



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 2 7 8 8 7 8 6 8 9 *

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 how they are used.

(a) File allocation table (FAT)

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..... [3]

(b) Boot file

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..... [3]

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

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..... [3]

(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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..... [3]

(ii) Current Instruction Register (CIR)

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..... [3]

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

(i) -390

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.....

(ii) -47

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..... [3]

(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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..... [2]

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

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..... [3]

(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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7 (a) Explain the difference between storing data in a flat file and in a relational database.

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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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..... [5]

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

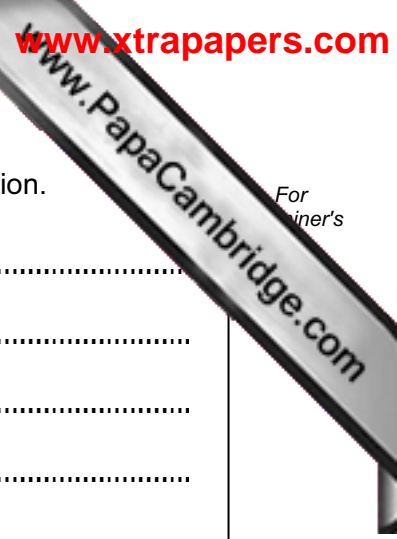
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(iv) Parameter passed by reference

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..... [4]

(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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..... [2]

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

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..... [2]

10 A variable identifier in a certain programming language is defined in BNF (Backus Normal 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

.....
.....

(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]