Cambridge International A Level

Cambridge International Examinations
Cambridge International Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4449790337

COMPUTER SCIENCE **9608/33**

Paper 3 Advanced Theory **May/June 2015**

1 hour 30 minutes

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 in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
No marks will be awarded for using brand names of software packages or hardware.

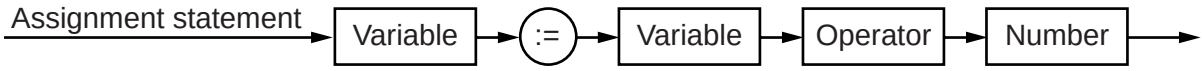
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

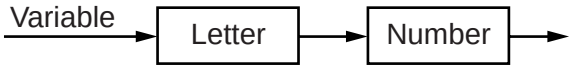
The maximum number of marks is 75.

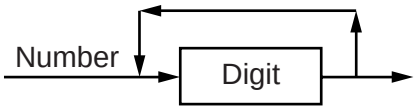
DC (ST/SW) 95542/2
© UCLES 2015

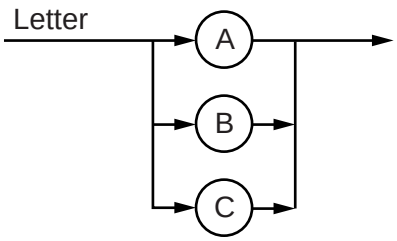
1 The following syntax diagrams, for a particular programming language, show the syntax of:

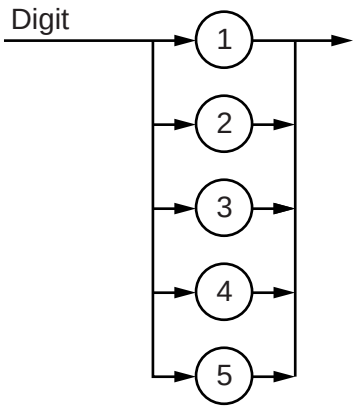
- an assignment statement
- a variable
- a number
- a letter
- a digit
- an operator

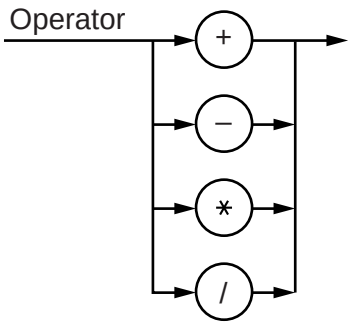












(a) The following assignment statements are invalid.

Give a reason in each case.

(i) `A2 = B3 + 123`

Reason .....

.....[1]

(ii) `B3 := B3 – 203`

Reason .....

.....[1]

(iii) `A2414 := A3 * B`

Reason .....

.....[1]

(b) Complete the Backus-Naur Form (BNF) for the syntax diagrams shown on the opposite page.

<letter> has been done for you.

<assignmentstatement> ::=

.....

<variable> ::=

.....

<number> ::=

.....

<letter> ::= A | B | C

<digit> ::=

.....

<operator> ::=

.....

[6]

(c) A company develops software. It provides virtual machines for its software developers. The company has a large number of clients who use a wide range of hardware and software.

(i) Explain the term virtual machine. Ensure that your answer includes the terms **hardware** and **software**.

.....

.....

.....

.....[2]

(ii) Give **one** benefit to the company of using virtual machines.

.....

.....[1]

(iii) Give **one** drawback to the company of using virtual machines.

.....

.....[1]

2 **(a)** Four descriptions and three types of local area network (LAN) are shown below.

Draw a line to connect each description to the type of LAN it applies to.

Description	Type of LAN
Any packet the listening computer receives may be part of a message for itself	Bus with terminators at each end
Connection provided through an access point	Star
A process for handling collisions has to be implemented	Wireless
Listening computer only receives packets that are addressed to itself	

[4]

(b) A user downloads a file using the FTP protocol.

Explain the function played by each of the following:

(i) Server .....

.....

.....[2]

(ii) Command .....

.....

.....[2]

(iii) Anonymous .....

.....

.....[2]

3 The incomplete table below shows descriptions and terms relating to malware.

(a) Complete the table with appropriate descriptions and terms.

	Description	Term
A	Sending emails which contain a link to a website that attempts to trick users into giving confidential personal data.	.....
B	It replicates by inserting itself into another piece of software.	.....
C	....	Worm
D	....	Spam

[4]

(b) Choose term A **or** term B and describe:

- a problem that might arise for a user
- a possible solution to the problem

Term .....

Problem .....

.....

Solution .....

.....[2]

(c) Explain the following terms:

Cipher text .....

.....

.....

Private key .....

.....

.....[2]

(d) Bill, a manager of a company, sent an email with very sensitive information to a work colleague, Alison. However, Bill also accidentally sent it to everybody in the company.

Describe the method used that ensured only Alison was able to read the original contents of the email.

.....

.....

.....

.....

.....

