Diploma Programme
Programme du diplôme
Programa del Diploma

Computer Science
Higher Level
Paper 1 Mock Exam

Dec 2017

2 hours 10 minutes Duration

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 **[100 marks]**.

6 pages

International Baccalaureate
Baccalauréat International
Bachillerato Internacional

Section A

Answer **all** questions.

1.   Outline two different types of testing.   [2]

2.   Identify **two** common causes of data loss.   [2]

3.   Identify **two** reasons for releasing a software update.   [2]

4.   Explain how cache memory can speed up the processing within a computer.   [2]

5.   One of the functions of an operating system is memory management.

    Describe how this function prevents the system from crashing when more than one program is run at the same time.   [2]

6.   Explain the importance of complying with the OSI standard networking model.   [2]

7.   Outline one advantage and one disadvantage of **data compression.**   [4]

8.   Explain how the use of media access control (MAC) addresses can improve security.   [2]

9.   Identify two advantages of using a Linked-List rather than using an array.   [3]

10.   Outline one difference between storing data in a binary tree as opposed to storing it in a linear data structure.   [2]

11.   Identify **two** features of an autonomous agent acting within a larger system.   [2]

Section B

Answer **all** questions.

12. A large company has taken over another business. This takeover has required various changes to be made. One of the changes requires data migration.

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

           (ii)   Describe **two** problems, concerning **data migration**, which the company may have to overcome.   [4]

    (b)   Other than data migration, describe **two** aspects of change management that may arise from this takeover.   [4]

The company produces industrial chemicals. One of the chemical processes is represented by the following logic diagram, where A and B are input signals and C is an output signal.
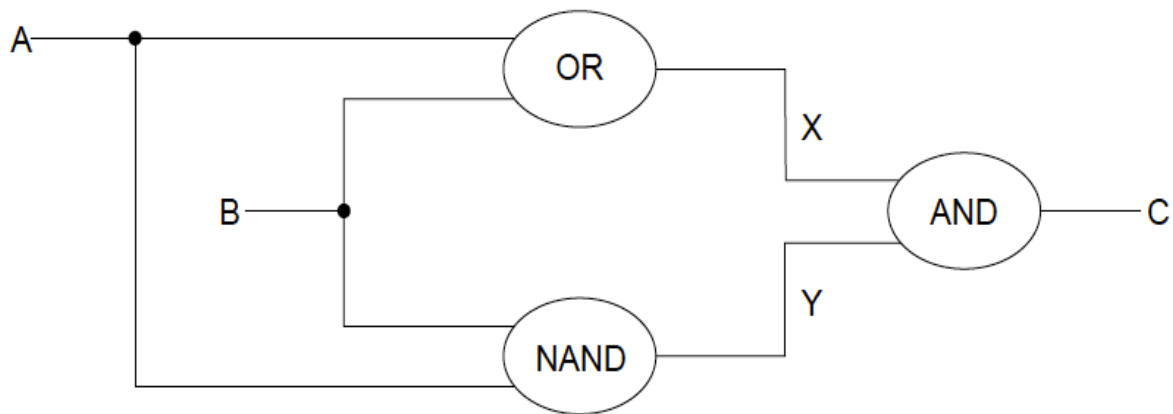
    (c)   (i)   Construct the truth table corresponding to this diagram.   [3]

           (ii)   Identify the single logic gate that is equivalent to this diagram.   [1]

    (d)   Outline how truth tables can be used to test that any two logic diagrams are equivalent.   [2]

Turn over

13. (a)   Copy the table below and use it to trace the following algorithm,
where DATA is a Collection, and **B** and **C** are also collections.
All 3 collections are initially empty.

```
DATA.addItem(2)
DATA.addItem(4)
DATA.addItem(-1)
DATA.addItem(3)

DATA.resetNext()
loop while DATA.hasNext()
  A = DATA.getNext()
  if A >= 0 then
    if A mod 2 = 0 then
      B.addItem(A)
    else
      C.addItem(A)
    end if
  end if
end loop
```

[4 marks]

DATA.hasNext() ?	A	A >= 0?	A mod 2 = 0?	Contents of B	Contents of C

(b)   In Pseudocode, write an algorithm that calculates the average of the numbers
in the DATA collection - it must also function for different values in DATA.   [4]

(c)   An Array called NUMBERS is to be searched to see if it contains a specified value.
In Pseudocode, write a linear search algorithm that inputs a value to be searched for,
searches through the NUMBERS array, and outputs either "Found" or "Not Found".   [4]

(d)   A binary search could be performed on a sorted array NUMBERS that contains decimal values.
Explain why the binary search will be considerably faster than a linear search.   [3]

14.

