UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

COMPUTING **9691/32**

Paper 3 **May/June 2010**

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.
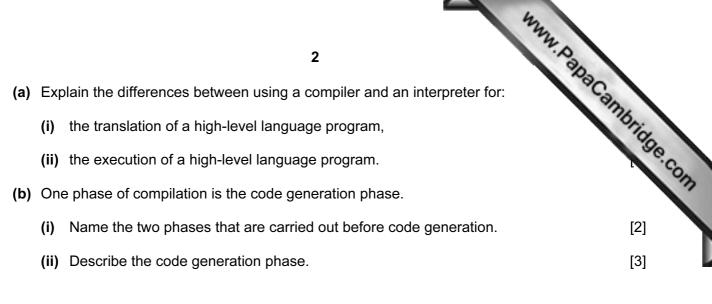
Answer **all** questions.

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 the differences between using a compiler and an interpreter for:

       (i)   the translation of a high-level language program,

       (ii) the execution of a high-level language program.

    (b) One phase of compilation is the code generation phase.

       (i)   Name the two phases that are carried out before code generation.   [2]

       (ii) Describe the code generation phase.   [3]

2   A company uses a computerised payroll system. Details of the work done by employees each week are stored serially in a transaction file. This transaction file is used to create the payroll at the end of the week. It has to be sorted into the same order as the master file.

    (a) It is necessary to find and output all the records in the transaction file which relate to a worker with ID number 23714.

       (i)   Describe how the file can be searched serially for all records with ID number 23714.   [4]

       (ii) Explain how the serial search would differ if it was known that there was only one record with that ID number.   [2]

       (iii) Describe a more efficient search algorithm if the file is in numerical order of ID numbers.   [3]

    (b) The following ID numbers are to be sorted into numerical order, with the smallest first.

           36721, 53967, 24378, 47869, 47691

       Describe an algorithm for implementing an insertion sort on the above data.   [3]

3   Robots are used to carry car bodies around in a car factory. They move from position to position in a specific order so that the car parts can be added.

    (a) State **two** types of sensor which would be needed to provide input to the robot, explaining why each is necessary.   [4]

    (b) Discuss the use of robots in the car factory.   [6]

4   (a) Explain how flat files differ from a relational database.   [2]

    (b) Describe **three** advantages of using a relational database rather than flat files to store information.   [6]

5   A new school is being built on a single site. The computers will be networked with a central storage facility.

    Discuss different topologies and the media available for transmitting data around the network.   [6]

6 **(a)** Describe the difference between the use of pages and the use of segmentation in memory.

(b) A job is split by the operating system into a number of pages. At any one time, only some of the pages are in memory.

Explain how the operating system keeps track of the different pages and the part played by virtual memory in their movement. [6]

7 **(a)** Explain how the introduction of computing technology to a factory production line has changed the working patterns of people who work there. [4]

(b) Describe the expected changes in quality of work that can be expected. [2]

8 State what is stored in each of the following special purpose registers in a computer and explain how the contents are altered during the fetch/execute cycle.

    (i) MAR [3]

    (ii) MDR (or MBR) [3]

    (iii) CIR [3]

9 A shop uses two computer systems.

System 1
At the checkout, goods being bought are identified by the system. Details are given to the customer along with the total amount owed.

System 2
Each evening details of the sales during the day are collected together. They are then used to update the stock file.

(a) Explain why the response times in these two systems will be different. [3]

(b) Describe the hardware, software and data structures of the two systems. [8]

10 An INTEGER is defined in a certain language by the following BNF rules:

<INTEGER>::=<NZDIGIT><NUMBER>│ <NZDIGIT>
<NUMBER>::=<DIGIT>│ <DIGIT><NUMBER>
<NZDIGIT>::=1│2│3│4│5│6│7│8│9
<DIGIT>::=0│ <NZDIGIT>

(a) Explain why each of the following is **not** an integer:

(i) .037   [1]

(ii) 037   [1]

(b) A REAL is defined as an integer or a zero followed by a . (point) followed by an unlimited number of digits (including none).

Produce BNF rules to define REAL. (The BNF rules stated above do not need to be reproduced.)   [3]

(c) Draw a syntax diagram of REAL. You may use NZDIGIT, DIGIT, POINT and ZERO in your diagram but no other values.   [4]