Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

8259318641

COMPUTER SCIENCE **2210/13**

Paper 1 Theory **October/November 2015**

1 hour 45 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 **15** printed pages and **1** blank page.

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1 **(a)** Name an application which makes use of the following sensors. A different application should be used in each case.

Temperature .....

.....

Magnetic field .....

.....

Motion .....

.....

[3]

(b) The flowchart on the opposite page shows how a light sensor and microprocessor are used to switch a street lamp on or off. When the sensor reading is <= 50 light units, the lamp is turned on automatically.

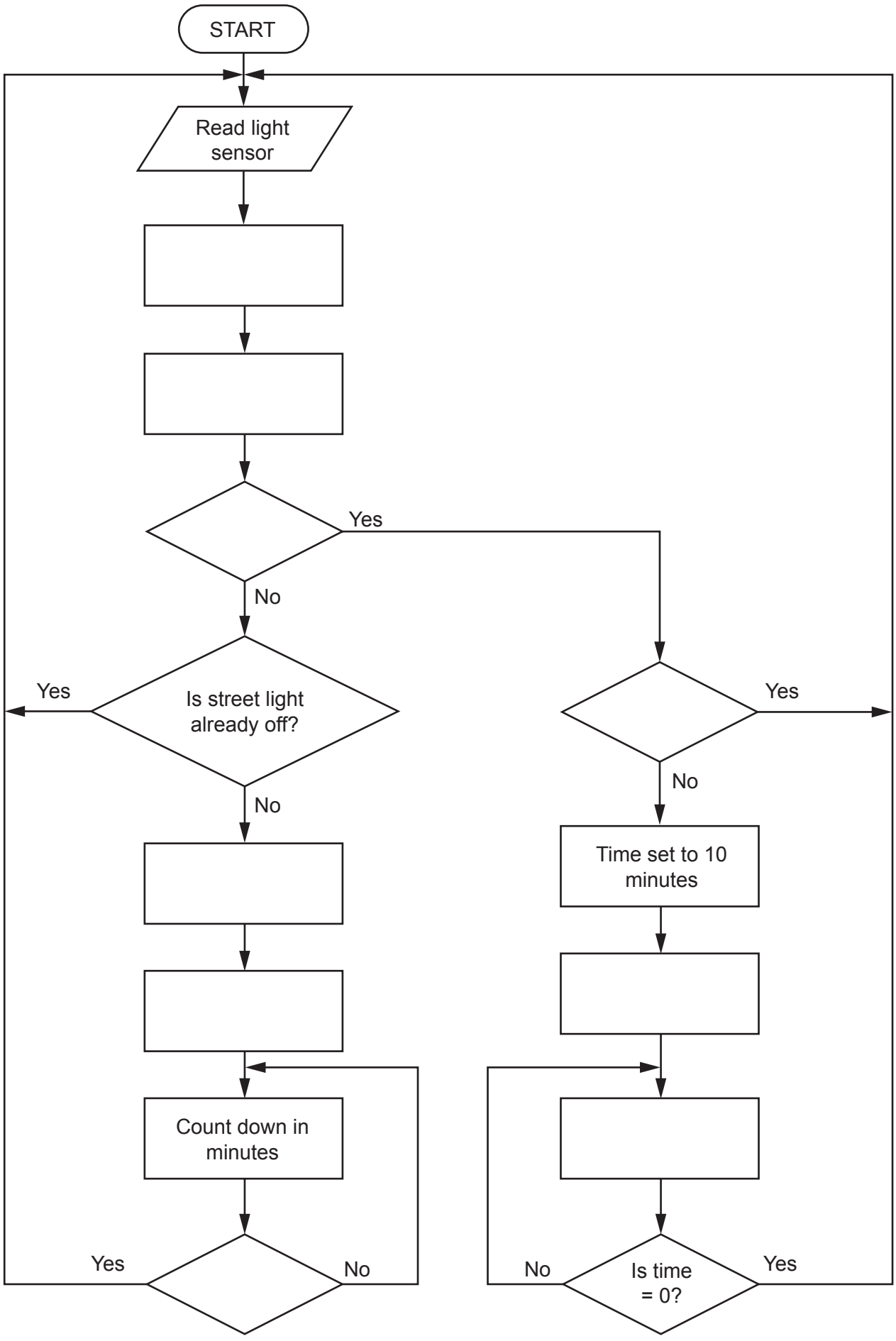
Several of the instructions have been omitted from the flowchart.

