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

MARKSCHEME

November 2006

COMPUTER SCIENCE

Standard Level

Paper 1

12 pages

General Marking Instructions

After marking a sufficient number of scripts to become familiar with the markscheme and candidates' responses to all or the majority of questions, Assistant Examiners (AEs) will be contacted by their Team Leader (TL). The purpose of this contact is to discuss the standard of marking, the interpretation of the markscheme and any difficulties with particular questions. It may be necessary to review your initial marking after contacting your TL. **DO NOT BEGIN THE FINAL MARKING OF YOUR SCRIPTS IN RED INK UNTIL YOU RECEIVE NOTIFICATION THAT THE MARKSCHEME IS FINALIZED.** *You will be informed by e-mail, fax or post of modifications to the markscheme and should receive these about one week after the date of the examination. If you have not received them within 10 days you should contact your TL and IBCA. Make an allowance for any difference in time zone before calling.* **AEs WHO DO NOT COMPLY WITH THESE INSTRUCTIONS MAY NOT BE INVITED TO MARK IN FUTURE SESSIONS.**

You should contact the TL whose name appears on your "Allocation of Schools listing" sheet.

Note:
Please use a personal courier service when sending sample materials to TLs unless postal services can be guaranteed. Record the costs on your examiner claim form.

General Marking Instructions

1. Once markscheme is received mark in pencil until final markscheme is received.

2. Follow the markscheme provided, do **not** use decimals or fractions and mark only in **RED**.

3. Where a mark is awarded, a tick (✓) should be placed in the text at the **precise point** where it becomes clear that the candidate deserves the mark.

4. Sometimes, careful consideration is required to decide whether or not to award a mark. Indeed, another examiner may have arrived at the opposite decision. In these cases write a brief annotation in the **left hand margin** to explain your decision. You are encouraged to write comments where it helps clarity, especially for moderation and re-marking.

5. Unexplained symbols or personal codes/notations on their own are unacceptable.

6. Record subtotals (where applicable) in the right-hand margin against the part of the answer to which they refer. Show a mark for each part question (a), (b), *etc.* Do **not** circle sub-totals. Circle the total mark for the question in the right-hand margin opposite the last line of the answer.

7. Where an answer to a part question is worth no marks, put a zero in the right-hand margin.

8. **Section A**: Add together the total for the section and write it in the Examiner Column on the cover sheet.

  Section B: Record the mark awarded for each of the four questions answered in the Examiner Column on the cover sheet.

  Total: Add up the marks awarded and enter this in the box marked TOTAL in the Examiner Column on the cover sheet.

9. After entering the marks on the cover sheet check your addition of all marks to ensure that you have not made an arithmetical error. Check also that you have transferred the marks correctly to the cover sheet. **We have script checking and a note of all clerical errors may be given in feedback to all examiners.**

10. Every page and every question must have an indication that you have marked it. Do this by **writing your initials** on each page where you have made no other mark.

11. A candidate can be penalized if he/she clearly contradicts him/herself within an answer. Once again make a comment to this effect in the left hand margin.

Subject Details: Computer Science SL Paper 1 Markscheme

Mark Allocation

Section A: Candidates are required to answer ALL questions. Total 30 marks.
Section B: Candidates are required to answer ALL questions. Total 40 marks.
Maximum total = 70 marks.

General

A markscheme often has more specific points worthy of a mark than the total allows. This is intentional. Do not award more than the maximum marks allowed for part of a question.

When deciding upon alternative answers by candidates to those given in the markscheme, consider the following points:

- Each marking point has a separate line and the end is signified by means of a semi-colon (;)

- An alternative answer or wording is indicated in the markscheme by a "/"; either wording can be accepted.

- Words in (…) in the markscheme are not necessary to gain the mark.

- The order of points does not have to be as written (unless stated otherwise).

- If the candidate's answer has the same "meaning" or can be clearly interpreted as being the same as that in the mark scheme then award the mark.

- Mark positively. Give candidates credit for what they have achieved, and for what they have got correct, rather than penalising them for what they have not achieved or what they have got wrong.

