

MARKSCHEME

May 2005

COMPUTER SCIENCE

Higher Level

Paper 2

*This markscheme is **confidential** and for the exclusive use of examiners in this examination session.*

*It is the property of the International Baccalaureate and must **not** be reproduced or distributed to any other person without the authorisation of IBCA.*

If you do not have a copy of the current Computer Science Guide,
please request one from IBCA.

Subject Details: Computer Science HL Paper 2 Markscheme

Mark Allocation

Candidates are required to answer ALL questions (*[30 marks]* for question 1, *[30 marks]* for question 2 and *[15 marks]* for the remaining three questions). Maximum total = *[105 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**”.

1. (a) No a parity check would not detect a corruption; **[1 mark]**
- (b) Column 7 **[1 mark]** and row 4. **[2 marks]**
- (c) For example:

```

function HAMMING (val BOOLDATA array of integer [1..8, 1..8])
  result integer
  declare COL, ROW, RTN, COUNT integer
  RTN ← 0
  for ROW ← 1 upto 8
    COUNT ← 0
    for COL ← 1 upto 8
      if BOOLDATA[ROW, COL] = 1 then
        COUNT ← COUNT + 1
      endif
    endfor
    if COUNT mod 2 = 1
      if RTN = 0
        RTN ← ROW
      else
        RTN ← -1
      endif
    endif
  endfor
  return RTN
endfunction HAMMING

```

Accept alternative solutions but award [1 mark] for each point unless otherwise stated.

parameters passed correctly;
integer result given;
variables declared correctly;
loop through rows and columns **[2 marks]**
initialize count in the correct place;
test value in array and/or accumulate values **[2 marks]** – these 2 awarded for
adding the values in the row;
test parity **[2 marks]**
accumulate values (no need to test for 1);
test parity;
return set to ROW if appropriate **[2 marks]**
set to -1 if error already exists;
early exit if return -1;
correct return in all cases **[2 marks]** – award **[1 mark]** if there is only one error.

[15 marks max]

(d)

```

procedure SWAP (ref BOOLDATA array of integer [1..8, 1..8])

  declare TEMP integer
  for ROW  $\leftarrow$  1 upto 7
    for COL ROW + 1 upto 8
      TEMP  $\leftarrow$  BOOLDATA[ROW, COL]
      BOOLDATA[ROW, COL]  $\leftarrow$  BOOLDATA[COL, ROW]
      BOOLDATA[COL, ROW]  $\leftarrow$  TEMP
    endfor
  endfor
endprocedure SWAP

```

Award marks as follows:

BOOLDATA passed by reference **[1 mark]**
 double loop **[2 marks]** award **[1 mark]** for a reasonable attempt.
 correct SWAP **[2 marks]**

[4 marks]

(e)

```

procedure CHECK (ref BOOLDATA array of integer [1..8, 1..8])
  declare COL, ROW integer
  ROW  $\leftarrow$  HAMMING(BOOLDATA)
  SWAP(BOOLDATA)
  COL  $\leftarrow$  HAMMING(BOOLDATA)
  SWAP(BOOLDATA)
  if COL = -1 or ROW = -1
    output ("error message")
  elseif ROW > 0 and COL > 0
    if BOOLDATA[ROW, COL] = 1 then
      BOOLDATA[ROW, COL]  $\leftarrow$  0
    else
      BOOLDATA[ROW, COL]  $\leftarrow$  1
    endif
  endif
endprocedure CHECK

```

Award marks as follows:

rows checked with correct call to HAMMING **[1 mark]**
 array swapped with correct call to SWAP **[2 marks]**
 columns checked with correct call to HAMMING **[1 mark]**
 output error and exit routine if either -1 **[2 marks]**
 check for parity failure **[1 mark]**
 if so change value **[1 mark]**

[8 marks]

2. (a) JIT (just in time) or stockless;
Some candidates have been influenced by the diagram and the description and have answered along the lines “central stock processing” allow this. [1 mark]
- (b) *Award [1 mark] per suggestion and [1 mark] per description up to a max of [4 marks].
 Never run out of stock as ordering is automatically enabled in time [2 marks].
 Money not tied up in wasteful stock purchasing as over ordering not needed to ensure availability [2 marks].
 Money not spent on storage as amount of stock carried is less [2 marks].
 Up to 2 follow through points if the central stock processing is continued although most have picked up the “not too soon” for this part. [4 marks max]*
- (c) *Systems keep track of stock levels [1 mark] and can predict when stocks will run out [1 mark]. The system also has data concerning delivery lag [1 mark] and can therefore calculate optimum reorder date and quantity [1 mark]. [4 marks]*
- (d) *Award [1 mark] for point and [1 mark] for explanation.*

For example:

As the owner is the end user [1 mark] the new system should closely match the organizations needs [1 mark].

