MARKSCHEME

May 2013

COMPUTER SCIENCE

Standard Level

Paper 1

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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 that part of a question.

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

- Each statement worth one 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.

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

- Mark positively. Give candidates credit for what they have achieved and for what they have
  got correct, rather than penalizing 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. In this subject effective communication is more important than grammatical
  accuracy.

- 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 *Total: [30 marks]*

1. *Award up to [2 marks max] for max two forms.*
   Barcode scanner;
   OCR/OMR scanner;
   MICR reader;
   Voice recognition;
   Directly-interfaced sensors, *eg* a temperature probe;
   Smart Card reader; *[2 marks]*

2. *Award up to [4 marks] as follows:*
   [1 mark] for a stated advantage and *[1 mark]* for an expansion relevant to protest groups.
   [1 mark] for a stated disadvantage and *[1 mark]* for an expansion relevant to protest groups.

   Example of answers:

   Advantages / Disadvantages:
           Pervasiveness;
           Immediacy;
           Accessibility;
           Anonymity
           Visibility;
           Multimedia nature of social networks;
           Information stored on the server;

   Expansion: Help the group in organizing themselves quickly/broadly;
           Contribute spreading the reasons of the protest;
           Gain of visibility on media/political level;
           Support publishing multimedia files that can document the protest, and these can be used in several different ways (including defensive one or to gain consensus from public opinion);

           Allows members with different objectives (undercover agents, radical exponents, or those opposed to the groups aims) to monitor the activities of the group;
           Compromise the identity of the group members;
           Misdirect the group to thwart them from the original purposes; *[4 marks]*

3.   *Award [1 mark] for each use (two uses) up to [2 marks max]. Accept any software tool used to develop a large project which is composed of multiple components/sub-systems.*
   Summarise requirements;
   Developing flow diagrams;
   Scheduling tasks in development;
   Preparing documentation;
   Controlling system versions;
   Developing code;
   A statement that indicates a recognition that these tools are for coordinating the design and development of multiple subsystems/parts within a larger project; *[2 marks]*

4.   (a) *Award up to [2 marks max].*
   Controls fetching instructions from memory;
   Controls/directs transfer of data within the CPU;
   Via the memory data and address buses;
   Interprets instructions;
   Controls/directs execution of instructions;
   Controls/directs storing data in memory; *[2 marks]*

  (b) *Award up to [2 marks max].*
   Registers hold memory addresses;
   The larger register can address a larger number of distinct memory locations;
   Size of memory is 2^n where n is the number of bits in the register; *[2 marks]*
   Do not accept "if one is bigger, the other is bigger" unless fully explained.

5.   *Award [1 mark] for naming the disadvantage and [1 mark] for an explanation up to [2 marks max].*

  Possible answers (there may be others)

 Performances drop;
   Because of the time to switch among applications;
   The time to search/access files on the hard disk;
   Access speed of secondary memory versus primary;

 May require more HW;
   Because part of the hard disk is reserved to virtual memory, hence additional storage space might be necessary;

 Increase power consumption;
   Because the overall processing time slows down; *[2 marks]*

6.   *Award up to [2 marks max].*
 Scan files searching for viruses;
 Remove the viruses / alerts the user;
 Scan incoming files to detect if they contain known virus; *[2 marks]*

7. *Award [2 marks max] for **one** difference, in terms of both ASCII and Unicode.*

Possible answers:
ASCII uses 7 bit;
Unicode extends it to 8/16/32 bit;
Hence Unicode requires more disk space;

ASCII encodes only 128 characters by assigning numbers;
Unicode may use different and more sophisticated representation;

ASCII American English alphabet+ control;
Unicode tries to include all possible existing alphabets;   *[2 marks]*

8. (a) *Award [1mark] for the correct answer;*
       Award [1 mark] for the conversion up to [2 marks max];

$$(189)_{10} = (16^1 * 11 + 16^0 * 13)_{10}$$
$$= (BD)_{16}$$ *[2 marks]*

   (b) *Award [1 mark] for the correct answer, and [1 mark] for evidence of correct*
       working, up to [2 marks max].
       Answer:10101001;
       Method 1: Compute 87 as binary: 01010111;
                  Flip bits and add 1;
       Method 2: Compute $(-128) - 87$ in binary;
                  $10000000 - 01010111$;
       Method 3: Compute $128 - 87 = 41$ in decimal, convert 41 and place 1 in MSB; *[2 marks]*

9. *Award up to [3 marks max].*

$v = 2.5$;
In the 4th line of code, z takes the value 15.0 (accept either a statement that z is a
double or having the number written with a decimal place);
In the 5th line of code, a double division is performed, z/y is evaluated (2.5), before
being assigned to v;   *[3 marks]*

10. *Award [1 mark] for an example and [2 marks] for a discussion, up to [3 marks max].*

Examples include and are not limited to:

public repositories, ftp/mail servers, any monitoring system as power stations, hospitals, air-traffic control *etc.*;
Accept parallel running only in an example where system failure is critical and the live back-up is essential;

