	0	
1	1	

[1]

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9

(a) When computers transmit data over a network they use protocols.

Explain the importance of using protocols when transmitting data.

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

(b) The TCP/IP stack allows communication over large distances such as the internet.

Describe the purpose of the **transport** layer in the TCP/IP stack.

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

END OF QUESTION PAPER

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