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Diploma Programme
Programme du diplôme
Programa del Diploma

Computer science
Standard level
Paper 1

2 May 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]**.

2224 – 6912

6 pages

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Section A

Answer **all** questions.

1. (a) State **one** benefit of using software-as-a-service (SaaS). [1]

(b) State **one** drawback of using software-as-a-service (SaaS). [1]

2. Describe the pilot running method for the implementation of a new system. [2]

3. Describe the purpose of user acceptance testing. [2]

4. Identify **two** methods of providing user documentation. [2]

5. Outline **one** method that can be used to deliver user training. [2]

6. Define the term *peripheral*. [1]

7. State **two** usability issues that could occur when using a cell phone (mobile phone). [2]

8. Identify **two** methods that can be used to improve the accessibility of a computer system for users. [2]

9. (a) Outline the purpose of the memory data register (MDR). [2]

(b) Outline the role of the arithmetic logic unit (ALU). [2]

10. (a) State the binary equivalent of the denary number 37. [1]

(b) State the hexadecimal equivalent of the binary number 10011110. [1]

11. Distinguish between **two** types of primary memory. [2]

12. Identify **two** of the layers of the Open Systems Interconnection (OSI) seven-layer model. [2]

Section B

Answer **all** questions.

13. Different transmission media may be used within a network.

(a) (i) Identify **two** characteristics of fibre optic cables as a transmission medium. [2]

(ii) Identify **two** characteristics of wireless transmission. [2]

(b) Describe how encryption is used to protect data during transmission. [3]

(c) Explain how data is transmitted using packet switching. [5]

(d) Explain **one** social implication of changes to working patterns due to the use of a virtual private network (VPN). [3]

14. (a) Define the NOR Boolean operator. [1]

A car has features that monitor its speed, direction and distance from the car in front. This is shown in **Figure 1**.

Figure 1: Rules to control car motion

Input	Binary representation	Description
A	0	Car is less than 20 metres from the vehicle in front.
	1	Car is 20 metres or more from the vehicle in front.
B	0	Car is travelling in reverse or stationary.
	1	Car is travelling forward.
C	0	Car speed is more than 130 kilometres per hour.
	1	Car speed is 0–130 kilometres per hour.

For example, if the car is travelling forward, input B would have a binary representation of 1.

(b) Construct a logic diagram with inputs A, B, and C and output Z to represent the following scenario:

Output Z equals 1 when:

- the car is travelling forward AND it is less than 20 metres from the vehicle in front.

  OR

- the car speed is more than 130 km per hour.

In all other conditions, output Z equals 0. [4]

An additional row (input D) is to be added to assist when the car is in reverse or stationary. Input D checks if there are obstructions less than 3 metres from the rear of the car.

(c) State the rules that need to be added to **Figure 1** to test this condition. [2]

(This question continues on the following page)

(Question 14 continued)

Information similar to that presented in **Figure 1** could be used to construct decisions and conditions in program design (see **Figure 2**).

Figure 2: Identifiers for car motion rules

Identifier	Description
F	Distance in metres to the vehicle in front
S	Speed of car in kilometres per hour
T	Travelling in a forward direction

(d) Determine the value of the following expression given that the input values for F, S and T are:

```
F = 5
S = 30
T = true

F >= 25 AND S >= 10 AND S <= 130 AND T = true
```

You must show your working. [2]

(e) Construct an algorithm in pseudocode that repeats the following steps while the car is moving:

- Input the value for the distance from the vehicle in front.
- Input the value for the speed of the car.
- Check the inputs and notify the user if either the distance from the car in front is less than 20 metres or if the speed of the car is more than 130 kilometres per hour.

The algorithm will only terminate when the car stops moving. [6]

15. (a) Describe **one** standard operation of collections. [2]

The collection `RAINBOW` holds the names of the main colours of the rainbow along with their order indicator, as follows:

```
Blue, E, Green, D, Indigo, F, Orange, B, Red, A, Violet, G, Yellow, C
```

(b) Construct an algorithm using pseudocode to read the data from `RAINBOW` and store the names of the colours in a one-dimensional string array, `COLOUR`, and the order indicators in another one-dimensional string array, `ORDER`.

The matching colour and order indicator must have the same index in the `COLOUR` and `ORDER` arrays. [4]

(c) Construct an algorithm using pseudocode to sort the contents of the array `ORDER` into alphabetical order. The indexes for the corresponding data in the two parallel arrays must remain the same after sorting. [5]

(d) Compare and contrast the bubble sort algorithm and the selection sort algorithm. [4]