Surname		Centre Number	Candidate Number
First name(s)			2

GCE AS

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B500U10-1

Z22-B500U10-1

eduqas
Part of WJEC

TUESDAY, 17 MAY 2022 – AFTERNOON

COMPUTER SCIENCE – AS component 1
Fundamentals of Computer Science

2 hours

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	4	
2.	5	
3.	7	
4.	9	
5.	8	
6.	11	
7.	7	
8.	6	
9.	7	
10.	14	
11.	6	
12.	4	
13.	12	
Total	100	

ADDITIONAL MATERIALS

A calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

The total number of marks available is 100.

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Answer **all** questions.

1. Describe the use of **two** input and **two** output devices in an application of your choice. [4]

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2. Draw a truth table for the Boolean expression. [5]

$$P = \overline{A} \oplus B + (B + \overline{C})$$

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3. (a) Name **two** methods of data transmission and give an application for each. [4]

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(b) State how multiplexing works on a computer network. [1]

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(c) Describe what happens in a network collision. [2]

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4. The following data is stored in RAM:

Address	Memory Contents	
	Opcode	**Operand**
0000	0101	0100
0001	0001	0101
0010	0011	0110
0011	0000	0000
0100	0000	0001
0101	0000	0100
0110	0000	0000

Opcodes
- 0001 is used to add the contents of the memory data register to the accumulator.
- 0011 is used to store the contents of the accumulator in main memory.
- 0101 is used to load data from RAM.

(a) Complete the following table showing how data changes when read from RAM into registers for **three** fetch-decode-execute cycles. [6]
The first cycle has been completed for you.

	Cycle Stage	Control Unit	Program Counter	Memory Address Register	Memory Data Register	Current Instruction Register	Accumulator
First	**Fetch**		0000	0000	0101 0100	0101 0100	
	Decode	0101					
	Execute		0001	0100	0000 0001		0000 0001
Second	**Fetch**						
	Decode						
	Execute						
Third	**Fetch**						
	Decode						
	Execute						

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(b)   State the role of the Arithmetic Logic Unit in question **4**(a) and the denary value that
       resulted from this.   [2]

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(c)   State the change to the data stored in RAM at the end of the three cycles.   [1]

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5. Clearly showing each step, simplify the following expression using only Boolean identities and rules. [8]

Do not use truth tables in your simplification.

$$(X + Y) \cdot (Z + \overline{Y}) + X \cdot Y + Z \cdot \overline{X}$$

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(B500U10-1)   **Turn over.**

8

6. In a certain computer system, real numbers are stored in **normalised** floating-point form using two's complementation, a 6-bit mantissa and a 3-bit exponent.

(a) Convert the number 3.125_{10} into this floating-point form. [3]

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(b) The largest denary number that can be stored in this floating-point form is 7.75_{10}. Demonstrate how this value could be increased without changing the overall 9-bit storage requirement for this floating-point number. [4]

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(c)   Give the advantages of representing numbers in integer and floating-point forms.   [4]

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7. Consider the algorithm for Function X.

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1   Function X (myArray[0 to n - 1], searchValue, start, end)
2
3   if (end < start)then
4      return error_message
5   end if
6
7   mid = (start + end) DIV 2
8
9   if (myArray[mid] > searchValue)then
10     return X(myArray, searchValue, start, mid - 1)
11  else if (myArray[mid]
12     return X(myArray, searchValue, mid + 1, end)
13  else
14     return mid
15  end if
16  End Function
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(a) State the name given to this type of algorithm. [1]

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(b) Describe why the function DIV is used in line 7 instead of the division symbol /. [2]

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(c) Complete the following table by identifying **two** parameters used in Function X and their purpose. [4]

Parameter	Purpose

8. Describe the distinguishing features of an event-driven programming paradigm. [6]

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9. Write an algorithm, using pseudo-code, which converts a denary value between $0-15_{10}$ to a 4-bit binary value. [7]

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10. A team of systems analysts have been employed to develop a new computer system for a nationwide organisation.

    (a)   Explain the benefits and drawbacks of **two** different methods of investigation.   [8]

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(b)   The organisation wishes to explore different methods for backing up its data.
      Describe different procedures for backing up and recovering data.   [6]

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11. Describe open source, bespoke and off-the-shelf software. [6]

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12. Describe malicious and accidental damage to data and identify situations where either could occur. [4]

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13. Advances in computer science, such as expert systems and robotics, have completely transformed the way in which some organisations work.

Discuss the function of expert systems and robotics and their use in different contexts. Describe the social and economic changes that have happened as a result of their use.   [12]

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.	Examiner only

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