M11/5/COMSC/SP1/ENG/TZ0/XX

International Baccalaureate®
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COMPUTER SCIENCE
STANDARD LEVEL
PAPER 1

Thursday 19 May 2011 (afternoon)

1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Section A: answer all the questions.
- Section B: answer all the questions.

SECTION A

*Answer **all** the questions.*

1. State **two** ways in which the functioning of a compiler differs from that of an interpreter. *[2 marks]*

2. (a) Convert the decimal number 17 into 6-bit two's complement. *[1 mark]*

(b) Convert the decimal number –17 into 6-bit two's complement. *[1 mark]*

(c) Convert the hexadecimal number $A3_{(16)}$ into binary. *[2 marks]*

3. Outline the following functions of an operating system.

(a) memory management *[2 marks]*

(b) security *[2 marks]*

4. Outline **one** reason for using defragmentation software. *[2 marks]*

5. Consider the method `test()` shown below.

```
public static double test(int x, int y)
{
  if (y != 0)
  {
    return (double)(x % y) / y;
  }
  else
  {
    return 0;
  }
}
```

(a) State the value that would be returned after the call `test(11, 2)`. *[1 mark]*

(b) Identify a reason for the line `if (y != 0)`. *[1 mark]*

(c) Suggest a reason for the code `(double)` that appears in the line

`return (double)(x % y) / y;`. *[2 marks]*

6. Explain **two** ways of reducing the time required to transmit data in a computer network. *[4 marks]*

7. (a) State a suitable file format for a graphics file that needs to be made publicly available for low bandwidth download. *[1 mark]*

(b) Outline **one** advantage of using the file format for this purpose. *[2 marks]*

8. Compare *bus topology* with *star topology* for networking. *[3 marks]*

9. (a) Outline **one** benefit provided by *high-level programming languages*. *[2 marks]*

(b) State **two** advantages of using *modularity* in programming. *[2 marks]*

SECTION B

*Answer **all** the questions.*

10. A college issues student ID cards that contain a magnetic strip. These cards can be used in the college cafeteria to purchase meals.

There is a card reader in the cafeteria which is connected to a server via a local area network (LAN).

(a) Define the term *LAN*. *[1 mark]*

The purchase of a meal requires two transactions with the server.

- Before a meal is chosen, the card is read and the account balance is displayed. If the account has a negative balance no meal will be allowed. Otherwise the student chooses a meal.
- After the student has chosen a meal, the cashier enters the cost of the meal which is deducted from the account (which may become negative).

(b) Identify the processes that take place in the server for both transactions. *[5 marks]*

(c) Discuss **two** possible improvements to the system. *[4 marks]*

11. A children's hospital has decided to provide Internet facilities to its long-term patients to support their education during medical treatment.

Two schools have offered to support this initiative. School A will allow access to class work stored on files. School B will provide classes where pupils in hospital can interact in real-time with those in the school.

(a) Identify **two** additional input devices that would be required for School B's approach. *[2 marks]*

(b) Compare the advantages of School A's approach and School B's approach for the patients. *[4 marks]*

(c) Discuss the social implications of implementing this educational project in hospitals. *[4 marks]*

12. Consider the following method.

```
public static boolean whatPropertyIsIt(String s)
{
  int i = 0;
  int j = s.length() - 1;

  while (i < j)
  {
    if (s.charAt(i) != s.charAt(j))
    { return false; }
    i = i + 1;
    j = j - 1;
  }
  return true;
}
```

Note that `s.charAt(i)` is the character in the i^{th} position of `String s`.
For example, where `s` is the string "`abcde`", `s.charAt(2)` is the character '`c`'.

(a) By copying and completing the following table, trace the method for the call `whatPropertyIsIt("xyzdyx")`. *[4 marks]*

i	j	i < j	s.charAt(i) != s.charAt(j)	return value
0	5	true	false	

(b) Identify the purpose of this program. *[1 mark]*

(c) Identify the termination conditions for the loop. *[2 marks]*

(d) Explain the effect of changing the condition in the **`while`** loop to `i <= j`. *[3 marks]*

13. A business is considering computerizing its operations and has employed a team of system analysts to investigate possible solutions. The first task of this team is to clearly define the problem.

(a) Outline the benefits of **two** methods of data collection that will help them to clearly define the problem. *[4 marks]*

Once the problem is defined, the analysis team will produce different types of documentation.

(b) Outline the documentation that would be presented to

(i) the business; *[2 marks]*

(ii) the design team. *[2 marks]*

(c) Outline **one** additional piece of documentation that would be produced after the analysis stage. *[2 marks]*