CANDIDATE
NAME

CENTRE
NUMBER

CANDIDATE
NUMBER

COMPUTING **9691/33**

Paper 3 **May/June 2011**

2 hours

Candidates answer on the Question Paper.

No additional materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

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.

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

No marks will be awarded for using brand names for software packages or hardware.

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 **13** printed pages and **3** blank pages.

UNIVERSITY *of* CAMBRIDGE
International Examinations

[Turn over

1 Describe the following types of processor:

    (i) Parallel processor

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    .... [2]

    (ii) Maths co-processor

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    .... [2]

    (iii) Array processor

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    .... [2]

2 **(a)** A program is to be run on a computer system.
Explain the purpose of the following in preparing the program to be run.

    (i) linkers

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(ii) loaders

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.... [4]

(b) The address part of a low-level instruction can be the address of the data to be used. This is a direct address.
Describe the following types of addressing. In each case give a reason why it may be used.

    (i) Indirect addressing

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.... [3]

    (ii) Indexed addressing

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          [Turn over

3   Discuss the problem of maintaining confidentiality of data on an open network and how to address this problem.

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4 (a) Explain why a computer-controlled door into a hotel is an example of a real-time application.

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(b) Explain how sensors and actuators are used to control the automatic door.

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                                       [Turn over

5 **(a)** Describe what is meant by virtual memory.

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(b) Describe how segmentation can be used to manage the memory in a typical modern computer system. (You may use a diagram to illustrate your answer.)

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6 Describe the purpose of the following parts of a database management system (DBMS).

    (i) Data dictionary

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        .... [2]

    (ii) Data Manipulation Language (DML)

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        .... [3]

7 **(a)** Express the denary number -95 as a two's complement integer in an eight-bit byte.

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        .... [2]

    (b) Add together the following binary numbers. Show your working.

$$\begin{array}{r} 0\ 1\ 1\ 0\ 0\ 1\ 1\ 0 \\ +\ \underline{0\ 0\ 1\ 0\ 0\ 1\ 0\ 1} \\ \\ \hline \end{array}$$

[2]

8 (a) (i) Explain the difference between static and dynamic implementation of data structures.

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.... [2]

(ii) Give **two** advantages of storing a stack in a linked list rather than in an array.

Advantage 1 ....

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Advantage 2 ....

.... [2]

(b) (i) Draw a diagram to show the following members of a Computing class sorted into alphabetic order in a binary tree. You must use the names in the order given.

FRO,   TSI,   BEV,   ROS,   AMB,   WIL,   JAM

[2]

(ii) Describe an algorithm to insert a new member of the class into the correct position in the tree.

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(iii) State a problem that arises when a member of the class needs to be removed from the tree.

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Explain how this problem can be overcome.

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9 (a) Explain why reverse Polish notation is used in computer processing.

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(b) (i) Show how the following infix expression can be represented as a binary tree.

$(a+b) - c*(d-e)$

(ii) Use the tree to write down the reverse Polish form of the expression.

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.... [6]

10 A farm has a number of FIELDs. A number of CROPs are grown on the farm.
Each CROP is grown in a number of FIELDs but each FIELD only grows one CROP.
A number of different FERTILISERs are used on each FIELD and each FERTILISER can be used on many FIELDs.

    (i) State the relationship between FIELD and CROP.

       ....

       Draw the entity-relationship (E-R) diagram to show this relationship.

       [2]

    (ii) State the relationship between FERTILISER and FIELD.

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       Draw the E-R diagram to show this relationship.

       [2]

    (iii) Explain how the relationship between FERTILISER and FIELD can be designed in third normal form.

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11 (a) Describe the differences between interpretation and compilation of a high-level language program.

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(b) When a program is run the processor uses special purpose registers. One of these registers is the Program Counter (PC).
Describe how the content of the PC changes during the fetch-execute cycle.

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.... [4]

12 A business uses the Internet to communicate with suppliers and to pay bills electronically. The business has an accounts department and a sales department, each of which has their own network. These two departments are in different buildings on the same site but their networks are connected.

Discuss different components and types of communications media available for transmitting data around the network.

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