As he is the end user [1 mark] end user acceptance is guaranteed [1 mark].

accept the following alternative answers:

- cheaper (if it is elaborated or compared with going to a software house)
 - business is not interrupted as the current system is not needed during the holiday
- [2 marks max]*

- (e) *Award [1 mark] per point, [1 mark] per description and [1 mark] per consequence up to a max of [6 marks].*

For example:

As he is not a computer expert [1 mark] he is likely to build in mistakes [1 marks], which will be expensive to fix afterwards [1 mark].

Total changeover is risky [1 mark] as emergent problems may be catastrophic [1 mark] leaving the organization with no system at all [1 mark]. *[6 marks]*

- (f) *Award [1 mark] per point, [1 mark] per description and [1 mark] per consequence up to a max of [3 marks].*

For example:

Prototyping [1 mark] would allow emergent problems to surface [1 mark] and iterate towards a problem free solution [1 mark].

A systems analyst could be used [1 mark] to design the system using formal design methods [1 mark] thus reducing risk [1 mark].

With no training the workers will not know how to work the system/will find it difficult to adapt immediately and a lot of time could be lost making the shop inefficient/losing customers.

[3 marks max]

- (g) *Award [1 mark] per point, [1 mark] per description and [1 mark] per consequence up to a max of [3 marks].*

For example:

Phased implementation **[1 mark]** would allow problems to be examined **[1 mark]** without exposing whole organization to risk **[1 mark]**.

Parallel implementation **[1 mark]** could be used test the new system insitu **[1 mark]** but with the existing system in place as a failsafe **[1 mark]**.

Credit answers for either phased or parallel that mention time for worker involvement and the business running smoothly as a consequence. **[3 marks max]**

- (h) *Award [1 mark] per point and [1 mark] per description up to a max of [4 marks].*
Points can relate to e-business, productivity, costs, workforce, efficiency, control, planning, flexibility, access to information, learning, job satisfaction, decision-making, client satisfaction and or corporate image. **[4 marks max]**

- (i) *Award [1 mark] per point, [1 mark] per description and [1 mark] per consequence.* **[3 marks max]**

For example:

The organization may become dependent upon information systems **[1 mark]** to maintain profitability, if for some reason the system failed to function properly **[1 mark]** the organization could be become exposed to financial problems **[1 mark]**.

[3 marks max]

3. (a) For example:

Advantage – electricity company does not have to employ meter readers;

Disadvantage – customer may record incorrect data; **[2 marks]**

For example

(b) Answers which use bar codes generated from the computer are equally acceptable (and probably better). Accept any reasonable with the following mark allocation:

generation of computer forms (details from a database of clients either mail merge or report generation) – with suitable computer readable identification (bar code, MICR, OCR) **[2 marks]**

reading of forms on return – using appropriate input device **[2 marks]**

link to database via unique code to retrieve past reading, present taken from form and bill calculated **[2 marks]** **[6 marks]**