Using **item numbers only** from the list below, complete the flowchart:

Item number	Instruction
1	Count down in minutes
2	Is light reading <= 50?
3	Is street lamp already on?
4	Is time = 0?
5	The microprocessor compares the sensor reading with stored values
6	The sensor reading is sent to the microprocessor
7	Switch the street lamp off
8	Switch street lamp on
9	Time set to 10 minutes

[5]

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START
Read light sensor
Yes
No
Yes
Is street light already off?
No
Count down in minutes
Yes
No
Yes
No
Time set to 10 minutes
Yes
No
Is time = 0?

2 Sensors and a microprocessor monitor a car exhaust for high temperature and high carbon monoxide (CO) levels.

(a) Describe how the sensors and microprocessor are used to monitor the temperature and CO levels and warn the driver if either is out of range.

.....

.....

.....

.....

.....

.....

.....

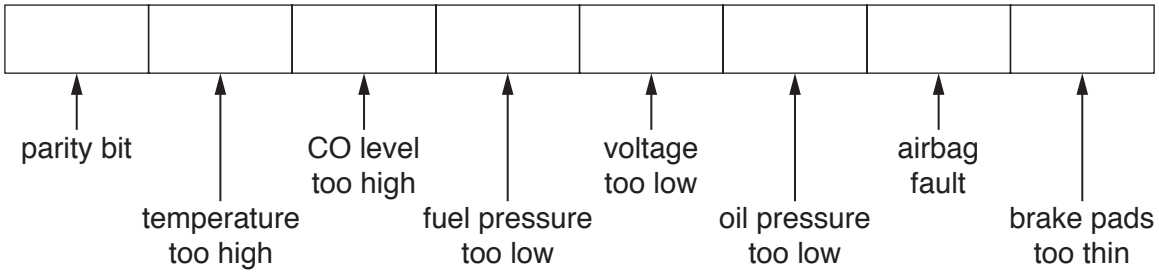
.....

.....

.....

.....[5]

(b) The information from seven sensors is sent to an engine management system in the car. The status of each sensor is stored in an 8-bit register; a value of 1 indicates a fault condition:



For example, a register showing **0 1 0 1 1 0 0 0** indicates:

- temperature too high
- fuel pressure too low
- voltage too low

(i) Identify the fault condition(s) that the following register indicates:

0	**0**	**1**	**0**	**0**	**1**	**0**	**1**

.....

.....

.....[2]

(ii) The system uses **odd** parity.

Write the correct parity bit in each register.

	1	**1**	**1**	**0**	**0**	**1**	**0**

	0	**0**	**0**	**1**	**1**	**1**	**0**

[2]

(iii) A car has a faulty airbag and the CO level is too high.

Write what should be contained in the 8-bit register.

[2]

(iv) Give the hexadecimal value of the binary number shown in **part (iii)**.

.....

.....[1]

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3 A section of computer memory is shown below:

Address	Contents
1000 0000	0110 1110
1000 0001	0101 0001
1000 0010	1000 1101
1000 0011	1000 1100
1000 1100	
1000 1101	
1000 1110	
1000 1111	

(a) (i) The contents of memory location 1000 0001 are to be read.

Show the contents of the Memory Address Register (MAR) and the Memory Data Register (MDR) during this read operation:

MAR

MDR

[2]

(ii) The value 0111 1001 is to be written into memory location 1000 1110.

