

Surname	Centre Number	Candidate Number
Other Names		2

GCE AS – NEW AS



B500U10-1



COMPUTER SCIENCE – Component 1
Fundamentals of Computer Science

A.M. MONDAY, 6 June 2016

2 hours

For Examiner's use only		
	Maximum Mark	Mark Awarded
Total	100	

B500U101
01

ADDITIONAL MATERIALS

The use of a calculator is permitted in this examination.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball point pen.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

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.

Answer all questions.

1. (a) Complete the truth table below.

[4]

A	B	A OR B	A AND B	A XOR B	A OR (NOT B)
0	0				
0	1				
1	0				
1	1				

- (b) Using the following number:

10101111_2

Show how a logical operation can be used to discover the state of the most significant (leftmost) bit. [3]

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3. Discuss the benefits of solid-state drives compared with magnetic hard disc drives.

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4. (a) State what is meant by the term handshaking.

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- (b) Name a standard networking protocol, describing its function and importance.

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5. Different primitive data types are used in computer systems.

- (a) (i) Using the example 131_{10} , calculate the storage requirements for an integer data type within an **unsigned** range of 0_{10} to 255_{10} . [2]

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- (ii) In a certain computer system, numbers are represented using sign and magnitude.
Give the range for a **signed** integer data type with the same storage requirements as question 5(a)(i). [1]

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(b) Character and string are also primitive data types.

- (i) Describe the use of standardised character sets, such as ASCII. [1]

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- (ii) Giving suitable examples, compare the storage requirements for a character and a string data type which uses a standard character set. [2]

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6. Discuss the benefits and drawbacks of two different methods of investigation available to a systems analyst. [6]

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7. Giving suitable examples, explain how the Computer Misuse Act 1990 aims to improve data security. [3]

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8. (a) Convert the hexadecimal numbers $3E_{16}$ and 27_{16} into two binary numbers and, using binary addition, calculate the number that would result from adding them.

Convert your answer into a denary number.

You must show **all** of your workings.

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- (b) Using the number -27_{10} as an example, describe two's complement and sign and magnitude representation in an 8-bit register.

[5]

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- (c) (i) In a certain computer system, real numbers are stored in floating point form using two's complementation, an 8 bit mantissa and a 4 bit exponent.

Mantissa								Exponent			
.											

Convert the number 8.75_{10} into this floating point form.

[3]

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- (ii) In the same computer system, the following is a floating point representation of a real number:

Mantissa								Exponent			
0	.	1	0	1	1	0	0	0	0	1	1

Calculate the denary value of the mantissa and exponent, and convert this floating point number into a denary number.

[3]

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10. Clearly showing each step, simplify the following Boolean expression:

[6]

$$A.(A + C) + A.(C + B) + C.(C + B)$$

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11. Explain the concept of open source software.

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12. Describe syntax analysis in the compilation process.

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13. The following algorithm sorts integers stored in `myArray`. It will not work correctly under certain circumstances.

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1   Start Procedure SortMyArray
2   n is integer
3   temp is integer
4   swapped is boolean
5
6   set n = length(myArray)    {returns the length of myArray}
7   repeat
8       set swapped = FALSE
9       for i = 0 to (n - 1)
10          if myArray[i] <= myArray[i + 1] then
11              temp = myArray[i + 1]
12              myArray[i + 1] = myArray[i]
13              myArray[i] = temp
14              swapped = TRUE
15          end if
16      end for
17  until (swapped = FALSE)
18
19  End Procedure

```

- (a) State the name given to this type of sort and describe its function.

[2]

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- (b) The following data is stored in `myArray`:

(0)	(1)	(2)	(3)	(4)
1	5	2	6	10

myArray

Show the effect that this algorithm will have on the data in the array below.

[1]

(0)	(1)	(2)	(3)	(4)

myArray

- (c) The algorithm will fail if `myArray` contains the following data:

(0)	(1)	(2)	(3)	(4)
131	4	0	-6	4

myArray

- (i) Explain why the algorithm will fail in this case.

[3]

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- (ii) Suggest a suitable change that could be made to the algorithm to overcome this problem.

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14. (a) Describe the distinguishing features of a procedural language programming paradigm.

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- (b) Describe the object-oriented approach to programming.

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- Giving a suitable application for each, describe the main features of two different modes of operation.

You should draw on your knowledge, skills and understanding from a number of areas across your Computer Science course when answering this question. [12]

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