.....[4]

4 **(a)** A particular programming language allows the programmer to define their own data types.

An example of a user-defined data type for an address is:

```
TYPE ThisAddress
   DECLARE ThisHouseNo : INTEGER
   DECLARE ThisStreet  : STRING
   DECLARE ThisTown    : STRING
ENDTYPE
```

A variable of this new type is declared as follows:

```
DECLARE HomeAddress : ThisAddress
```

(i) Write the statement that assigns the house number 34 to `HomeAddress`.

.....[1]

(ii) The type definition for `ThisAddress` is to be changed.

Rewrite one line from the definition for each of the following changes.

House numbers are in the range from 1 to 10.

`DECLARE` .....

The possible towns are limited to: Brightown, Arunde and Shoram.

`DECLARE` .....[2]

(b) Temperature data from a number of weather stations are to be processed by a program.

The following data are to be stored:

- weather station ID (a unique four-letter code)
- latitude (to 2 decimal places)
- average temperature (to the nearest whole number) for each year from 2001 to 2015 inclusive

A programmer designs a composite data type `WeatherStation`. A variable of this type can be used to store all the data for one particular station.

(i) Write the definition for the user-defined data type `WeatherStation`.

.....

.....

.....

.....

.....

.....[5]

(ii) The programmer decides to store all the data in a file. The number of weather stations could grow to reach 20000, but not all stations will be present at first.

The programmer decides on random organisation for the file.

Describe **three** steps which show how a new weather station record is added to the file.

1 .....

.....

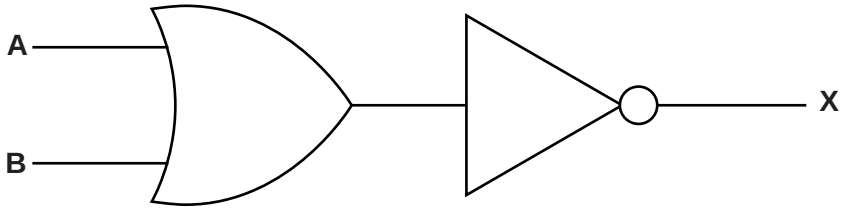
2 .....

.....

3 .....

.....[3]

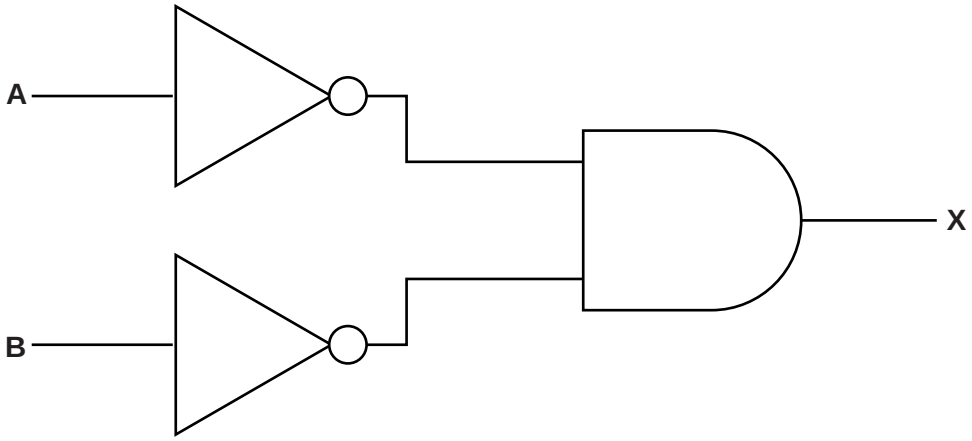
5 (a) (i) Complete the truth table for this logic circuit:



A	B	Working space	X
0	0		
0	1		
1	0		
1	1		

[1]

(ii) Complete the truth table for this logic circuit:



A	B	Working space	X
0	0		
0	1		
1	0		
1	1		

[1]

© UCLES 2015

(b) A student decides to write an equation for **X** to represent the full behaviour of each logic circuit.

(i) Write the Boolean expression that will complete the required equation for **X** for each circuit:

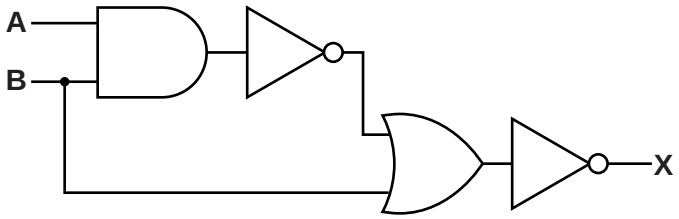
Circuit 1: **X** = ...

Circuit 2: **X** = ...[2]

(ii) Write the De Morgan's Law which is shown by your answers to **part (a)** and **part (b)(i)**.

.....[1]

(c) Write the Boolean algebraic expression corresponding to the following logic circuit:



.....[3]

(d) Using De Morgan's laws and Boolean algebra, simplify your answer to **part (c)**.

