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MARKSCHEME

November 2014

COMPUTER SCIENCE

Standard Level

Paper 1

9 pages

Subject Details: Computer Science SL Paper 1 Markscheme

Mark Allocation

Section A: Candidates are required to answer **all** questions. Total 25 marks.
Section B: Candidates are required to answer **all** questions. Total 45 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**".

General guidance

Issue	Guidance
Answering more than the quantity of responses prescribed in the questions	- In the case of an "identify" question read all answers and mark positively up to the maximum marks. Disregard incorrect answers. - In the case of a "describe" question, which asks for a certain number of facts *eg* "describe two kinds", mark the first two correct answers. This could include two descriptions, one description and one identification, or two identifications. - In the case of an "explain" question, which asks for a specified number of explanations *eg* "explain two reasons …", mark the first two correct answers. This could include two full explanations, one explanation, one partial explanation *etc*.

SECTION A   *Total: [25 marks]*

1.   *Award up to [2 marks max].*
      Made up of rows and columns used to organize data;
      Automatically (re)calculates results when data is entered/changed;
      Helps people to get various results/many combinations quickly;
      Built in graphics, charts allow easier and faster interpretation of data;
      Etc.   *[2 marks]*

2.   (a)   Part of a processor that performs arithmetic and logical operations;   *[1 mark]*

      (b)   Part of processor which coordinates all activities in processor and all other parts
             within a computer;   *[1 mark]*

3.   Binary numbers have base 2, hexadecimal numbers have base 16 (2^4=16);
      Each digit (letter/number) in a hexadecimal number can be represented by the group of
      four binary digits;   *[2 marks]*

4.   (a)   A computer system which uses communications equipment to connect
             computers and their resources;   *[1 mark]*

      (b)   A VPN;
             Accept other possible answers.   *[1 mark]*

      (c)   *Award [2 marks] for benefits, [2 marks] for problems, up to [4 marks max].*

             Benefits
             Savings in fuel cost and commuting time;
             An opportunity to work at your own pace / more comfortable;
             Increased productivity;
             An opportunity to work in an undisturbed environment;
             Chose their own work hours;
             Convenience of not having to travel;

             Problems
             Employers can claim the employees are part time consultants or the like to avoid paying
             benefits like insurance, medical plans, taxes;
             The strain on families that result when a family member works at home;
             At-home employees miss interaction with co-workers at the office;
             At-home employees think they work too much, employers think they do not
             work enough;
             Employees cannot monitor employees;
             Expense of setting up a VPN;   *[4 marks]*

5. *Award up to [4 marks max].*
Award [1 mark] for each correct row. Accept 1/0 instead of true/false.
For all 4 correct input combinations award [1 mark].

A	B	X
true	true	false
false	true	true
true	false	true
false	false	false

[4 marks]

6. *Award up to [3 marks max].*
A large/difficult program could be divided into smaller/easier parts (sub-programs);
A sub-program could be used many times in this and other programs;
A sub-program could be written independently;
A sub-program could be tested independently;
Easier maintenance – only sub-program could be changed/modified as needed;
Etc.

[3 marks]

7. *Award up to [3 marks] max. Award [1 mark] for each correct output.*

K	K>1	P	output
3	true	1	**3**
2	true	2	**2**
1	false	2	**2**

***Note:** candidates are not expected to produce the whole trace table, only the outputs.* *[3 marks]*

8. (a) A set of rules to coordinate data transmission (between a sender and a receiver); *[1 mark]*

(b) *Award up to [2 marks max].*
To ensure data integrity;
To control data flow / allow data flow;
Provide error checking;
Minimize congestion;
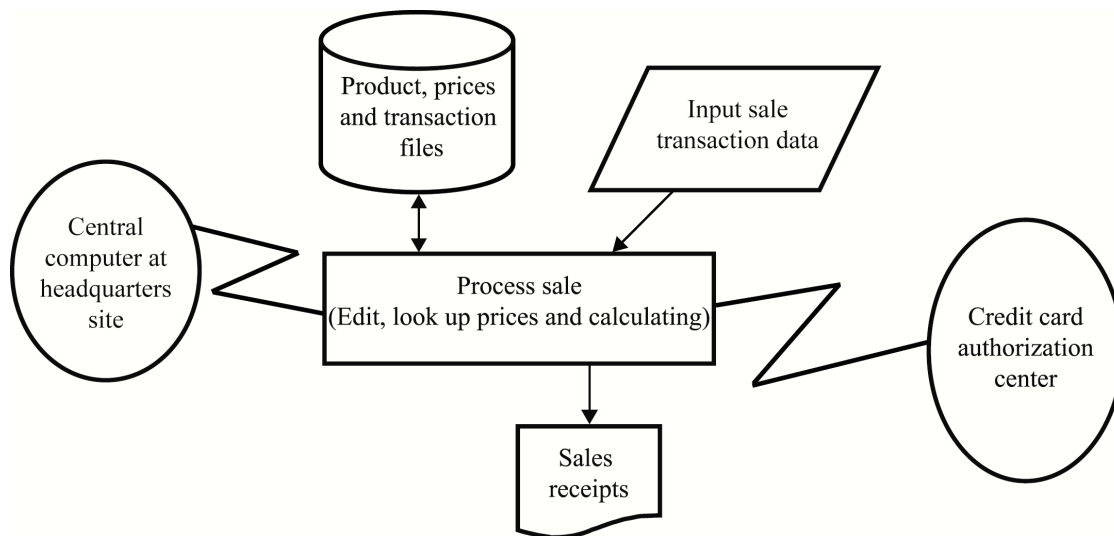Prevent deadlock;
Allows interoperability;
Etc.

