UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

General Certificate of Education

Advanced Subsidiary Level and Advanced Level

COMPUTING **9691/03**

Paper 3

October/November 2004

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 in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams, graphs, music 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.

1   A user has just received and read a message via electronic mail. Describe **four** typ_____ of electronic mail which would help the user to manage the message.

2   A landscape garden company services a number of gardens. Each GARDEN is owned by ___ OWNER. Each owner may have more than one garden. Each garden has a number of PLANT_ in it and each plant may be in a number of gardens.

Draw an entity relationship (E-R) diagram to represent this data model in third normal form and label the relationships.   **[10]**

3   Describe how memory is managed in a typical modern computer system. Your answer should include an explanation of

    (i)   fragmentation of memory,   **[3]**

   (ii)   paging,   **[3]**

  (iii)   segmentation,   **[3]**

  (iv)   virtual memory.   **[3]**

4   Explain the purpose of linkers and loaders when running a program.   **[6]**

5   **(a)**   Describe the stages of the fetch/decode/execute/reset cycle, explaining how the special registers in the processor are used. You should use as an example the processing of a jump instruction.   **[9]**

  (b)   **(i)**   Explain what is meant by a parallel processing system.   **[1]**

      (ii)   Give an advantage and a disadvantage of parallel processing as opposed to serial processing.   **[2]**

6 (a) Express the denary value 109 as

    (i) a binary number using an 8-bit byte;

    (ii) an octal number;

    (iii) a hexadecimal number. **[6]**

(b) Numbers are held in floating point form with one byte for the mantissa (fraction) and one byte for the exponent (characteristic). All values are held in two's complement form and the mantissa is normalised.

Using this format, write down the binary floating point values and the denary values of

    (i) the largest magnitude, positive number;

    (ii) the smallest magnitude, positive number;

    (iii) the largest magnitude, negative number;

    (iv) the smallest magnitude, negative number.

(The denary values may be left as a product of a power of 2). **[8]**

(c) Explain how accuracy can be improved in a floating point representation and state an effect it can have on the number represented. **[3]**

7 (a) Explain what is meant by the following terms

    (i) local variables;

    (ii) global variables;

    (iii) parameters. **[3]**

(b) Explain the difference between passing a parameter by value and by reference. **[5]**

(c) Explain how a stack is used to control the following example.

A main program is run.
The instruction at address 100 calls a procedure with a parameter of value 6.
Within this procedure, at address 300, there is a call to another procedure. This second procedure is called with two parameters, 2 and 3.
(You are advised to use diagrams of a stack to illustrate your answer). **[6]**

8 **(a)** Describe the use of computers in creating a weather forecast. [5]

(b) Explain the need for parallel architecture when using a computer to forecast the weather.

(c) Weather forecasters from wide geographical areas communicate with one another electronically. Video conferencing may be used when they want to discuss particularly unusual weather systems.

State **three** advantages of communicating in this way. [3]