Show all your working.

.....

.....

.....

.....

.....

.....[3]

6 A company grows vegetables in a number of large greenhouses. For the vegetables to grow well, the temperature, light level and soil moisture need to always be within certain ranges.

The company installs a computerised system to keep these three growing conditions within the best ranges. Sensors are used for collecting data about the temperature, light level, and moisture content of the soil.

(a) Name the type of system described.

.....[1]

(b) Give **three** items of hardware that would be needed for this system. Justify your choice. Do not include sensors in your answer.

Item 1 .....

Justification .....

.....

Item 2 .....

Justification .....

.....

Item 3 .....

Justification .....

.....[6]

(c) **(i)** Describe what is meant by feedback in the above system.

.....

.....

.....

.....

.....

.....[3]

(ii) When the system was designed, various parameters for temperature were set.

Name **one** of these parameters.

.....

.....[1]

(iii) Explain how this parameter value is used by the feedback system.

.....

.....

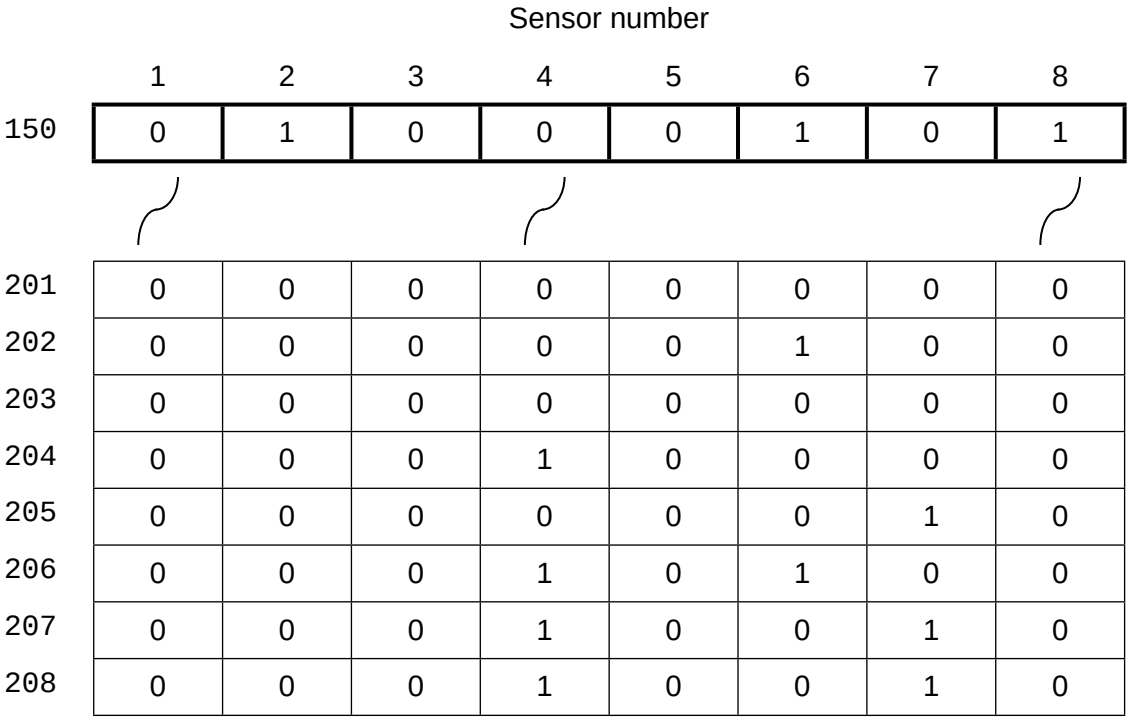
.....

.....[2]

Question 6 continues on page 14.

Each greenhouse has eight sensors (numbered 1–8).

- The byte at address 150 is used to store eight 1-bit flags.
- A flag is set to indicate whether its associated sensor reading is waiting to be processed.
- More than one sensor reading may be waiting to be processed at any particular moment.
- Data received from the sensors is stored in a block of eight consecutive bytes (addresses 201–208).
- The data from sensor 1 is at address 201, the data from sensor 2 is at address 202, and so on.



Sensor number

	1	2	3	4	5	6	7	8
150	0	1	0	0	0	1	0	1
201	0	0	0	0	0	0	0	0
202	0	0	0	0	0	1	0	0
203	0	0	0	0	0	0	0	0
204	0	0	0	1	0	0	0	0
205	0	0	0	0	0	0	1	0
206	0	0	0	1	0	1	0	0
207	0	0	0	1	0	0	1	0
208	0	0	0	1	0	0	1	0

(d) (i) Interpret the current reading for sensor 2.

.....

.....[2]

(ii) The accumulator is loaded with the data from location 150.

Write the assembly language instruction to check whether there is a value waiting to be processed for sensor 6.

```
LDD 150                 // data loaded from address 150
```

.....[3]

BLANK PAGE

© UCLES 2015

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.