COMPUTER SCIENCE
PAPER 1 SAMPLE
MOCK EXAM REVIEW

SL = 1 hour 30 min

HL = 2 hour 10 min

INSTRUCTIONS TO CANDIDATES

- Do not open this exam until told to do so.
- Answer all questions

Possible Misprints

It is possible that this exam paper contains misprints.
There should be NO misprints or syntax errors in any pseudocode.
If a misprint does occur in pseudocode, and this would cause an error,
then the candidate must do their best to correct this error and answer the question as if no misprint had occurred. The same applies to all questions, but this is especially important in programming questions. The answer to a programming question should never be "a syntax error prevents execution".

1. Explain the difference between **white-box testing** and **black-box testing.** *[2 marks]*

2. Explain one difference between **data validation** and **data verification**. *[2 marks]*

3. (a) State the largest positive number that can be stored in **8 bits**, assuming that no sign bit is used. *[1 mark]*

   (b) State how the decimal number 21 would be stored in **8 bit binary**. *[1 mark]*

4. Outline a situation where **data compression** would probably NOT be used, as well as a situation where **data compression** is usually needed. *[2 marks]*

5. Describe a common use of **ROM** that could NOT be accomplished by **RAM**. *[2 marks]*

6. With reference to number bases, explain why one kilometre is equivalent to 1000 metres whereas one kilobyte is equivalent to 1024 bytes. *[2 marks]*

7. Explain how **virtual memory** functions in a **multi-tasking** operating system. *[3 marks]*

8. Assume that an array stores names that are **sorted alphabetically.**

   (a) Explain why keeping the names sorted does NOT improve the efficiency of a **sequential search.** *[2 marks]*

   (b) Describe a searching algorithm that is more efficient than a sequential search, but that can only be used if the data is sorted. *[3 marks]*

9. (a) Outline how an **overflow error** can occur in an **integer variable**. *[1 mark]*

   (b) Describe a type of error that can occur in a **floating point variable**, but which cannot occur in an **integer variable.** *[2 marks]*

10. This question refers to the **software development life cycle.**
    Explain why the **intended user** must be involved in the **analysis stage,** but probably not involved in the **design stage.** *[2 marks]*

11. Draw a labeled diagram showing the connections between **primary memory**, **cache memory** and the **CPU.** *[3 marks]*

12. Outline two differences between a **LAN** and a **WAN.** *[2 marks]*

#13

A digital music player stores a song as a file of numbers (each of which is called a sample) that are converted to a signal for the audio speaker or headphones.

(a) Define the term **analog data.** *[1 mark]*

(b) Define the term **digital data.** *[1 mark]*

(c) Identify one example of **analog data** and one example of **digital data** in a digital music player. *[2 marks]*

(d) A CD-quality recording requires 44100 samples for every second of time and each sample is a 16-bit integer (2 bytes).

(i) Outline how the number of kilobytes required for a CD-quality recording of a 3-minute song would be calculated. *[2 marks]*

(ii) State the type of software that could be used to reduce the size of a digital recording. *[1 mark]*

(e) Discuss one ethical issue created by the availability of digital music recordings on a computer network. *[3 marks]*

#14

Recall that: 18 mod 6 = 0 and 18 mod 7 = 4

Consider the following algorithm, which is written in pseudocode.

```
S = 0

N = 6

loop F from 1 to N-1

     if  (N mod F) = 0  then
          S = S + F
     end if

end loop

output "S = " , S
```

(a) Construct a trace table: *[4 marks]*

F	N mod f	N mod F = 0	S

(b) State what will be OUTPUT if we start with N = 12 *[2 marks]*

(c) Write a similar algorithm to add up the numbers 1+2+4+8+...+256+512 *[4 marks]*

#15

Alex is a personal computer (PC) user. She uses her PC for:

1. Playing video games (stored locally)
2. Internet access, especially downloading files
3. Word-processing simple text documents

Alex's PC is 5 years old. The hard-disk is about half full, which is okay,
but Alex finds that all the applications listed above run too slowly.
She wishes to upgrade the hardware, by doing one or more of the following:

- Add an extra hard-disk-drive
- Add more RAM
- Replace the CPU with a faster model

(a) Explain why adding more RAM might speed up one of the applications, clearly identifying which application you are discussing . *[2 marks]*

(b) Explain why replacing the CPU will probably not speed up Internet downloads. *[2 marks]*

(c) Explain why none of the upgrades listed is likely to speed up word-processing. *[2 marks]*

(d) One possible CPU upgrade would significantly increase the cache memory, but this new CPU runs at the same speed as the old one. Outline the function of cache memory, and state whether or not it is possible that this upgrade would speed up the applications. *[2 marks]*

Alex found out that hardware upgrades are expensive. She is looking for ways to speed up the applications without hardware upgrades.

