UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

COMPUTING **9691/03**

Paper 3

May/June 2008

2 hours

Additional Materials: Answer Booklet/Paper

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **4** printed pages.

UNIVERSITY *of* CAMBRIDGE
International Examinations

[Turn over

1 (a) Explain what is meant by a flat file.

(b) Explain the advantages of using a relational database rather than flat files.

2 The medical notes of patients who attend a medical centre are kept on a computer system.

(a) The centre has expanded and also taken on more complex work.
The manager of the centre has commissioned a new computer system designed to accommodate this expansion.
The manager has rejected a pilot as a method of implementing the system.

(i) Describe **three** other methods of implementing the new system. [6]

(ii) Select **one** of your methods of implementation which would be most appropriate. Justify your choice. [2]

(b) The computer systems of all the medical centres in the area are connected to the area hospital. This means that patients can attend any centre and the hospital can access any record in case of emergency.
Explain why the administrators of the system chose to use an intranet for communication of data rather than the Internet. [4]

3 (a) A robot is designed to clean a floor.
It has sensors to learn about its environment and actuators to control its actions.

(i) Identify **two** sensors which would be used to give the robot sensible information and state how they would be used. [4]

(ii) Explain why the processor which controls the robot must use a real-time operating system. [2]

(b) Apart from using a robot to clean floors, give **two** other applications for which a robot would be sensible, stating why it is better to use a robot than a human. [4]

4 (a) (i) Express the number 93 as an 8 bit binary number. [2]

(ii) Express the number 93 as a number in octal. [2]

(iii) Express the number 93 as a number in hexadecimal. [2]

(b) (i) Explain how to use the binary representation of a number to work out its value in octal. [2]

(ii) Describe the connection between binary representation and hexadecimal. [2]

5 (a) Explain why standardisation across computer systems is important.
       In your answer you should include comments about standardisation of hard
       software, file formats and communication protocols.

   (b) State **two** reasons why standardisation may be considered undesirable.   [2]

6 (a) (i) State what is held in the Program Counter (PC) during the fetch/execute cycle.   [1]

       (ii) Explain how the contents of the PC change during the fetch/execute cycle.   [4]

   (b) Describe the contents of the memory address register (MAR) during the fetch/execute cycle.
                                                                                          [4]

7 List A is   2,4,7,9
   List B is   15,3,8,10,1
   These two lists are to be merged into one list in numerical order, smallest first.

   (a) List B must first be sorted into order.
       Describe how an insertion sort can be used to do this.   [4]

   (b) After both lists have been sorted they are to be combined into a single list in numerical order.
       Describe how a merge sort can be used to do this.   [4]

8 One of the main features of an operating system is the ability to schedule job throughput.

   (a) Explain the purpose of scheduling job throughput.   [2]

   (b) Describe **three** scheduling policies which lead to different scheduling algorithms.   [6]

9 (a) Describe how a compiler recognises a syntax error.   [4]

   (b) Describe the code generation phase of compilation.   [4]

10 The following fish are all part of the same food chain

guppy, herring, roach, salmon, shrimp.

The following facts apply:

fresh(guppy)
fresh(roach)
salt(shrimp)
salt(herring)
salt(salmon)
eats(herring, shrimp)
eats(salmon, herring)
eats(guppy, roach)
eats(salmon, roach)

Where fresh(x) states that x is a fresh water fish
    salt(x) states that x is a salt water fish
    eats(x, y) states that x eats y

By using examples from the facts given, explain what is meant by

    (i) instantiation, [2]

    (ii) a goal, [2]

    (iii) backtracking. [4]