Surname	Centre Number	Candidate Number
Other Names		2

GCE AS – NEW AS

B500U10-1

S16-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.

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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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2. Describe cache memory in a Central Processing Unit (CPU), giving advantages of using cache memory. [5]

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3. Discuss the benefits of solid-state drives compared with magnetic hard disc drives. [6]

Examiner only

4. *(a)* State what is meant by the term handshaking. [1]

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(b) Name a standard networking protocol, describing its function and importance. [3]

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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. [5]

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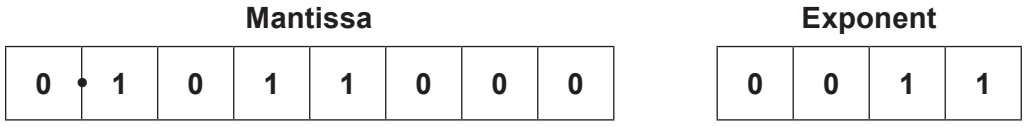
(c) (i) In a certain computer system, real numbers are stored in floating point form using two's complementation, an 8 bit mantissa and a 4 bit exponent.

Convert the number 8.75_{10} into this floating point form. [3]

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



Calculate the denary value of the mantissa and exponent, and convert this floating point number into a denary number. [3]

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9. Write a linear search algorithm, using pseudo-code, for the following array.

(0)	(1)	(2)	(3)	(4)	(5)	(6)
2	7	3	5	8	9	1

myArray

Your algorithm should output the position of the `SearchValue` if it is found or a suitable message if the `SearchValue` is not present in `myArray`.

Your algorithm should be written using self-documenting identifiers. [7]

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10. Clearly showing each step, simplify the following Boolean expression: [6]

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

Examiner only

11. Explain the concept of open source software. [4]

Examiner only

12. Describe syntax analysis in the compilation process. [3]

Examiner only

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

```
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

Examiner only

(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. [1]

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14. *(a)* Describe the distinguishing features of a procedural language programming paradigm. [4]

(b) Describe the object-oriented approach to programming. [4]

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15. Different modes of operation are used for processing data in different operating systems.

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

In each case, discuss suitable input and output methods that could be used in the applications you have described.

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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