Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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2252490273

COMPUTER SCIENCE **9608/12**

Paper 1 Theory Fundamentals **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.

This document consists of **16** printed pages.

CAMBRIDGE International Examinations

[Turn over

1 **(i)** Convert the following binary number into hexadecimal.

1 0 1 1 1 0 0 0

.....[1]

(ii) Convert the following denary number into BCD format.

9 7

.....[1]

(iii) Using two's complement, show how the following denary numbers could be stored in an 8-bit register:

114 | | | | | | | | |

- 93 | | | | | | | | |

[2]

2 **(a)** Sound can be represented in a computer in a digital format.

(i) Give the definition of the term sampling.

.....

.....

.....[1]

(ii) Give **one** reason why 16-bit sampling is used in an audio compact disc (CD).

.....

.....[1]

(iii) Explain what is meant by the term sampling resolution.

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.....[2]

(iv) Give **one** benefit and **one** drawback of using a higher sampling resolution.

Benefit .....

.....

Drawback .....

.....[2]

(b) Describe **two** typical features found in software for editing sound files.

1 .....

.....

2 .....

.....[2]

(c) Explain the difference between *lossless* and *lossy* data compression techniques.

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.....

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.....

.....

.....[3]

3 Five modes of addressing and five descriptions are shown below.

Draw a line to connect **each** mode of addressing to its correct description.

Mode of addressing	Description
direct	the operand is the address of the address of the value to be used
immediate	the operand is the address of the value to be used
indexed	the operand is the offset from the current address where the value to be used is stored
indirect	the operand plus the contents of the index register is the address of the value to be used
relative	the operand is the value to be used

[4]

4 **(a)** Sensors are one type of input device.

For each of the following situations, name a **different** sensor that could be used.

(i) air conditioning in an office building

.....[1]

(ii) maintaining correct growing conditions in a greenhouse

.....[1]

(iii) detecting an intruder in a building

.....[1]

(b) Sensors are used to monitor seismic activity. At the end of each day, all the data are transmitted to a central computer. This is hundreds of kilometres away.

Describe **one** way of ensuring that the integrity of the data is retained during the transmission stage.

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.....

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.....[4]

5 **(a)** Telephone calls can be made by using:

- conventional telephones (using the Public Service Telephone Network (PSTN) s
  over a wired network
- a computer, equipped with speakers and microphone, connected to the Internet

Put a tick (✓) in the correct column to match each description to the appropriate communication method.

Description	Conventional telephone using PSTN	Internet-based system
connection only in use whilst sound is being transmitted		
dedicated channel used between two points for the duration of the call		
connection maintained throughout the telephone call		
encoding schemes and compression technology used		
lines remain active even during a power outage		

[5]

(b) Distinguish between the Internet and the World Wide Web (WWW).

.....

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.....

.....[3]

(c) Name the hardware device that is being described:

(i) A device that transfers data from one network to another in an intelligent way. It [illegible] task of forwarding data packets to their destination by the most efficient route.

.....[1]

(ii) A device used between two dissimilar LANs. The device is required to convert data packets from one protocol to another.

.....[1]

(iii) A device or software that provides a specific function for computers using a network. The most common examples handle printing, file storage and the delivery of web pages.

.....[1]

6 **(a)** Name the **most** suitable input or output device for each of the following uses.

Give a different device in **each** case.

Description of use	Input or output device
input of credit card number into an online form	
selection of an option at an airport information kiosk	
output of a single high-quality photograph	
output of several hundred high-quality leaflets	
input of a hard copy image into a computer	

[5]

(b) All of the uses in **part (a)** involve the input or output of data.

(i) Describe **two** methods of preventing accidental loss of data.

1 .....

.....

2 .....

.....[2]

(ii) Describe **one** way of ensuring the security of the data against malicious damage.

.....

.....[1]

7 A system is monitored using sensors. The sensors output binary values corresponding to the following conditions, as shown in the table:

Parameter	Description of parameter	Binary value	Description of condition
P	oil pressure	1	pressure >= 3 bar
		0	pressure < 3 bar
T	temperature	1	temperature >= 200°C
		0	temperature < 200°C
R	rotation	1	rotation <= 1000 revs per minute (rpm)
		0	rotation > 1000 revs per minute (rpm)

