UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

COMPUTING **9691/31**

Paper 3 **October/November 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 **12** printed pages.

1 Describe the following components of a typical PC operating system and explain ho
are used.

(a) File allocation table (FAT)

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(b) Boot file

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2 **(a)** Explain what is meant by Von Neumann architecture.

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(b) Describe the use of the following special purpose registers and how they change during the fetch-execute cycle.

(i) Program Counter (PC)

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(ii) Current Instruction Register (CIR)

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3 **(a)** Convert the following denary numbers into 10-bit, sign and magnitude, binary nu

(i) -390

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(ii) -47

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(b) Convert the following denary numbers into 8-bit, two's complement, binary numbers:

(i) +93

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..... [2]

(ii) - 69

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(c) **(i)** Using the binary values from part **(a)** work out (-390) + (- 47), giving your ans
sign and magnitude form using 10-bit binary. You must show your working.

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(ii) Using the binary values from part **(b)**, work out 93 - 69, giving your answer in two's complement form using 8-bit binary. You must show your working.

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4 A health ministry has decided that it would be useful for doctors in that cou
communicate using an intranet.
Patient records could be shared and advice could be given by the doctors.

(a) Describe what is meant by an intranet.

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(b) Explain why an intranet was used rather than an open network like the World Wide Web.

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5 Robotic arms are used on the production line in a car factory.

(a) State **one** input device and **one** output device which would be used to ensure that robot can carry out its task on the production line.
In each case explain why it would be necessary.

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(b) Explain why robots are used on the production line to replace workers.

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(c) Robots are used to spray paint the car bodies.
Describe what would need to be done with the robots in the painting area fo production of a different car model.

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6 Explain how interrupts are handled by a computer system.

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7 **(a)** Explain the difference between storing data in a flat file and in a relational databa

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(b) Data about patients, doctors and treatments in a hospital are stored in a relational database.

Explain the advantages of using a relational database rather than a flat file to store the hospital data.

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(c) **(i)** Explain why access to the data in the database needs to be controlled.

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(ii) Describe how this can be achieved.

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8 **(a)** State the meaning of the following:

(i) Local variable

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(ii) Global variable

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(iii) Parameter passed by value

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(iv) Parameter passed by reference

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(b) Explain how a stack is used to handle procedure calling and parameter passing.

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9 **(a)** **(i)** Describe what happens during the lexical analysis phase of compilation.

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(ii) Explain how syntax errors are identified during compilation.

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(b) **(i)** Explain the value of using library routines when writing new programs.

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(ii) Describe how linkers and loaders are used to make the use of library routines possible.

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10 A variable identifier in a certain programming language is defined in BNF (Backu… form) as:

<non-zero-digit> ::= 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

<digit> ::= 0 | <non-zero-digit>

<letter> ::= A | B | C | x | y | z

<group> ::= <letter> | <letter><group>

<variable-identifier> ::= <non-zero-digit><group><digit> | <non-zero-digit><group>

(a) Explain why each of the following variable identifiers is invalid:

(i) 23A

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(ii) 2X

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(iii) 2ACB24

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..... [3]

(b) Using only the terms:

- non-zero-digit
- digit
- letter
- variable-identifier

draw a syntax diagram to show the definition of a variable identifier.

[4]