Diploma Programme
Programme du diplôme
Programa del Diploma

Computer science
Standard level
Paper 1

Friday 30 October 2020 (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]**.

8820 – 7014

5 pages

Section A

Answer **all** questions.

1. (a) Outline **one** feature of a word processor that could reduce the amount of typing required when writing letters. [2]

(b) State the purpose of technical documentation provided with software. [1]

2. An airline has a server that holds the flight database. Passengers can check in using a number of self-service client kiosks located in the airport.

(a) (i) Define the term *client*. [1]

(ii) Define the term *server*. [1]

(b) Explain the functions performed by the server in this situation. [4]

3. Compare direct changeover with parallel running as a method of implementation. [4]

4. The machine instruction cycle is a sequence of actions that a central processing unit (CPU) performs to execute each machine code instruction in a program.

(a) State where the program is held. [1]

(b) State the part of the central processing unit (CPU) that performs the decoding. [1]

(c) Outline the function of the memory address register (MAR). [2]

5. Describe the steps involved in using the bubble sort algorithm to sort an array. [4]

6. Construct a truth table for the following logical expression. [4]

(A XOR B) AND NOT C

Section B

Answer **all** questions.

7. A school has a local area network (LAN) connecting its computers and peripheral devices. The LAN also provides access to the internet.

(a) Describe the role of a router in this network. [3]

Users have been troubled by slow speeds when accessing the internet.

(b) Outline **two** reasons why there might be a reduction in data transmission speed at certain times. [4]

(c) Outline **two** measures that the school could take to safeguard its data from unlawful access via the internet. [4]

The inventory of office supplies used in the school is stored on the computer as a single file.

Each of the office supplies in the inventory (such as paper, ink, toner, printers, pens, staplers, pencils and scissors) has a unique ID number, name, maximum quantity, minimum quantity and remaining quantity.

(d) Outline the steps in an algorithm that would output a list of supplies with the quantity to be ordered. [4]

8. Website developers need to consider a range of usability factors when designing a website.

(a) Identify **two** usability factors that need to be considered in the design of a website. [2]

(b) Outline **one** reason why visual displays on a computer screen can create difficulties for some people. [2]

A company promotes its products online. To make a purchase, customers are required to register with the company and provide data like their name, date of birth, age, gender and email address. Once registered, more than one customer is able to access the server to retrieve and modify their data at the same time.

(c) (i) State where the customer data is held during the process of modifying their data. [1]

(ii) Explain how the operating system ensures that each customer's data is secure when multiple users are accessing the data at the same time. [4]

The company is considering sharing its customers' data with marketing organizations.

(d) Explain why there could be ethical issues for the company when sharing its customers' data. [6]

9. A school has 100 students. All student names (strings) and student ID numbers (five-digit integers) are held in two separate one-dimensional arrays named `SID` and `SNAMES`.

	SID
[0]	10011
[1]	10002
[2]	11876
[3]	10122
[4]	22103
…	…
[99]	32000

	SNAMES
[0]	Aron Zucker
[1]	Cary Armand
[2]	Pia Baranger
[3]	Peter Bow
[4]	John Buffet
…	…
[99]	Evan Apples

For example, student Pia Baranger has ID number 11 876.

A binary search algorithm is not used to find a particular name in array `SNAMES`.

(a) State the reason for not using a binary search. [1]

The school offers its sporting program to students and has a basketball team, a tennis team and a football team. Each student must choose at least one of these three sports.

Three collections, `BASKETBALL`, `TENNIS` and `FOOTBALL`, are created. When a student chooses a sporting activity, their ID number is added to the appropriate collection.

For example:

```
BASKETBALL={10011, 11876, 10122}
TENNIS={10011, 11876, 10002}
FOOTBALL={10011, 10002, 22103, 32000}
```

The method `isIn(X, COL)` is available, where:
- `X` is a five-digit integer representing an ID number
- `COL` is a collection that holds student ID numbers.

The method `isIn(X, COL)` returns `True` if the ID number `X` is in the collection `COL`; `False` otherwise.

For example:

`isIn(11876, BASKETBALL)` returns `True`
`isIn(11876, FOOTBALL)` returns `False`

(b) Construct an algorithm in pseudocode for the method `isIn(X, COL)`. [4]

(This question continues on the following page)

(Question 9 continued)

The football and tennis training sessions are held at the same time. The football coach would like to know how many students will not be able to attend the football training session because they will be attending the tennis training session.

(c) Construct an algorithm in pseudocode that will output the number of students who have chosen both tennis and football. The method `isIn()` should be used in your answer. [3]

The school coordinator would like to check whether there are students who have not yet chosen any one of the three sports.

(d) Construct an algorithm in pseudocode that will output the names of students who have not yet chosen any one of the three sports. An appropriate message should be displayed if every student has chosen a sport. [7]