- Remember that many candidates are writing in a second language; be forgiving of minor linguistic slips. Effective communication is more important than grammatical niceties.

- Occasionally, a part of a question may require a calculation whose answer is required for subsequent parts. If an error is made in the first part then it should be penalized. However, if the incorrect answer is used correctly in subsequent parts then **follow through** marks should be awarded. Indicate this with **"FT"**.

SECTION A   *[30 marks]*

*Answer **all** questions.*

1.   *Award **[1 mark]** for each valid point.*

      For example:

      to sort the transaction data/file;
      so that it is in the same order as the master file data;
      in order to speed up the processing of the payroll program;   *[2 marks max]*

2.   *Award **[1 mark]** for each valid point.*

      For example:

      optimise the operation of the brakes (or words to that effect – not just "to operate the brakes");
      warning message if seat belts are not fastened;
      (possibly) warning if too close to car in front;
      warning if car passes maximum speed limit;
      + any other use that relates specifically to safety;   *[2 marks max]*

3.   (a)   *Award **[1 mark]** for each valid point.*

             For example:

             memory that allows a user to store data/programs;
             permanently;
             that is outside of the CPU;   *[2 marks max]*

      (b)   *Award **[1 mark]** for each valid point.*

             For example:

             when a program is too large to fit into primary memory;
             part of the program that is not currently being used can be stored temporarily in secondary memory;
             part of the program can be stored in secondary memory until it is required;

             Students might give concrete examples, but the points above should be followed to gain marks.
             The term 'virtual memory' on its own is not enough to gain marks.   *[2 marks max]*

4.   (a)   2-D array of real/integer;   *[1 mark]*

      (b)   array of records / objects;   *[1 mark]*

5.   *Award [1 mark] for each valid point.*

      For example:

      a number is added to (each block of) the data sent;
      which is the sum of the bytes in that block;
      this value is recalculated by the receiving device and compared to the checksum;
      if the values are different the data will be re-sent;   *[3 marks max]*

6.   The width of the address bus determines the maximum amount of memory *[1 mark]* that can be
      accessed/addressed *[1 mark]*.   *[2 marks]*

7.   *Award [1 mark] for each valid point.*

      For example:

      to improve on the present software (better algorithms *etc.*);
      to adapt the software to changing needs of the company;
      to correct errors that have previously gone undetected;   *[2 marks max]*
      note: answers must refer specifically to the <u>software</u> cycle.

8.   A storage area (generally one or two words) in the CPU;
      that has a specific purpose;   *[2 marks]*
      Accept example of specific purpose.

9.   *Award [1 mark] for each valid point.*

      For example:

      can still be read if smudged / crumpled;
      difficult to forge;
      can be read by people;   *[2 marks]*

10.   (a)   updating a customer's account after a withdrawal;   *[1 mark]*

      (b)   processing bank cheques;   *[1 mark]*

      (c)   ATM operation, Internet banking;   *[1 mark]*

11.   *Award [1 mark] for each valid point.*

      For example:

      use of passwords;
      different permissions for different users;
      examples of physical security;   *[2 marks max]*

12.   (a) $01111111_{(2)} = 127_{(10)}$ *[2 marks]*

      (b) $10000000_{(2)} = -128_{(10)}$ *[2 marks]*

SECTION B   *[40 marks]*

*Answer **all** questions.*

13. (a)   *Award **[1 mark]** for stating a clear advantage and **[1 mark]** for an acceptable expansion that refers to the other topology. The advantage given must be an advantage over the other topology.*

For example:

The advantages of a star network are:
if 1 cable breaks only 1 workstation is affected;
whereas with the bus network a cable failure could affect the whole network;

an increase in network traffic will not unduly slow the work of each workstation;
whereas in a bus network increase in traffic will degrade the performance of each workstation;

The advantage of a bus network is:
the bus network would prove less expensive to set up/expand;
as less cabling is needed than for a star network;
no need for a server;   *[4 marks max]*

