Diploma Programme
Programme du diplôme
Programa del Diploma

Computer science
Standard level
Paper 1

Tuesday 17 November 2015 (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]**.

8815 – 7014

Section A

Answer **all** questions.

1. Human interaction with the computer system includes a range of usability problems.

(a) Define the term *usability*. [1]

(b) Identify **two** methods that could be used to improve the accessibility of a computer system. [2]

2. By making direct reference to the technologies used, explain how a virtual private network (VPN) allows a travelling salesperson to connect securely to their company's network. [4]

3. Construct a truth table for the following Boolean expression.

(A AND B) NOR C [3]

4. A small hotel buys a software package to manage their bookings.

(a) Describe **two** types of documentation that should be provided with the software package. [4]

(b) State **two** methods of delivering user training. [2]

5. A school uses a local area network (LAN) which connects several computers and a printer to a server and allows access to the internet.

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

(b) Identify the different clients in this network. [1]

(c) (i) Identify **one** external threat to the security of the school's computer system. [1]

(ii) State **one** way to protect the computer system from the threat identified in part (c)(i). [1]

6. A sub-program `all_even()` accepts a positive integer N and outputs `true` if all digits of N are even, otherwise it outputs `false`. For example, `all_even(246)` outputs `true` and `all_even(256)` outputs `false`.

The following algorithm is constructed for the sub-program `all_even(N)`.

```
EVEN = true
loop while (N > 0) and (EVEN = true)
     if (N mod 10)mod 2 = 1 then
          EVEN = false
     end if
end loop
output EVEN
```

(a) Explain why this algorithm does not obtain the correct result. [2]

(b) Outline what should be changed in the algorithm to obtain the correct result. [3]

Section B

Answer **all** questions.

7. A hardware shop supplies a wide variety of bathroom equipment. There are 15 shop assistants who serve customers, 3 office staff who handle the administration, and a manager.

A specialized company is asked to design and implement a new computer system for the shop.

(a) (i) Identify **two** different types of users of the system. [2]

(ii) Explain the role of users in the process of developing the new computer system. [3]

(b) Describe why it is useful to produce more than one prototype of the new system. [2]

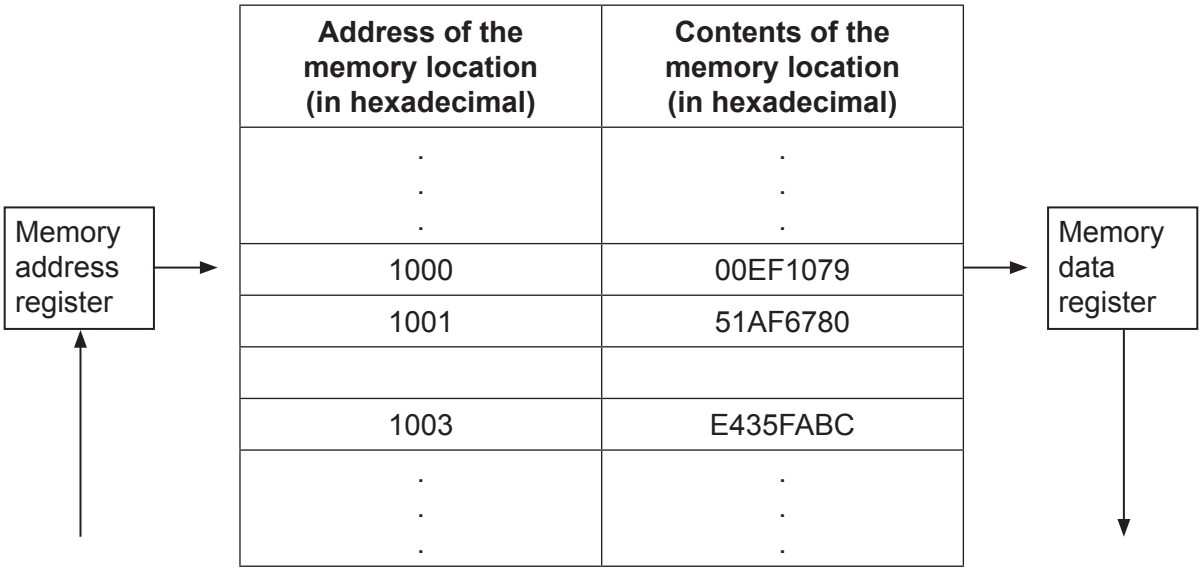
(c) Outline **two** problems that may occur when transferring data from the old system to the new system. [4]

The new system is implemented using parallel running.

(d) (i) Outline what is meant by parallel running. [2]

(ii) Outline **one** reason for choosing parallel running as opposed to a direct changeover. [2]

8. The following diagram shows the structure of the random access memory (RAM).



Address of the memory location (in hexadecimal)	Contents of the memory location (in hexadecimal)
. . .	. . .
1000	00EF1079
1001	51AF6780
1003	E435FABC
. . .	. . .

(a) Calculate the number of bits in each memory location. [1]

(b) Calculate the number of bytes in each address. [1]

(c) Outline the function of the:

(i) memory address register [2]

(ii) memory data register. [2]

(d) (i) Identify **two** functions of the operating system. [2]

(ii) State where the operating system is held when the computer is turned off. [1]

The machine instruction cycle refers to the retrieval of an instruction from the RAM, and subsequently decoding, executing and storing the result.

(e) (i) Construct a diagram to illustrate the structure of a central processing unit (CPU), clearly showing the flow of data within the CPU. [4]

(ii) Identify the part of the CPU which performs decoding. [1]

(iii) Identify the part of the CPU which executes the instruction. [1]

9. A candy company manufactures 20 different kinds of candy, each identified by a product ID. An array, `Product_ID`, is used to store the product IDs, and another array, `Unit_Price`, is used to store the price per unit of each type of candy. The unit price of the product identified by `Product_ID[N]` is equal to `Unit_Price[N]` for any index `N`.

Product_ID		**Unit_Price**
Mints-1A	[0]	15.20
Choco-1B	[1]	18.10
Jelly-1Q	[2]	16.30
	…	
Choco-2A	[19]	11.90

(a) State the price of the candy identified by `Product_ID[2]`. [1]

(b) Explain the steps that would be needed in an algorithm to calculate the average unit price. [3]

(c) Construct the algorithm that will output the price of a candy after its product ID is entered by the user. The algorithm should output an appropriate message if the product ID entered does not appear in the array `Product_ID`. [6]

The company maintains two warehouses each of which stocks a selection of the 20 types of candy indicated above.

The first warehouse stocks 15 items and their IDs are stored in an array, `One`. The second warehouse stocks 10 items and their IDs are stored in an array, `Two`.

All product IDs common to both warehouses will be placed in an array, `Three`.

(d) (i) State the maximum number of common product IDs which can be placed in `Three`. [1]

(ii) Construct the algorithm that will place all product IDs common to both warehouses in `Three`. [4]