N08/5/COMSC/HP1/ENG/TZ0/XX

88087011

International Baccalaureate®
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COMPUTER SCIENCE
HIGHER LEVEL
PAPER 1

Friday 14 November 2008 (afternoon)

2 hours 15 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. Define the term *operating system*. *[2 marks]*

2. Describe the role of the following in creating a computer program.

(a) An *editor*. *[2 marks]*

(b) A *compiler*. *[2 marks]*

(c) An *interpreter*. *[2 marks]*

3. Outline the meaning of *buffering*. *[2 marks]*

4. State **two** basic network topologies. *[2 marks]*

5. Describe how a binary search works. *[6 marks]*

6. Describe, with the aid of a diagram, the data structure called a doubly linked list. *[3 marks]*

7. State **two** methods of collecting data. *[2 marks]*

8. Construct a labelled systems flowchart for the data processing described below.

A sequential transaction file is sorted,
stored onto a hard disk,
and a printed report is produced. *[4 marks]*

9. State the representation of the following values in an 8-bit register in two's complement form.

(a) $+15_{(10)}$ *[2 marks]*

(b) $-15_{(10)}$ *[2 marks]*

10. Convert $11110.01_{(2)}$ to decimal. *[2 marks]*

11. Outline the need for a *protocol* in data transmission across a network. *[2 marks]*

12. Define the Boolean **XOR** operator by drawing the appropriate *truth table*. *[3 marks]*

13. Outline **one** security application of digital cameras. *[2 marks]*

SECTION B

*Answer **all** the questions.*

14. A company selling products uses a computer system that supports on-line enquiries during the day and batch processing at night.

(a) (i) Describe **one** task which might be processed in batch processing mode. *[2 marks]*

(ii) Describe **one** task which might be processed in on-line processing mode. *[2 marks]*

All software applications are used by staff and customers with various levels of technological expertise.

(b) Identify **three** types of human computer interface that could be provided to users to make communication with the computer as easy as possible. *[6 marks]*

15. (a) (i) Define the term *stack*. *[2 marks]*

(ii) State **two** basic stack operations and identify the operation that could cause *stack overflow* error. *[3 marks]*

(b) Consider the following infix expression 4 * (1 + 2) – 3.

(i) Convert this expression into postfix notation. *[2 marks]*

(ii) Draw a binary tree that corresponds to the expression. *[3 marks]*

16. (a) Define the term *file*. *[2 marks]*

A sequential file is created. Each line contains the name of a student. For example:

```
Adams, J
Bush, M
Cash, L
Dove, J
```

The names are stored in alphabetical order.

(b) (i) Explain how the file could be updated when a new line is **inserted** in the file. *[3 marks]*

(ii) Explain how a line could be **deleted** from the file. *[3 marks]*

(c) Describe **one** advantage of *direct (random access) files* over *sequential files*. *[2 marks]*

17. (a) (i) Define *CPU*. *[1 mark]*

(ii) Explain the role of the program counter in the machine instruction cycle. *[2 marks]*

(iii) Outline what is meant by the term *bus*. *[2 marks]*

(b) (i) Create truth tables for the following two Boolean expressions.

$$x = \overline{\mathrm{A} + \overline{\mathrm{B} \bullet \mathrm{C}}}$$

$$y = \overline{\overline{\mathrm{A} \bullet \mathrm{B}} + \mathrm{C}}$$ *[4 marks]*

(ii) Hence determine whether they are equivalent. *[1 mark]*

18. An on-line information retrieval system holds confidential data.

(a) Outline **three** precautions which should be taken to minimize unauthorized access. *[3 marks]*

(b) Explain why different users might be given different access privileges. *[3 marks]*

(c) Explain how the data could be recovered after a systems failure. *[4 marks]*

19. Consider the following two dimensional array.

A	0	1	2	3	4
0	**1**	**1**	**1**	**1**	**0**
1	**0**	**0**	**1**	**1**	**2**
2	**2**	**2**	**2**	**0**	**1**
3	**1**	**1**	**1**	**1**	**1**
4	**4**	**3**	**2**	**1**	**1**

(a) Construct a trace table for the following algorithm.

```
int sum = 0;
for (int k = 0; k < 5; k++)
{
  sum = sum + A[k][k];
}
output ("The sum is " + sum);
```

[3 marks]

(b) (i) By tracing the following algorithm, or otherwise, show the output produced.

```
for (int j = 0; j < 5; j++)
{
  int sum = 0;
  for (int k = 0; k < 5; k++)
  {
    sum = sum + A[j][k];
  }
  output ("The sum is " + sum);
}
```

[5 marks]

(ii) Outline the purpose of the program fragment in part (b)(i). *[2 marks]*