Diploma Programme
Programme du diplôme
Programa del Diploma

Computer science
Standard level
Paper 1

28 October 2024

Zone A afternoon | **Zone B** afternoon | **Zone C** afternoon

1 hour 30 minutes

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer all questions.
- The maximum mark for this examination paper is **[70 marks]**.

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Section A

Answer **all** questions.

1. State **two** features of spreadsheets. [2]

2. Outline why beta testing is useful. [2]

3. Describe the role of end users in the process of replacing an old computer system with a new one. [2]

4. Evaluate phased conversion as a method of installation for a new system. [4]

5. Outline what is meant by a media access control (MAC) address. [2]

6. Outline the purpose of a system flow chart. [2]

7. Describe the role of a firewall. [3]

8. Identify **two** advantages of low power consumption digital devices for users. [2]

9. Construct a trace table for the following algorithm: [4]

```
A = 20
B = 12
loop while B > 0
    TEMP = B
    B = A mod B
    A = TEMP
end loop
output (A)
```

10. State **two** characteristics of a collection. [2]

Section B

Answer **all** questions.

11. Laptops are used daily for data storage, web browsing, gaming, and email.

(a) State **one** precaution a user can take to secure their data in case their laptop is stolen. [1]

(b) Outline **one** feature of the operating system that is required when running a program on a laptop. [2]

(c) Justify the decision of the laptop manufacturer to include both wired **and** wireless network connection capability. [4]

A data packet is a basic unit of communication over a computer network.

(d) Describe the structure of a data packet. [2]

(e) Outline **three** reasons why protocols are necessary on a computer network. [6]

12. (a) Consider the following expression:

$$(X > 6) \text{ OR } (Y > 3) \text{ AND } ((X + Y) < 20)$$

(i) State **all** the Boolean operators in this expression. [1]

(ii) State **all** the constants in this expression. [1]

(iii) Determine the value of this expression when X is 6 and Y is 6. Show all your working. [2]

A student plans to create an alarm system for their room. The room has one door and one window.

Three sensors will be used in the system:
- A sensor to detect movement in the room.
- A sensor to detect if the door is locked or unlocked.
- A sensor to detect if the window is open or closed.

The student knows that this practical problem can be expressed in terms of Boolean logic and presented in a truth table.

The student considers the following three inputs:
1. MOTION, where true (1), represents that movement is detected in the room and false (0) represents no movement is detected.
2. DOOR, where true (1), represents that the door is locked and false (0) represents an unlocked door.
3. WINDOW, where true (1), represents that the window is open and false (0) represents a closed window.

(This question continues on the following page)

(Question 12 continued)

A siren will make a warning noise when the door is locked and **either** of the following occur:

- Movement is detected.
- The window is open.

(b) Copy and complete the truth table for this alarm system. [4]

MOTION	DOOR	WINDOW	SIREN
0	0	0	

The central processing unit (CPU) executes a program that is stored as a sequence of machine language instructions in primary memory. It does this by repeatedly fetching an instruction from primary memory, decoding that instruction, executing and storing the result.

(c) (i) Identify the CPU register that holds data to be transferred to primary memory. [1]

(ii) Identify the part of the CPU that performs decoding. [1]

(iii) State where the calculations will be executed. [1]

(iv) Explain the role of buses in the execution of a machine language instruction. [4]

13. Mean and median are different measures of central tendency for a numerical dataset.

Figure 1: Example data values stored in a one-dimensional array, DATA, which contains 10 elements

[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
2	3	3	6	5	9	10	100	14	17

The mean of the data values stored in a one-dimensional array can be determined as follows:
- Add up all the numbers in the one-dimensional array.
- Divide this sum by how many numbers there are.

The mean of the data values stored in the DATA array in **Figure 1** is 16.9.

(a) Construct an algorithm in pseudocode to calculate and output the mean of the data values stored in the one-dimensional array DATA that contains N elements. You may assume that the DATA array containing N elements has been inputted. [4]

The median of the data values stored in a one-dimensional array can be determined as follows:
- Arrange the data values from the lowest to highest value.
- The median is the data value in the middle of the array.
- If there are two data values in the middle, then the median is the mean of those two values.

The median of the data values stored in the DATA array in **Figure 1** is 7.5.

(b) (i) State **one** algorithm that could be used to arrange the data values from the lowest to highest value. [1]

(ii) Construct an algorithm in pseudocode to determine and output the median of the data values stored in the one-dimensional array DATA that contains N elements. You may assume that the DATA array containing N elements has been inputted. [10]