Surname	Centre Number	Candidate Number
Other Names		2

GCE AS – NEW

B500U10-1

S17-B500U10-1

COMPUTER SCIENCE – AS component 1
Fundamentals of Computer Science

MONDAY, 5 JUNE 2017 – MORNING

2 hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**5**	
2.	**4**	
3.	**4**	
4.	**20**	
5.	**10**	
6.	**6**	
7.	**11**	
8.	**6**	
9.	**4**	
10.	**8**	
11.	**12**	
12.	**10**	
Total	**100**	

B500U101
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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.

Examiner only

Answer **all** *questions.*

1. *(a)* Define the term Internet. [1]

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(b) Name the most appropriate networking protocols for the following situations:

(i) Broadcasting data where there is no need to guarantee delivery, ordering or duplicate protection. [1]

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(ii) Transferring multimedia web pages over the Internet. [1]

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(iii) Adding devices to a network without the need for manually assigning them a unique IP address. [1]

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(iv) Downloading email from a mail server. [1]

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Examiner only

2. Describe the fetch-execute cycle, including how data is read from RAM into registers. [4]

Examiner only

3. Explain the term parallel processing. Your answer should include the principles on which it operates and its associated drawbacks. [4]

Examiner only

4. *(a)* Convert the denary numbers 106_{10} and 57_{10} into their equivalent unsigned 8 bit binary numbers.

Carry out the binary addition of the two resulting 8 bit binary numbers. Convert your binary answer into a hexadecimal number.

Show **all** of your workings. [5]

(b) (i) Using the denary numbers $+8_{10}$ and -8_{10}, describe how positive and negative integers are stored using sign and magnitude representation. [3]

(ii) Describe how the denary number -8_{10} is stored using two's complement representation. [2]

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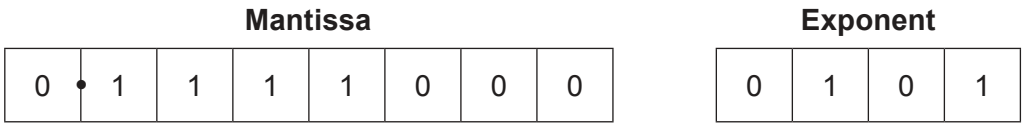
(c) (i) In a certain computer system, real numbers are stored in floating-point form using 12 bits as shown below.

8 bits are used for the mantissa and 4 bits for the exponent. Both mantissa and exponent use two's complement representation.

Convert the number 2.375_{10} into this floating-point form. [3]

(ii) In the same computer system, a floating-point representation of a real number is shown below.



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

Examiner only

(iii) Give the advantages of representing numbers in integer form and give the advantages of representing numbers in floating-point form. [4]

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Examiner only

5. *(a)* State what is meant by the term algorithm and give two common methods of defining algorithms. [3]

(b) Write an algorithm that will determine if a positive integer entered is odd or even.

Your algorithm should output a suitable error message if the integer entered is greater than 100.

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

Examiner only

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

$$A.(B + C) + B.(A + \overline{B}) + C.(\overline{A} + C)$$

[6]

7. The following algorithm sorts integers stored in `myArray`.

```
1  Declare Procedure SortMyArray
2
3  myArray [0…3] is integer            {declares the array}
4
5  i is integer
6  j is integer
7  n is integer
8  currentItem is integer
9  inserted is boolean
10
11 set n = ubound[myArray]    {total number of items in array}
12
13 for i = 1 to n - 1
14    set currentItem = myArray[i]
15    set inserted = false
16    set j = i - 1
17
18    Do
19          if (currentItem < myArray[j]) then
20              myArray[j + 1] = myArray[j]
21              j = j - 1
22              myArray[j + 1] = currentItem
23          Else
24              inserted = true
25          End If
26    While (j >= 0 AND inserted = false)
27
28 next i
29
30 End
```

(a) The following data is stored in `myArray`:

(0)	(1)	(2)	(3)
1	3	9	2

myArray

Examiner only

Show the four effects that this algorithm will have on the data within the array. [4]

	(0)	(1)	(2)	(3)
Original Data	1	3	9	2
Effect 1				
Effect 2				
Effect 3				
Effect 4				

myArray

(b) State the name given to this type of sort and describe its function. [2]

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(c) Name a logical operator used in the algorithm. [1]

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(d) Give an example of selection from the algorithm and state its purpose. [2]

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(e) Give an example of repetition from the algorithm and state its purpose. [2]

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Examiner only

8. Describe the features of the mark-up language programming paradigm. [6]

Examiner only

9. Explain lossy data compression techniques. [4]

Examiner only

10. *(a)* Describe the terms file and record within a computer system. [2]

(b) Explain what is meant by a fixed length field and a variable length field and give an example of data that could sensibly be stored in each field type. [6]

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11. A mobile phone company uses indexed sequential files and direct (random) access files on its computer system.

(a) Describe indexed sequential file organisation. [2]

(b) Describe direct (random) access file organisation and how overflow is used. [6]

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(c) Draw a clearly labelled diagram that shows how a transaction file and master file are used to produce a monthly mobile phone bill for each customer. [4]

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12. Describe the role of the operating system in managing resources and providing a user interface. [10]

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END OF PAPER