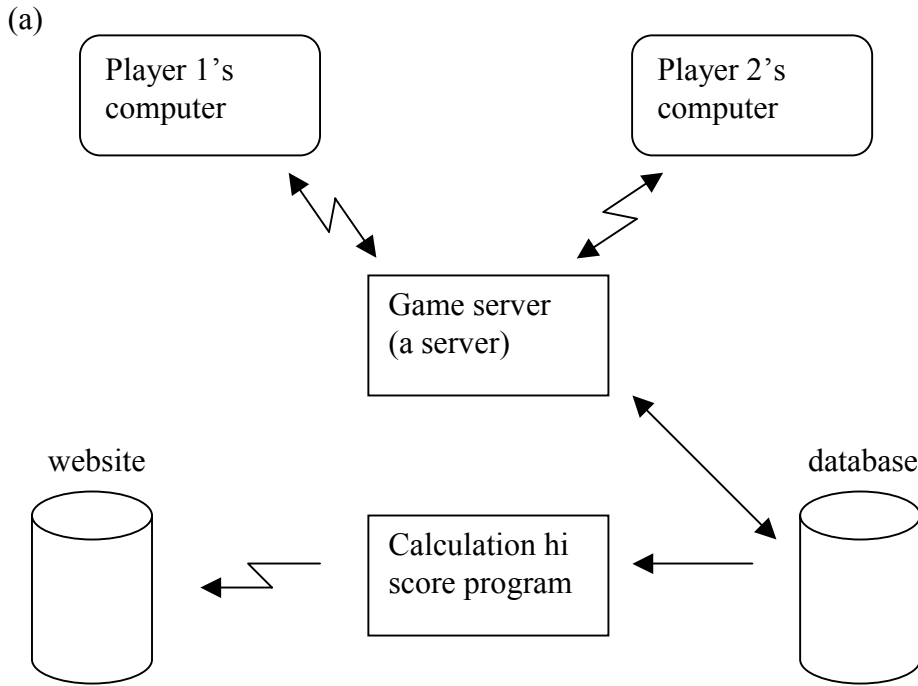
(c) Suitable method of recording **[1 mark]** – could be some type of OMR

Way in which data is recorded on the form (can be shown diagrammatically – may be circles numbers, marks in columns) **[1 mark]**

Relation to the way it can be read automatically **[1 mark]** **[3 marks]**

(d) There is no ambiguity **[1 mark]** and invalid entries cannot be made **[1 mark]**. OCR is less suitable as people's handwriting varies **[1 mark]** which introduces ambiguity into the data. **[1 mark]** **[4 marks]**

4.



Award **[1 mark]** for each of the following.

Playing game;

2 way data flow;

Update database;

Read database;

Update web page;

Communications links;

[6 marks]

Accept game on each machine with communication link to a server.

(b) B;

[1 mark]

(c) A;

[1 mark]

(d) D;

[1 mark]

(e) C;

[1 mark]

(f) (i) Award **[1 mark]** for a reason **[1 mark]** for an elaboration.

For example:

Game will run quicker when loading from the players own computer as there may be a lot to download or upload especially screen displays.

Credit also those that state it would be better for the manufacturers to sell multiple copies although this is not necessarily the case as there could be a registration fee to play.

[2 marks]

(ii) Award **[1 mark]** for an advantage and **[2 marks]** for a full discussion of this advantage.

For example:

Advantages are that the player can play with people from all over the World, hence is more likely to find people of the same level. If a laptop is used then the game can be played in any location. The game can also be played over a very long period of time or very quickly depending on the speed of response from the opponent. **[3 marks]**

5. (a) Award **[1 mark]** for each comparison up to a max of **[8 marks]**.
Award **[4 marks]** per question.

	Volume	Speed	Portability	Access	Life
Tape	Largest	Slow	Yes	Serial	1 Year

(i)

Hard Disk	Large	Fast	Can be	Random	1 Year
-----------	-------	------	--------	--------	--------

(ii)

Floppy	Tiny	Slow	Yes	Random	1 Year
--------	------	------	-----	--------	--------

Do not award a mark for tape lifetime of 1 year (since this is given later in the question) the mark should be given for the comparison that the lifetime is the same.

Allow a cost comparison, bearing in mind that disk costs are falling quickly – this is likely to be mentioned. Credit reliability of medium, were reasonable.

- (b) A media with a longer shelf life **[1 mark]** such as optical **[1 mark]** could be used. The smaller capacity **[1 mark]** could be compensated for by storing only changed data **[1 mark]**.

*Allow outsourcing to a company onto another server.
Storing on a second server within the business.*

[4 marks]

- (c) The backups need to be stored physically separate **[1 mark]** so if something happens to one the same thing **[1 mark]** does not happen to the other **[1 mark]**.

Accept locking in a fireproof safe, in case of fire or flood to allow computers to start up again. **[3 marks]**