Discussion includes:

Systems are increasingly complex;
Data integrity, reliability of system, and data loss recovery is vital especially for critical real time operations;
Mirroring is a way to enforce at least two copies of the system run in parallel (should one crash the mirror can continue running) *[3 marks]*

11. *Award up to [2 marks max].*
A description on how checksum is computed;
Checksum is computed prior to transmission and sent with the data;
Checksum is recomputed by receiver and compared with checksum transmitted;
If the checksums do not match, a retransmission is requested; *[2 marks]*

SECTION B   *Total: [40 marks]*

12. (a) (i)   A computer (and its software) that provides services available through
the network;   *[1 mark]*

(ii)   A computer/terminal (and its software) used to access the services in a
network, by sending requests to the server;   *[1 mark]*

(b)   It passes data packets from input channels;
To all output channels;   *[2 marks]*

(c) (i)   *Award up to [2 marks max].*
Assign different access rights to the files/parts of the file system;
To different groups of users;   *[2 marks]*

(ii)   Patients should log-on with a password or create an account;
They should only have access to their own medical records;
If they have access, it should be read only;
They should have read/write access to the appointments/bookings in
order to check/change their appointments;   *[4 marks]*

Total: [10 marks]

13. (a)   4;   *[1 mark]*

(b)   *Award marks as follows up to [4 marks].*

*Warning: Students might not evaluate the Boolean test in the third and fourth
column, be aware two kinds of answers will be accepted and marks awarded.*

[1 mark] for each correct row in the table;
*[1 mark] if the 4th column is filled with Boolean values only, even if table is
incorrect or truncated;*

i	j	i < m && j<len	s.charAt(i)!=s.charAt(j)	return
0	4	0<4 && 4<7 [or true]	x!=x [or false]	
1	5	1<4 && 5<7 [or true]	y!=y [or false]	
2	6	2<4 && 6<7 [or true]	z!=x [or true]	false

[4 marks]

(c)   Any string of the form SS or SxS, where S is a string and x is a char
(*eg.* aa, aba, adefade);   *[1 mark]*

Question 13 continued

(d) *Award [1 mark] for each condition (or equivalent expressions, including written in words) up to [2 marks max].*

```
!(i<m && j<len)  OR  (i>=m || j>=len);
s.charAt(i) != s.charAt(j);
```
[2 marks]

(e) *Award up to [2 marks max].*
It allows an early exit from the while and early termination of the program;
As soon as a condition is detected, that will make the program fail (substrings with different current chars);   *[2 marks]*

Total: [10 marks]

14. (a) *Award up to [2 marks max].*
Requirements;
Costs;
Benefits;
Estimates of the time for developing the project;
Possible difficulties and alternative solutions;
Risk analysis (costs/technical/legal);
Review of previously proposed solutions;   *[2 marks]*

(b) *Award [1 mark] for identifying a factor and [1 mark] for an expansion that relates that factor to commercial or customized software up to [4 marks max].*
Example factors to be considered:
    Cost;
    Time to develop/deploy;
    Availability of documentation and training materials;
    Suitability of the software for the task;

Example expansions:
    Cost –   Commercial software is usually cheaper to purchase than developing customized software;
    Suitability – Commercial software is usually designed to appeal to a large group of potential customers and may not contain specialized features needed by the company / may contain needlessly complex tools to support functions not needed by the company;   *[4 marks]*
Accept other realistic factors and expansions.

(c) The customer could ask for modifications;
Adding some new/different features that affect the current design;
And that could affect the feasibility report in several ways;
Such as costs, delivery time, technical requirements;   *[4 marks]*
Accept these points if put in the context of "repeated analysis and design".

Total: [10 marks]

15. (a) HTML – hypertext markup language (accept PHP, ASP, .NET);   *[1 mark]*

(b) To search/retrieve information resources on the WWW via the URL;
To display it/make it available, possibly using other applications;   *[2 marks]*

(c) *Award up to [3 marks max].*
It behaves as an interpreter;
Since the browser must provide interactive access to the WWW;
HTML Tags are interpreted as they are received from the server;
To indicate the way to display text/graphics;
To access other URL/URI;   *[3 marks]*
*Accept other reasonable differences between an interpreter and compiler that
are applicable to a web browser.*

(d) *Award [4 marks max] as follows:*
[2 marks] each for up to two aspects ([1] for identifying and [1] for discussion)

Data encryption;
To protect from interception during transmission and to store data on disk

User login and individual passwords;
To protect from unauthorized users, and these should also be encrypted;

Permissions/access levels;
Given to different users groups, common users should have access to their data
only;

Settings;
Firewalls, proxies, protection against spyware;   *[4 marks]*
*Do not accept answers about establishing an individual's identity (i.e.
validating their credit card) – the question is about protecting the identity of
the donors after they have been established and saved on the organization's
servers.*

Total: [10 marks]