[2 marks]

SECTION B   *Total: [45 marks]*

9.   (a)   *Award up to [5 marks max]. Award [1 mark] for each labelled flow chart symbol.*

                                                                              [5 marks]

(b)   *Award up to [2 marks max].*
Updating inventory database;
Storing transactions for later auditing;
Producing reports (such as transfer report, reorder report *etc*);
Re-pricing;
Batch processing takes place;   *[2 marks]*

(c)   *Award up to [3 marks max].*
Natural disasters;
Viruses;
Hackers;
Disgruntled employees;
Hard disk failure;
Server stolen;
Etc.   *[3 marks]*

(d)   *Award up to [3 marks max].*
Loss of hardware should not be a major problem and it is not too expensive for the company, if the hardware is insured then new substitute hardware could be found quickly (repurchased);
Loss of software should not be a critical problem if owner has made backup copies (reinstalled);
Loss of data could be quite expensive for the company and it could also extend to security problems – misusing information about company and individuals that are stored in the company's database;
Difficult/impossible to replace;

Note: *Accept answers that assume the user still has a copy of the "lost" data.*   *[3 marks]*

(e) *Award up to [2 marks max].*
Passwords;
Cryptography;
Internal controls/separation of employees functions/secured waste, *etc*;
Antivirus programs;
Backup systems (removable media, offsite storage);
Strengthen physical security in company;
Etc. *[2 marks]*

Total: [15 marks]

10. (a) *Award up to [2 marks max].*
They should specify program objectives;
They should specify program users/collect the information from the users;
They should specify output requirements;
They should specify input requirements;
They should specify processing requirements;
They should document the requirements and objectives;
Etc. *[2 marks]*

(b) *Award [1 mark max] for any two of the following:*
Pseudocode
Program flowcharts
Structure diagrams *[1 mark]*

(c) *Award up to [3 marks max].*
Award [1 mark] for an explanation of why beta testing is appropriate.
Award [1 mark] for an explanation of why it is not appropriate.
Award [1 mark] for contrasting the two and making a decision.

Example:
Not appropriate, as beta testing involves other people, but the timescale may not permit this;
However the involvement of other people provides increased objectivity;
Therefore alpha-testing is better; *[3 marks]*

(d) *Award up to [3 marks max].*
Is programming language complex or easy to use / do all students know the syntax?;
Is there a good base of prewritten library functions?;
Is portability good?;
Is the compiler available over a wide range of hardware and software platforms?;
Is speed of execution good?;
Is the language appropriate to the problem?;
Is it Web-based/mobile?;
Etc. *[3 marks]*

(e)   (i)   Designing algorithms and producing documentation;   *[1 mark]*

      (ii)   First defining the problem and then designing algorithms/coding;   *[1 mark]*

(f)   *Award up to [4 marks max].*
      Points may include:
      It shows only if the project is on schedule;
      It does not show what to do if one part of project is taking longer than expected;
      It does not show who is responsible for a particular activity;
      It does not show what should be done in other projects which depend on this one;
      So the result might be an extension of time;
      It does not identify critical activities and actions to be taken;
      To make sure the project is not going over the budget;
      Does not show dependence between tasks;
      Etc.   *[4 marks]*

                                                                 Total: [15 marks]

11. (a)   (i)   Program crashes / run time error / exception / out of bounds error   *[1 mark]*

              (ii)   Checking the value of the index;
                     Before accessing the array;   *[2 marks]*

      (b)   *Award marks as follows, up to [4 marks max].*
            Award [1 mark] for SUM initialized to 0.
            Award [1 mark] for correct loop.
            Award [1 mark] for adding correct value from the array to SUM.
            Award [1 mark] for calculating and outputing the average.

            Example 1

```
SUM = 0
loop for I=0 to 5
    SUM = SUM + NUMBERS[I]
end loop
output SUM/6
```

            Example 2

```
SUM=0
K = 0
loop while K<=5
    SUM = SUM + NUMBERS[K]
    K = K +1
end loop
output SUM/6
```
                                                                                     [4 marks]

(c)   (i)   *Award **[1 mark]** for showing the largest and **[1 mark]** for showing smallest number at correct position in the array.*

[0]	[1]	[2]	**[3]**	[4]	[5]
78.43	43.20	12.45	**3.12**	13.50	43.67

[2 marks]

(ii)   Swaps values;
Of the largest and the smallest numbers in the array;   *[2 marks]*

(d)   *Award marks as follows, up to **[4 marks]** max.*
*Award **[1 mark]** for correct initialization.*
*Award **[1 mark]** for correct loop/accept any other correct loop.*
*Award **[1 mark]** for correct condition in if statement.*
*Award **[1 mark]** for changing the current value of maximum/position of maximum in the array (if needed).*

Example 1

```
MAX=0
K=1
loop while K<=5
  if NUMBERS[K] > NUMBERS[MAX]
      MAX=K
  end if
  K=K+1
end loop
// MAX contains the value of maxPos()
```

Example 2

```
MAXPOS = 0
MAXVALUE = NUMBERS[MAXPOS]
loop for K = 1 to 5
  if NUMBERS[K] > MAXVALUE
        MAXVALUE = NUMBERS[K]
        MAXPOS = K
     endif
end loop
// MAXPOS contains the value of maxPos()
```
[4 marks]