OCR
Oxford Cambridge and RSA

AS Level Computer Science

H046/01 Computing Principles

Monday 4 June 2018 – Morning

Time allowed: 1 hour 15 minutes

6367219970

Do not use:
- a calculator

H046601

First name									
Last name									
Centre number						Candidate number				

INSTRUCTIONS
- Use black ink.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the barcodes.

INFORMATION
- The total mark for this paper is **70**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended responses will be assessed in questions marked with an asterisk (*).
- This document consists of **16** pages.

No calculator can be used for this paper

Answer **all** the questions.

1 A company produces digital photo frames (i.e. photo frames that display digital photographs).

(a) Identify the type of operating system that the photo frame is most likely to use.

Operating system	Tick one
Distributed	
Embedded	
Multi-user	

[1]

(b) Give **two** reasons why this operating system may be stored in ROM.

1 .....

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2 .....

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[2]

(c) The photo frame has a RISC processor.

Describe **one** advantage to the company of using a RISC processor, rather than a CISC processor.

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..... **[2]**

(d) Several of these photo frames can be placed around a house and connected in a peer to peer network.

Describe what is meant by the term 'peer to peer network'.

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..... **[2]**

(e) The photo frames can also play video clips. Due to the limited storage on the device the videos are stored on the company's servers (i.e. 'in the cloud') and streamed when needed.

Give **one** disadvantage to the user of using cloud storage for their photos.

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..... **[1]**

(f) The company allows users to connect a local storage device to the photo frame to increase storage capacity.

State the name of **one** device that might be connected to the photo frame to increase storage capacity.

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..... **[1]**

2 An electricity company is looking at ways of getting meter readings from its customers. It releases an application for smartphones which allows users to submit their meter reading (a 6 digit number).

(a) Describe **one** method in which a user could enter the meter reading into the smartphone application.

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..... **[2]**

(b) JavaScript is used to check that a reasonable value is being entered before a meter reading is sent to a server. When the user enters a meter reading number, the function `validateReading` is called. If the number entered is a valid number between 1 and 999999 inclusive, it returns `true` otherwise it returns `false`.

You will need to use the JavaScript function `isNaN()` standing for "is not a number". This returns `true` if the value it is given is not a number and `false` if it is.

`isNaN(computer4)` returns `true`
`isNaN(203)` returns `false`

Complete the function

```
function validateReading(reading)
{









}
```

[4]

(c) The electricity company decides to trial smart meters. These can be connected to a computer so the user can download and analyse records of their electricity usage.

(i) In order to be able to access all the functionality of the meter, the computer needs a device driver. Describe what is meant by the term 'device driver'.

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..... **[2]**

(ii) In order to transfer data, the meter and computer need an established set of rules for how they will communicate.

State the term used for a set of rules for communication between two devices.

..... **[1]**

(iii) Once downloaded, the user can analyse the data.

State the type of application that the user might use to analyse the data once downloaded.

..... **[1]**

3 The Government Communications Headquarters (GCHQ) is responsible for monitoring communications in order to keep the UK secure. A large part of its job involves trying to break into encrypted messages.

(a) The code breakers at GCHQ have access to supercomputers (computers with many processors).

Describe why a supercomputer will be useful to GCHQ.

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..... **[2]**

(b) GCHQ has to operate within the law. Describe how the law allows GCHQ to monitor communications.

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..... **[2]**

4 Desktop operating systems are an essential part of modern personal computer systems (i.e. desktops and laptops).

(a) Describe how a desktop operating system is loaded when a personal computer is first switched on.

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..... **[2]**

(b) Operating systems often come with utilities.

State a utility that might be supplied with a desktop operating system to help with system maintenance.

..... **[1]**

(c)* One of the key functions of an operating system in a personal computer is to manage system resources such as memory and CPU time. Discuss the different approaches a desktop operating system can take to managing these system resources and the relative advantages of each approach. **[9]**

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5 **(a)** Convert the denary number 72 to an unsigned 8-bit integer.

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..... **[1]**

(b) Convert the unsigned binary number 10000101 to denary.

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..... **[1]**

(c) Convert the denary number 104 to hexadecimal.

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..... **[1]**

(d) The following floating point binary number is represented using 6 bits for the mantissa and 4 bits for the exponent, both using two's complement.

Mantissa	Exponent
0100101	0100

Convert the number to denary, showing your working.

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..... **[3]**

(e) Given that computers store everything in binary, explain how they are able to represent text.

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..... **[2]**

6 A Boolean expression is entered into a Karnaugh Map.

(a) Give a simplified version of the expression using the Karnaugh Map. You must show your working.

CD \ AB	00	01	11	10
00	1	1	1	1
01	1	1	1	1
11	0	1	1	0
10	0	1	1	0

Simplified Expression: ..... **[3]**

(b) Draw a logic gate diagram to represent the expression below. **[4]**

$(\neg A \wedge B) \vee (\neg C \wedge D)$

7 A meteorologist sets up a weather station to monitor temperatures throughout the year.

She classifies temperatures in one of four bands:

Band	**Temperature Range (degrees Celsius)**
Band A	10 or below
Band B	11–20
Band C	21–30
Band D	31 or above

The weather station records the temperature every day as an integer. At the end of the year the temperatures are stored in an array called `temperatures`.

Write a program in pseudocode that reads through this array and produces an output which shows the total number of days within each band. An example of such an output is shown below.

```
Band A: 93
Band B: 143
Band C: 98
Band D: 31
```

Ensure your code is efficient.

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..... **[6]**

8* A programmer is writing a game to run on a variety of games consoles. Discuss the different ways in which they might use virtual machines in this process and any advantages and disadvantages of doing so.

.... [9]

9 The Von Neumann architecture uses a Control Unit and an Arithmetic Logic Unit.

(a) State the register in which the Arithmetic Logic Unit stores its results.

..... **[1]**

(b) Tick the stage of the fetch decode execute cycle in which the register in part (a) would receive a value from the Arithmetic Logic Unit.

Stage	Tick one
Fetch	
Decode	
Execute	

[1]

(c) Write an assembly program (using the Little Man Computer instruction set) which repeatedly asks for a number until 3 is entered. When 3 is entered, the program should stop.

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..... **[3]**

END OF QUESTION PAPER

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