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Diploma Programme
Programme du diplôme
Programa del Diploma

Computer science
Standard level
Paper 1

Thursday 5 May 2022 (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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5 pages

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Section A

Answer **all** questions

1. State **two** compatibility issues that may arise when international businesses merge. [2]

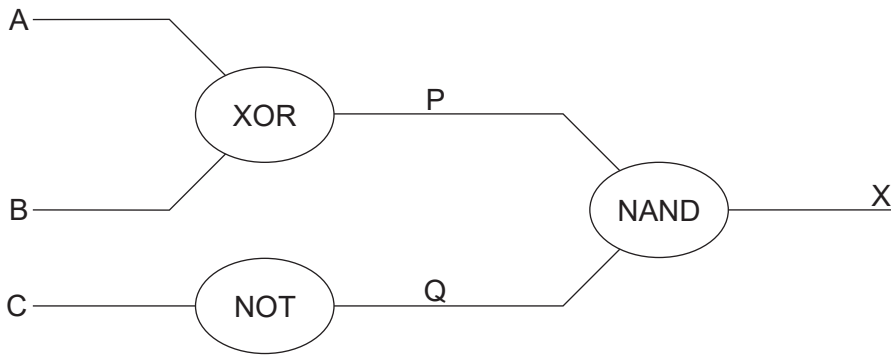
2. Outline **one** reason why accurate user documentation is necessary for a system. [2]

3. Identify **two** differences between a wide area network (WAN) and a local area network (LAN). [2]

4. Outline the reason for compression when transmitting data. [2]

5. Outline the need for a translation process from high level language to machine code. [2]

6. Draw the truth table for the following logic circuit. [4]



7. Calculate, showing your working in each case:

(a) the binary (base 2) value of the denary (base 10) number: 105 [2]

(b) the hexadecimal (base 16) value of the denary (base 10) number: 200 [2]

8. Identify **one** function of a single-user operating system. [1]

9. Define the term *usability*. [1]

10. Outline **one** reason for the use of standards in the construction of networks. [2]

11. Explain how cache memory affects system performance. [3]

Section B

Answer **all** questions

12. A business's computer system needs to be updated.

(a) (i) Identify **one** stakeholder to be considered when planning the new system. [1]

(ii) Outline **one** consequence of not including all stakeholders in the design of the new system. [2]

(b) Describe **two** appropriate techniques to gather the information needed to find a suitable solution for the updated system. [4]

(c) Outline **one** reason testing should take place at every stage of the development process. [2]

The new system is now ready for implementation.

(d) Evaluate **two** methods the business could use to implement the new system. Include the benefits and drawbacks of each. [6]

13. A teacher would like a simple program to store the names, marks and grades of students in a set of three parallel one-dimensional arrays called `NAME[]`, `MARK[]` and `GRADE[]`.

The grade boundaries for the individual grades are shown below:

Mark	Grade
80 and above	Distinction
60 and above	Merit
40 and above	Pass
Below 40	Fail

The class has 30 students.

(a) Identify **two** components in a conditional statement. [2]

(b) Construct an algorithm using pseudocode to take the marks that have been stored in `MARK[]`, convert them into the appropriate grade and store the calculated grades in `GRADE[]`. [5]

(c) Outline how the name, mark and grade in the three arrays correspond to the same student. [2]

(d) Construct an algorithm using pseudocode to output the names and grades of all students who achieve a grade of Merit or Distinction. [3]

(e) Explain how you would change your algorithm in **part (d)** to allow a user to choose a grade and output the names and marks of the students who have achieved this grade. [3]

14. The array `DATA_ARR[]` is a one-dimensional array of 12 integers.

[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
27	29	36	39	40	42	45	50	58	60	61	68

Algorithm 1 represents a method of searching the array `DATA_ARR[]` to see if it contains a specific value.

Algorithm 1

```
input TO_FIND
LIMIT = 11
LOC = FALSE
ITERATE = 0
loop while not LOC and ITERATE <= LIMIT
    if DATA_ARR[ITERATE] = TO_FIND then
        LOC = TRUE
    end if
    ITERATE = ITERATE + 1
end loop
if LOC then
    output TO_FIND, "is in the array"
else
    output TO_FIND, "is NOT in the array"
end if
```

(a) Copy and complete the trace table for **Algorithm 1** using `TO_FIND = 39`.

The first value of the first row has been done for you. [4]

TO_FIND	LOC	ITERATE	DATA_ARR [ITERATE]	Output
39				

(b) State the constant used in **Algorithm 1**. [1]

(This question continues on the following page)

(Question 14 continued)

Algorithm 2 represents an alternative method of searching the array `DATA_ARR[]` to see if it contains a specific value.

Algorithm 2

```
input TO_FIND
LOC = FALSE
LOW_LIM = 0
UP_LIM = 11
loop while LOW_LIM <= UP_LIM and LOC = FALSE
    MID_VAL = (LOW_LIM + UP_LIM) div 2
        if DATA_ARR[MID_VAL] = TO_FIND then
            LOC = TRUE
        else
            if TO_FIND < DATA_ARR[MID_VAL] then
                UP_LIM = MID_VAL - 1
            else
                LOW_LIM = MID_VAL + 1
            end if
        end if
end loop
if LOC = TRUE then
    output TO_FIND, "is in the array"
else
    output TO_FIND, "is NOT in the array"
end if
```

(c) Copy and complete the trace table for **Algorithm 2** using `TO_FIND = 50`.

The first two values of the first row have been done for you. [4]

TO_FIND	LOC	LOW_LIM	UP_LIM	MID_VAL	DATA_ARR [MID_VAL]	Output
50	FALSE					

(d) Outline why `MID_VAL` could not be a constant. [1]

(e) Evaluate the use of a sequential search and a binary search including the advantages and disadvantages of each. [5]

References:

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