



Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

AS COMPUTER SCIENCE

Paper 2

Friday 9 June 2017

Morning

Time allowed: 1 hour 30 minutes

Materials

You will need no other materials.

You may use a calculator.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.

Advice

- In some questions you are required to indicate your answer by completely shading a lozenge alongside the appropriate answer as shown. 
- If you want to change your answer you must cross out your original answer as shown. 
- If you wish to return to an answer previously crossed out, ring the answer you now wish to select as shown. 

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
TOTAL	

There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Answer **all** questions in the spaces provided.

0 1

0 1 . 1

Shade in **one** lozenge to indicate which of the symbols represents the set of rational numbers.

[1 mark]

Q	○	R	○	Z	○	N	○
---	---	---	---	---	---	---	---

0 1 . 2

Shade in **one** lozenge to indicate which of the symbols represents the set of numbers that does **not** include **all** of the numbers -3, 4 and 9.

[1 mark]

Q	○	R	○	Z	○	N	○
---	---	---	---	---	---	---	---

0 1 . 3

Shade in **one** lozenge to indicate which of the symbols represents the set of numbers that is most suitable for measuring the circumference of a ball.

[1 mark]

Q	○	R	○	Z	○	N	○
---	---	---	---	---	---	---	---

3

Turn over for the next question

Turn over ►

0 2 Figure 1a and Figure 1b show two bit patterns.

Figure 1a

0	0	0	1	0	1	1	1
---	---	---	---	---	---	---	---

Figure 1b

0	0	0	0	0	1	1	0
---	---	---	---	---	---	---	---

0 2 . 1 Explain how unsigned binary integers can be converted to hexadecimal.

You should illustrate in your explanation how the bit pattern in **Figure 1a** would be converted.

[2 marks]

0 2 . 2 If **Figure 1a** and **Figure 1b** both represent unsigned binary integers, what is the **binary result** of adding the two numbers together?

[1 mark]

Answer: _____

0 2 . 3

If **Figure 1a** and **Figure 1b** both represent unsigned binary integers, what is the **binary result** of multiplying the two numbers?

You **must** show your working.

[2 marks]

Answer: _____

0 2 . 4

Indicate clearly on **Figure 2** where the binary point must be placed so that the value 19.375 is represented.

[1 mark]

Figure 2

1	0	0	1	1	0	1	1
---	---	---	---	---	---	---	---

0 2 . 5

Figure 3 is a 7-bit ASCII character to be transmitted across a network. The system uses odd parity with the parity bit being transmitted in the MSB (Most Significant Bit).

Calculate the parity bit and write it in the empty cell in **Figure 3**.

[1 mark]

Figure 3

	0	1	0	1	0	1	1
--	---	---	---	---	---	---	---

Turn over ►

0 2 . 6

When transmitting data across a network some systems use majority voting rather than a parity bit.

State **one** advantage of using majority voting over a parity bit **and** explain how this advantage is achieved.

[2 marks]

9

0 3

A band is recording and digitising a song to make available as a download from their website.

0 3 . 1

The song lasts 3 minutes. The sample resolution is 16 bits and a sample rate of 44 kHz has been used.

A sample rate of 1 Hz means that one sample has been taken every second.

Calculate the minimum amount of storage space, in megabytes (MB), needed to store the song in an uncompressed format.

You **must** show your working.

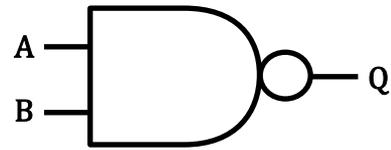
[3 marks]

Answer: _____

0 5

Figure 4

A	B	Q
0	0	1
0	1	1
1	0	1
1	1	0



0 5 . 1

What is the name of the logic gate represented by the truth table and symbol shown in **Figure 4**?

[1 mark]

0 5 . 2

Complete the truth table below to prove that $A + \bar{B}$ is equivalent to $\overline{\bar{A} \cdot B}$

[3 marks]

A	B					
0	0					
0	1					
1	0					
1	1					

0 5 . 3

Using the laws of Boolean algebra, simplify the following Boolean expression.

$$(X + Y) \cdot (X + \bar{Y})$$

You **must** show your working.