(b)   the school could:
use dedicated/leased lines;
use fibre optic cables;
use ISDN lines;
use ADSL;
use high bandwidth lines/broadband;   *[2 marks max]*

(c)   *For a max of 2 situations award **[1 mark]** for the type of access rights and **[1 mark]** for the reason for this. To gain max marks, the situations discussed must be significantly different.*

For example:

Read-only rights for the students with regard to access to test results *[1 mark]*, but read-write access for the teacher(s) who have provided these results *[1 mark]*.
Teachers may get read-only rights to students' records *[1 mark]*, whereas students will have no access *[1 mark]*.
Certain terminals might be configured so as to deny access to certain data *[1 mark]*, *e.g.*
students terminals will not have access to students records, but teachers terminals will
[1 mark].   *[4 marks max]*
There are many other possibilities.
Do not award marks for simplified answers such as "students won't be allowed to access students records".

14.   (a)   Boolean;   *[1 mark]*

      (b)   Award *[1 mark]* for correctly identifying the order of preference as the expression stands
            [!A would be evaluated first], and *[1 mark]* for identifying the program statement that would
            be executed.
            Award *[1 mark]* for adding the parentheses !(A && B) and *[1 mark]* for correctly identifying
            that the <u>other</u> statement could be executed in some cases.

            If a candidate has got the priorities the wrong way around (*i.e.* believes that the ! operator
            does not have precedence), then the final *[2 marks]* can be awarded as FT marks, if the rest of
            the explanation is correct (*for [2 marks max]*).   *[4 marks]*

      (c)   logical error;   *[1 mark]*

      (d)   Trace the program/dry run *[1 mark]*. This involves the programmer entering sample data
            [1 mark] and working through the program manually/line by line *[1 mark]*, evaluating all
            expressions *[1 mark]*.   *[4 marks]*

15. (a) might not be technically possible;
          might prove too expensive;
          might not be legally acceptable;
          might take too long to design/implement;
          might be too complicated to run;   *[2 marks max]*

     (b) The comparisons must involve parallel running with one other strategy.
          Award [2 marks max] for each comparison as follows:
          Stating/describing the advantage [1 mark], comparison with the other strategy [1 mark].

          For example:

          parallel v. direct change over
          parallel would allow flaws to be discovered/corrected *[1 mark]* without causing disruption to
          the company's operations *[1 mark]*.
          direct would requires less personnel/put less strain on personnel *[1 mark]* than parallel, as
          parallel requires two separate operations to be monitored *[1 mark]*.

          parallel v. phased change over
          parallel is always possible *[1 mark]*.
          phased could be used if whole process can be broken down into modules *[1 mark]*.
          phased would allow a smoother/cheaper changeover without need for extra staff *[1 mark]*,
          which would be needed for parallel running *[1 mark]*.   *[4 marks max]*

     (c) *Award [2 marks max] for each valid point. Award [1 mark] for identifying the point and
          [1 mark] for a suitable expansion.*

          For example:

          would provide banking services to many more people *[1 mark]* as previously few people
          would have had physical access to a bank *[1 mark]*;
          would be inappropriate *[1 mark]* as few people would be able to afford the equipment *[1 mark]*;
          it would only highlight the inequalities in the country *[1 mark]*, as only the well off citizens
          would be the ones able to take advantage *[1 mark]*.   *[4 marks max]*

16. (a)   communication software;
            (web) browser;
            graphics software;
            decompression software;
            FTP client software;   *[3 marks max]*

    (b)   the graphics card would only provide a limited number of colours/only give 2^8/256 colours;
            whereas the Internet files would typically contain thousands/millions of colours;
            therefore the graphics on his screen would be of inferior quality to the original Internet files;
                                                                              [3 marks]

    (c)   faster processor *[1 mark]*, that would allow faster redrawing/resizing of the graphics
            [1 mark];
            extra RAM *[1 mark]*, to allow faster access to the software program (no need for Virtual
            Memory) / allows the use of (larger) more professional graphics software *[1 mark]*;
                                                                              [4 marks max]