Diploma Programme
Programme du diplôme
Programa del Diploma

Computer science
Standard level
Paper 1

27 October 2023

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]**.

8823 – 7014

Blank page

Section A

Answer **all** questions.

1. State **two** compatibility issues that may occur when two information technology (IT) systems are merged. [2]

2. Define the term *constant*. [1]

3. Identify **two** usability problems that can occur in a voice recognition system. [2]

4. State **three** pieces of information that a data packet must contain. [3]

5. Construct a truth table for the following expression: [3]

A OR NOT B AND C

6. Outline what is meant by a virtual machine. [2]

7. Identify **three** functions of the control unit (CU) in the central processing unit (CPU). [3]

8. (a) Outline what is meant by concurrent processing. [2]

(b) Identify **one** advantage of concurrent processing. [1]

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

```
N = 1216
X = 0
loop while N > 0
    X = X + N mod 10
    N = N div 10
end loop
output(X)
```

(b) Deduce the purpose of the algorithm. [2]

Section B

Answer **all** questions.

10. The staff at a doctor's practice consist of a receptionist and a doctor.

The patients' medical records and payments, the doctor's appointment calendar, and other important data are stored in a database on the central computer.

(a) Outline **one** security measure that can be taken to prevent unauthorized access to the patients' data stored on the central computer. [2]

(b) (i) Identify **one** cause of data loss. [1]

(ii) Describe **one** method that can be used to prevent data loss. [2]

A new vaccine has been distributed that would be of benefit to some of the doctor's patients. A large number of personalized letters need to be written to these patients, inviting them to visit the doctor's practice to be vaccinated.

(c) Describe how these letters could be automatically generated by a word processing application. [3]

When the doctor visits a patient in their home, she needs to be able to access the patient's medical records stored on the central computer in the practice.

(d) Outline **two** reasons for the use of a virtual private network (VPN) in this situation. [4]

A mobile data connection enables the doctor to access internet resources while visiting patients in their homes. Sometimes the data transfer speeds are slow.

(e) Explain why the speed of data transmission across a mobile network can vary. [3]

11. A systems analyst has been employed to make proposals on how to improve the current operation of a design company.

To achieve this, the analyst decided to carry out interviews.

(a) (i) Identify **one** other method of obtaining information from the end-users. [1]

(ii) Outline **one** advantage of using the method identified in part (a)(i) in preference to interviews. [2]

(b) Outline the purpose of prototypes. [2]

A software company has been employed to program and implement a new system proposed by the systems analyst.

(c) Explain why software testing is important at all stages of implementation. [3]

Using images in design may have ethical considerations.

(d) Explain **one** ethical problem associated with using images. [3]

Images are sometimes larger than the limit placed on email attachments. For example, a 60 MB image file needs to be sent by email without losing quality, but a file larger than 10 MB cannot be uploaded as an attachment.

(e) (i) Describe how large image files can be sent by email. [3]

(ii) State **one** other hardware or software problem associated with the use of images. [1]

12. There were 10 gymnasts who took part in a gymnastics competition. The names and the scores for all competitors were sorted in alphabetical order and stored in two arrays, `NAMES` and `SCORES` (see **Figure 1**).

Figure 1: Data held in the `NAMES` array and the `SCORES` array

	NAMES
[0]	Adams, Lana
[1]	Allen, Mary
[2]	Baker, Lilly
[3]	Brown, Lea
[4]	Fox, Tea
[5]	Labar, Tanya
[6]	Lee, Mae
[7]	Miller, Ann
[8]	Palmer, Ella
[9]	Wood, Sarah

	SCORES
[0]	7.8
[1]	6.5
[2]	5.4
[3]	9.2
[4]	6.2
[5]	8.5
[6]	8.8
[7]	5.1
[8]	6.4
[9]	9.1

For example, the score awarded to Mary Allen was 6.5.

(a) State the name of the gymnast whose score is stored in `SCORES[5]`. [1]

(b) Construct an algorithm in pseudocode to determine the average score. [3]

To qualify for the next round of competition, a competitor must have a score above the average score.

(c) Construct an algorithm in pseudocode that will determine and output the number of gymnasts whose scores are above the average score.

You may assume that the average score is stored in the variable `AVERAGE`. [4]

An algorithm is needed that:
- allows input of a gymnast's name
- searches for this name in the `NAMES` array using a binary search
- outputs the gymnast's score. If the inputted name does not occur in the `NAMES` array, it outputs an appropriate message.

For example, from the data given in **Figure 1**:
- if "Allen, Mary" is the input name, then 6.5 should be output
- if "Peterson, Tina" is the input name, then a message saying "this name is not found" should be output.

(d) Construct an algorithm in pseudocode as described above. [7]