[4 marks]

Answer: _____

—
8

Turn over for the next question

Turn over ►

0	6
---	---

The two most common computer architectures are **Harvard** and **von Neumann**.

0	6	.	1
---	---	---	---

Describe **one** difference between the way the Harvard and von Neumann architectures operate.

[2 marks]

0	6	.	2
---	---	---	---

Shade **one** lozenge to indicate the type of computer architecture that is typically used for digital signal processing.

[1 mark]

Harvard	<input type="radio"/>	von Neumann	<input type="radio"/>
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0 7**Table 1 – standard AQA assembly language instruction set.** This should be used to answer question parts **0 7 . 1** and **0 7 . 2**

LDR Rd, <memory ref>	Load the value stored in the memory location specified by <memory ref> into register d.
STR Rd, <memory ref>	Store the value that is in register d into the memory location specified by <memory ref>.
ADD Rd, Rn, <operand2>	Add the value specified in <operand2> to the value in register n and store the result in register d.
SUB Rd, Rn, <operand2>	Subtract the value specified by <operand2> from the value in register n and store the result in register d.
MOV Rd, <operand2>	Copy the value specified by <operand2> into register d.
CMP Rn, <operand2>	Compare the value stored in register n with the value specified by <operand2>.
B <label>	Always branch to the instruction at position <label> in the program.
B<condition> <label>	Branch to the instruction at position <label> if the last comparison met the criterion specified by <condition>. Possible values for <condition> and their meanings are: EQ: equal to NE: not equal to GT: greater than LT: less than
AND Rd, Rn, <operand2>	Perform a bitwise logical AND operation between the value in register n and the value specified by <operand2> and store the result in register d.
ORR Rd, Rn, <operand2>	Perform a bitwise logical OR operation between the value in register n and the value specified by <operand2> and store the result in register d.
EOR Rd, Rn, <operand2>	Perform a bitwise logical XOR (exclusive or) operation between the value in register n and the value specified by <operand2> and store the result in register d.
MVN Rd, <operand2>	Perform a bitwise logical NOT operation on the value specified by <operand2> and store the result in register d.
LSL Rd, Rn, <operand2>	Logically shift left the value stored in register n by the number of bits specified by <operand2> and store the result in register d.
LSR Rd, Rn, <operand2>	Logically shift right the value stored in register n by the number of bits specified by <operand2> and store the result in register d.
HALT	Stops the execution of the program.

Labels: A label is placed in the code by writing an identifier followed by a colon (:). To refer to a label the identifier of the label is placed after the branch instruction.

Interpretation of <operand2>

<operand2> can be interpreted in two different ways, depending on whether the first character is a # or an R:

- # – use the decimal value specified after the #, eg #25 means use the decimal value 25.
- Rm – use the value stored in register m, eg R6 means use the value stored in register 6.

The available general purpose registers that the programmer can use are numbered 0 to 12.

0 7 . 1

Figure 5 shows an incomplete assembly language program. The intended purpose of the code is to count from 1 to 10 inclusive, writing the values to memory location 17, which is used to control a motor.

Complete the code in **Figure 5**. You may not need to use all four lines for your solution and you should not write more than one instruction per line.

[4 marks]

Figure 5

```

MOV R0, #1
startloop:
STR R0, 17
_____
_____
_____
_____
endloop:
HALT

```

0 7 . 2

R1 contains the decimal value 7. What value will be contained in R1 after the instruction below is executed?

```
LSL R1, R1, #2
```

[1 mark]

0 7 . 3

Explain the difference between direct addressing and immediate addressing.

[1 mark]

6

Turn over ►

0 8 . 3

Explain how disabling SSID (Service Set Identifier) broadcasting can increase the security of a wireless network.

[2 marks]

0 8 . 4

Explain how the use of a MAC (Media Access Control) address white list can increase the security of a wireless network.

[2 marks]

10

Turn over for the next question

Turn over ►