(e) State the name of a **software utility** which might speed some of the applications (above), and outline how this software utility functions. *[2 marks]*

#16

This question deals with details of programming in pseudocode.

(a) State the output of the following commands: *[2 marks]*

```
A = 100
B = 35
C = A*B

if  A > B  then

     if  A > C  then
        output A
     else if  C > A  then
        output C
     end if

else if  C > B  then
     output C
else
     output B
end if
```

(b) State one example of a **boolean expression** that appears in the algorithm above. *[1 mark]*

(c) Write a single **if..** construct that outputs "equal" if **A** and **B** and **C** are all equal. *[2 marks]*

(e) Construct an algorithm that contains 3 numbers, stored in variables, and outputs the **smallest** of the 3 values. Express your algorithm as a **flowchart**. *[5 marks]*

********** **HL Extension** **********

#17

A hospital has a large networked computer system. Data in the computer system is confidential.

(a) Identify two ways in which the security of the network within the hospital can be ensured. *[2 marks]*

(b) Describe how data could be recovered in a case of corruption. *[3 marks]*

Doctors, administrative staff and patients are permitted to access different parts of the data.

(c) Outline how the network administrator can reduce the risk that sensitive patient data is seen by someone other than a doctor. *[2 marks]*

The hospital uses specialized machines with **embedded microprocessors.**
These machines monitor patients' medical condition –
for example their heart rate, breathing rate and temperature.

(d) Outline why a **dedicated operating system** might be required for a monitoring device, rather than using a general purpose operating system like Windows. *[2 marks]*

(e) Explain why an **interrupt driven** system might be more reliable and efficient than a **polling** system for reading signals from the monitoring devices. *[2 marks]*

(f) Explain why a general purpose operating system like Windows will probably be used in computers that collect and store data from the monitoring devices. *[2 marks]*

(g) (i) Outline how RFID chips could be used to identify patients. *[1 mark]*

(ii) Outline one reason that RFID identification for patients is desirable. *[1 mark]*

********** **HL Extension** **********

#18

This question is about **data-structures.**

(a) (i) Explain why a **2-dimensional array** would NOT be a sensible data-structure for storing employ information that includes : name, telephone, and salary (in Euros). *[2 marks]*

(ii) Outline how it would be possible to store employee's name, telephone and salary data in **parallel arrays.** *[2 marks]*

(b) A **linked-list** is a **dynamic data-structure** that can be used to store a list of names, as an alternative to using an array.

(i) Outline **one advantage** of using a **dynamic linked-list** rather than a **static array.** *[2 marks]*

(ii) Outline **one advantage** of using a **static array** instead of a **dynamic linked-list.** *[2 marks]*

A web-browser maintains a list of web-sites that have been visited. It is possible to return to the previous web-site by pressing the [back] button. Pressing the [back] button several times moves back several web-sites.

(c) The web-site addresses for the [back] button could be stored in a **stack** or in a **queue.**

(i) State whether a **stack** or a **queue** would be better for this purpose. *[1 mark]*

(ii) State the standard method that would be used to retrieve the web-address from the data-structure when the [back] button is pressed. *[1 mark]*

A **binary search tree** can be used to store a set of names in alphabetical order.

(d) Draw a binary search tree containing the names: Al, Bob, Carla, Debbie, Ellen, Fred, Greg. *[2 marks]*

(e) (i) Explain how a binary search tree allows names to be retrieved more quickly than a simple sequential search through an array. *[2 marks]*

(ii) Outline a situation when a search in a binary-search-tree would NOT be more efficient than a sequential search in an array, assuming there are several hundred names in the tree. *[1 mark]*