UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4189566669

COMPUTING **9691/32**

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.

UNIVERSITY of CAMBRIDGE International Examinations

1 **(a)** State what is meant by spooling and why it is used.

For Examiner's Use

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..... [2]

(b) A network of computers has a single printer. Each of the computers can send a job for printing at any time.

Explain how a print spooler can be used to control the printing of jobs on the network.

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For Examiner's Use

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

(i) Memory Address Register (MAR)

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..... [3]

(ii) Index Register (IR)

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(b) Explain how the address bus and the data bus are used in a computer.

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3 **(a)** Convert the denary number 395 into

For Examiner's Use

(i) a binary coded decimal number (BCD)

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(ii) a hexadecimal number

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For Examiner's Use

(b) A particular computer uses two 8-bit bytes to store floating-point values. One byte is used to store the mantissa and the other is used to store the exponent.

(i) Write down, in binary form, the largest positive value that can be stored using this representation.

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..... [2]

(ii) Write down, in binary form the smallest magnitude, negative number that can be stored in this representation.

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..... [2]

(iii) The value 01101000 11111101 is stored as a floating-point number in this computer.
State what denary number is being represented, explaining how you arrived at your answer.

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For Examiner's Use

4 A health ministry has decided that it would be useful for doctors in that country to communicate using the Internet.
Patient records could be shared and advice could be given.

(a) Explain why patients may be worried about allowing their information to be used in this way.

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(b) Describe measures that could be taken to reduce the fears of the patients.

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For Examiner's Use

5 A robotic arm is to be used to make an assembly on a production line by picking up two separate parts and screwing them together. The two parts are delivered to the robotic arm on separate conveyor belts.

(a) State **one** type of sensor and **one** output device which would be used to ensure that the task can be carried out. 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) The task for the robotic arm is changed because the components to be screwed together change in both size and shape.

Describe what would need to be done to allow the robotic arm to carry out the new task.

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6 Explain how scheduling manages job throughput in a computer.

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For Examiner's Use

7 Data about patients, doctors and treatments in a hospital are stored in a relational database. PATIENTs are seen by one DOCTOR, and each DOCTOR has many PATIENTs. Each PATIENT can be receiving more than one TREATMENT and each TREATMENT can be given to more than one PATIENT.

(a) Draw an entity-relationship (E-R) diagram to represent:

(i) the relationship between PATIENT and DOCTOR

[1]

(ii) the relationship between PATIENT and TREATMENT in third normal form.

[3]

(b) State the meaning of each of the following terms and illustrate each of your answers with an example from this database.

(i) Primary key

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(ii) Foreign key

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(iii) Secondary key

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8 Describe the characteristics of the following programming paradigms:

For Examiner's Use

(i) Low level

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(ii) Object-oriented

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(iii) Declarative

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(iv) Procedural

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For Examiner's Use

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

[4]

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

[3]

(b) (i) Give **two** advantages of using a compiler rather than an interpreter to translate a high-level language program.

[2]

(ii) Describe an advantage of using an interpreter rather than a compiler to translate a high-level language program.

[2]

For Examiner's Use

10 A variable identifier in a certain programming language is defined in BNF (Backus-Naur 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> ::= <digit><group><non-zero-digit> | <digit><group>

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

(i) 0A0

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(ii) 2WA

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(iii) 2ACB24

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..... [3]

(b) 5Ay6 can be expressed as <digit><group><non-zero-digit>.

Explain why 5Ay6 is a valid variable identifier.

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