A small business, TSPORT, sells T-shirts at sports events. They order their shirts from a foreign country and ship them in large quantities to their central warehouse in France. From the warehouse, shirts are distributed to employees in many different cities in a variety of countries, where the local employees sell them at local sports events. A typical city office has 5-10 employees, working in a small office with a small warehouse nearby. TSPORT has a central office with 50 employees who manage the entire company.

(a) Describe 2 purposes for TSPORT to use a WLAN.   [3]

(b) Outline why a LAN might be used by some TSPORT employees.   [2]

(c) Explain why standard protocols are important for the TSPORT networks.   [2]

(d) Describe 2 different computer platforms that are needed for
    different tasks in the organization.   [3]

(e) Assume that TSPORT decides to create and use a new database system.

   (i) Outline 2 methods for collecting user needs at the beginning of the project. [3]

   (ii) Explain the important role of prototypes in the development process.   [2]

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15.   A laptop computer supplements its primary memory by making use of **virtual memory**.

   (a)   Outline how **virtual memory** functions.   [2]

   The laptop has 1GB of random access memory (RAM) and a single processor.
   The laptop is using one of the latest operating systems to run multimedia gaming programs.

   (b)   Explain the limitations and consequences of using the laptop for this purpose.   [3]

   One of the laptop's game applications stores the data relating to the different actions of one
   of its characters in a **stack**.

   (c)   Suggest **one** reason why the character's actions might be stored in a **stack**.   [2]

   Sometimes during the game data is read from the stack (STACK) into a queud (QUEUE).

   (d)   Using appropriate access methods for stacks and queues, construct Pseudocode that
         reads the data from STACK and enters it into QUEUE. You should assume that the
         STACK and QUEUE already exist and STACK contains data.   [6]

   (e)   Outline **one** advantage of using a CIRCULAR queue rather than
         a simple linear queue.   [2]

16.

A candy company is designing a new **automated vending machine**, where customers can buy candy. These machines will be available in airports, shopping malls, on street corners, etc.

The goal is to make the machines work without using cash. They intend to create a system so that customers can pay by using their mobile phone. They will place a call to a phone number printed on the front of the machine and place their order. Then the candy will slide out of a slot in the machine. The candy company will collect money from the customer's telephone account.

The vending machines should be further automated. By using facial recognition technology, the vending machine will display advertisements chosen according to gender and age. For example, the machine might advertise chewing gum for girls, chocolate for boys, mints for men, etc.

The advertising choices will be based on the items that have actually been purchased by customers in the past. A large database will collect data on all the transactions over a long period of time, and analyse popularity according to age and gender. For this to be useful, the vending machines must have a permanent connection to the central database.

 (a) Describe a type of **sensor** that could be used to activate the advertising screen whenever a pedestrian comes close to the machine.   *[2]*

(b) Explain the purpose of one type of **actuator** in the candy machine.   *[2]*

 (c) The **processing** for the facial recognition could be performed directly inside the vending machine, or it could be performed by a central computer. Describe **one advantage** and **one disadvantage** of using a central computer for doing the facial recognition processing.   *[4]*

 (d) Assuming that the facial recognition is performed by a central computer,
       outline **three other needs** for **three different microprocessors** in the vending machine.   *[3]*

(e) The vending machine might require a **secondary storage device.**

     Explain how the vending machine could display graphical advertisements
     if it does NOT contain a secondary storage device.   *[2]*

 (f) Explain why there is probably no need to implement Virtual Memory Management
       in this vending machine.   *[2]*