IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

M07/5/COMSC/SP2/ENG/TZ0/XX

22077014

COMPUTER SCIENCE
STANDARD LEVEL
PAPER 2

Wednesday 9 May 2007 (morning)

1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Answer all the questions.

*Answer **all** the questions.*

1. A car-park opens from 07:30 to 18:00 each day and functions as follows:

When a car is about to enter the car-park, a ticket is issued to the driver and the barrier is raised, allowing the car to enter.

When the driver wishes to leave, he/she must insert the ticket into the pay-machine and pay the amount displayed.

Part of the program that controls the operation of the car park is shown below.

```
public class CarPark
{

  public static void main(String[ ] args)
  {

       String start, finish;              // times of entry and
                                          // departure in 24 hour
                                          // format e.g. 07:30

       int hours = time(start, finish);   // the function 'time'
                                          // returns the hours parked

       double cost = charges(hours);      // the function 'charges'
                                          // returns the cost of
                                          // parking

       output(¨Cost of Parking = $ ¨+ cost);
  }
}
```

(a) Suggest how the pay-machine is able to automatically determine the time of entry when calculating the cost of parking. *[3 marks]*

(b) If the car-park charges $3 for the first hour of parking and then $2.50 for any additional hour, construct the method `charges`. *[4 marks]*

Recall that the string method `.substring (a, b)` returns part of a string, where the first character is in position `a` and the last is in position `(b-1)`.

For example, if `name = "Smith"`, then `name.substring(0,4)` would return the string "`Smit`".

(c) If `name = "South America"`, determine the result of

```
name.substring(6,13)
```

[1 mark]

(This question continues on the following page)

(Question 1 continued)

The method `time` returns the length of stay in hours. Parts of an hour are always rounded up, for example, if `start` = "07:30" and `finish` = "09:35", the method `time` would return the value 3.

(d) Given that the integer method `Integer.parseInt(string)` converts a string into an integer, construct the method `time()`. *[8 marks]*

It is now decided to open the car-park 24 hours a day.

(e) (i) Describe a problem that might now arise with the program. *[2 marks]*

(ii) Suggest how the problem might be solved. *[2 marks]*

2. Consider the following method:

```
public void multiples(int a, int y)
{
     for (int x = a; x < y; x = x+a)
     {
          System.out.println(x);      //output the value of x
     }
}
```

(a) (i) Explain how the code "`x < y`" functions in the above loop structure. *[3 marks]*

The above method could be rewritten using a `do...while` loop structure instead of the `for...` loop structure. This has been **partly** shown below:

```
public void multiples(int a, int y)
{
     do

     while...
}
```

(ii) Construct the method `multiples` using a `do...while` loop structure, so that it performs the same as the original method shown at the top of this page. *[4 marks]*

(iii) Explain why replacing the condition "`x < y`" by "`x ! = y`" (x does not equal y), would not necessarily produce the same result in the method `multiples`. *[3 marks]*

(b) (i) State typical values for both primary and cache memory for a modern desk-top computer. *[2 marks]*

(ii) Explain how the use of cache memory can lead to a more efficient running of the computer. *[3 marks]*

(c) Virtual memory is normally available in modern desk-top computers.

(i) Explain the advantage of using virtual memory. *[3 marks]*

(ii) Explain why the size of the primary memory still needs to be considered when running large programs, even when virtual memory has been incorporated. *[2 marks]*

3. *This question requires the use of the Case Study*.

A computer laboratory has been specifically equipped for use by visually impaired students.

(a) Outline how an electronic reading aid will enable these students to access printed notes handed out on paper by teachers. *[3 marks]*

(b) Apart from an electronic reading aid, describe how another hardware feature of this laboratory could allow better access to information for students with

(i) limited sight *[2 marks]*

(ii) no sight. *[2 marks]*

The company that designed the laboratory used a prototyping approach when designing the user interfaces for these computers.

(c) Outline how this approach would involve the intended users. *[3 marks]*

(d) Apart from the hardware and software, suggest with reasons how **two** other features of a normal computer laboratory should be adapted in order to suit these particular clients. *[4 marks]*

Not all disabled students would have access to such a specialized laboratory.

(e) Discuss **two** implications for such students when studying for courses such as the IB Diploma. *[6 marks]*

A password system will be installed to prevent unauthorized access to this laboratory.

(f) Compare the use of Braille keypads and voice recognition for use in the password system. *[4 marks]*

Voice recognition can be used to aid people with different disabilities.

(g) Outline **three** ways in which voice recognition systems can assist disabled computer users. *[6 marks]*