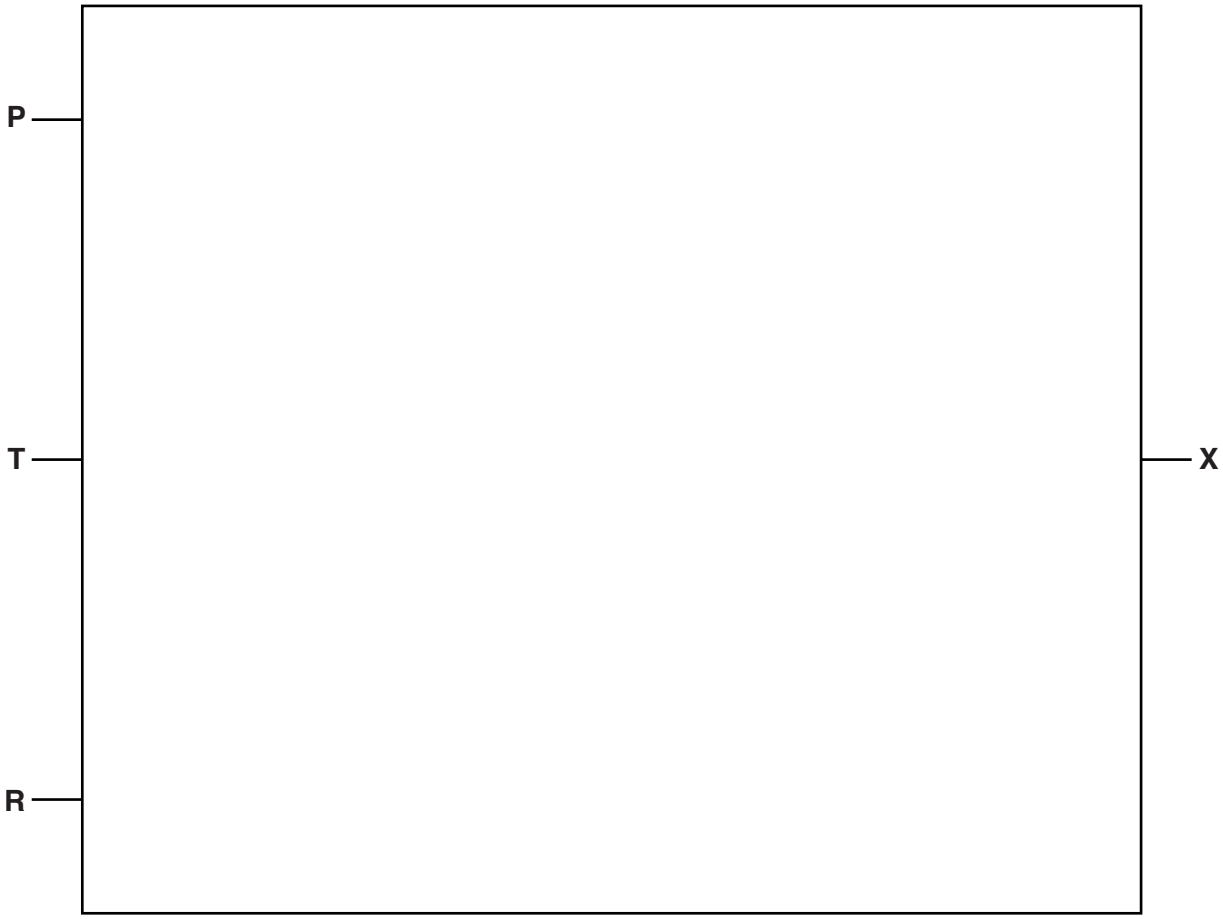
The outputs of the sensors form the inputs to a logic circuit. The output from the circuit, X, is 1 if any of the following three conditions occur:

either oil pressure >= 3 bar **and** temperature >= 200°C

or oil pressure < 3 bar **and** rotation > 1000 rpm

or temperature >= 200°C **and** rotation > 1000 rpm

(a) Draw a logic circuit to represent the above system.



[5]

(b) Complete the truth table for this system.

P	T	R	Workspace	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

8 **(a)** Explain how the width of the data bus and system clock speed affect the perfo[illegible] computer system.

Width of the data bus .....

.....

.....

.....

Clock speed .....

.....

.....

.....[3]

(b) Most computers use Universal Serial Bus (USB) ports to allow the attachment of devices.

Describe **two** benefits of using USB ports.

1 .....

.....

2 .....

.....[2]

(c) The table shows six stages in the von Neumann fetch-execute cycle.

Put the stages into the correct sequence by writing the numbers 1 to 6 in the right hand column.

Description of stage	Sequence number
the instruction is copied from the Memory Data Register (MDR) and placed in the Current Instruction Register (CIR)	
the instruction is executed	
the instruction is decoded	
the address contained in the Program Counter (PC) is copied to the Memory Address Register (MAR)	
the value in the Program Counter (PC) is incremented so that it points to the next instruction to be fetched	
the instruction is copied from the memory location contained in the Memory Address Register (MAR) and is placed in the Memory Data Register (MDR)	

[6]

Question 9 begins on page 14.

9 A database has been designed to store data about salespersons and the products the[illegible]

The following facts help to define the structure of the database:

- each salesperson works in a particular shop
- each salesperson has a unique first name
- each shop has one or more salespersons
- each product which is sold is manufactured by one company only
- each salesperson can sell any of the products
- the number of products that each salesperson has sold is recorded

The table `ShopSales` was the first attempt at designing the database.

FirstName	Shop	ProductName	NoOfProducts	Manufacturer
Nick	TX	television set refrigerator digital camera	3 2 6	SKC WP HKC
Sean	BH	hair dryer electric shaver	1 8	WG BG
John	TX	television set mobile phone digital camera toaster	2 8 4 3	SKC ARC HKC GK

(a) State why the table is **not** in First Normal Form (1NF).

.....

.....[1]

(b) The database design is changed to:

SalesPerson (FirstName, Shop)

SalesProducts (FirstName, ProductName, NoOfProducts, Manufacturer)

Using the data given in the first attempt table (ShopSales), show how these data are now stored in the revised table designs.

Table: SalesPerson

FirstName	Shop

Table: SalesProducts

FirstName	ProductName	NoOfProducts	Manufacturer

[3]

(c) (i) A relationship between the two tables has been implemented.

Explain how this has been done.

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.....

.....[2]

(ii) Explain why the `SalesProducts` table is **not** in Third Normal Form (3NF).

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.....[2]

(iii) Write the table definitions to give the database in 3NF.

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.....[2]