Show the contents of the MAR and MDR during this write operation:

MAR

MDR

[2]

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(iii) Show any changes to the computer memory following the read and write operations in **part (a)(i)** and **part (a)(ii)**.

Address	Contents
1000 0000	0110 1110
1000 0001	0101 0001
1000 0010	1000 1101
1000 0011	1000 1100
≀	≀
1000 1100	
1000 1101	
1000 1110	
1000 1111	

[1]

(b) Name **three** other registers used in computers.

1 .....

2 .....

3 .....

[3]

(c) The control unit is part of a computer system.

What is the function of the control unit?

.....

.....

.....

.....

.....

..... [3]

4 **(a)** Computer ethics involves a number of different topics.

(i) A student made the following statement on an examination paper:

"It allows a user to have the freedom to run, copy, change and adapt the software and then pass it on to a colleague, friend or family member."

Identify which computer term the student was describing.

..... [1]

(ii) Explain what is meant by computer ethics.

.....

.....

.....

.....

.....

..... [3]

(b) The four statements below refer to firewalls and proxy servers.

Study each statement.

Tick (✓) the appropriate column(s) to indicate whether the statement refers to a firewall and/or a proxy server.

Statement	Firewall	Proxy server
Speeds up access of information from a web server by using a cache		
Filters all Internet traffic coming into and out from a user's computer, intranet or private network		
Helps to prevent malware, including viruses, from entering a user's computer		
Keeps a list of undesirable websites and IP addresses		

[4]

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(c) Explain **three** ways of preventing **accidental** loss or corruption of data.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

3 .....

.....

.....

.....

[6]

5 A security system records video footage. One minute of video requires 180 MB of storage. The recording system can store several hours of video footage.

(a) Name and describe a suitable storage device for this recording system.

.....

.....

.....

..... [2]

(b) Calculate how much storage would be needed for 2 hours of video footage.

Show your working and give the answer in Gigabytes (GB).

.....

.....

.....

..... [2]

6 Passengers fly into an airport from other countries. The airport has a security system that uses:

- computers
- scanners
- digital cameras

To gain entry to the country, each passenger must have a passport or identification (ID) card. This must contain a recent photograph and other personal data. The passenger must:

- place their passport or ID card on a scanner that reads machine-readable characters and scans the photograph
- look towards a camera that takes an image of the passenger's face

Describe how a computer checks whether the image just taken by the camera matches the scanned photograph.

.....

.....

.....

.....[2]

7 Name a suitable output device for each of the following applications. A different device should be used for each application.

Application	Suitable output device
Production of one-off photographs of very good quality	.....
High volume colour printing of advertising flyers	.....
Production of an object, which is built up layer by layer; used in CAD applications	.....
Converting electrical signals into sound	.....
Showing enlarged computer output on a wall or large screen	.....

[5]

8 Four input devices are shown in the table below.

Give an application which makes use of each device and state a reason why the device is appropriate for that application.

Your application must be different in each case.

Input device	Application and reason
Light sensor	Application ..... Reason ....
Keyboard	Application ..... Reason ....
Barcode reader	Application ..... Reason ....
Touch screen	Application ..... Reason ....

[8]

9 MP3 file compression reduces the size of a music file by 90%.

(a) A music track is 80 MB in size.

Calculate the file size after compression.

.....

How many MP3 files of the size calculated above could be stored on an 800 MB CD?

.....
[2]

(b) **(i)** Explain how MP3 files retain most of the original music quality.

.....

.....

.....

.....

..... [2]

(ii) State the type of file compression used in MP3 files.

..... [1]

(iii) Name another file compression format.

..... [1]

10 Choose **five** correct terms from the following list to complete the spaces in the sentences below:

- cypher text
- encryption algorithm
- encryption key
- firewall
- plain text
- proxy server
- symmetric encryption

..... is a security system.

It uses the same ..... to encrypt and decrypt a message.

Before encryption, the message is called ..... .

The ..... processes the original message.

The output is known as ..... . [5]

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