

Surname	Centre Number	Candidate Number
Other Names		2



**GCE AS – NEW**

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	
<b>Total</b>	<b>100</b>	

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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.

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

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

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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.

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- (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]

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

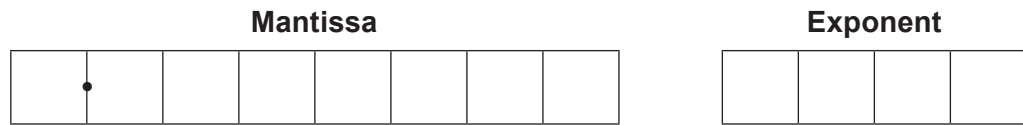
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- (c) (i) In a certain computer system, real numbers are stored in floating-point form using 12 bits as shown below.



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]

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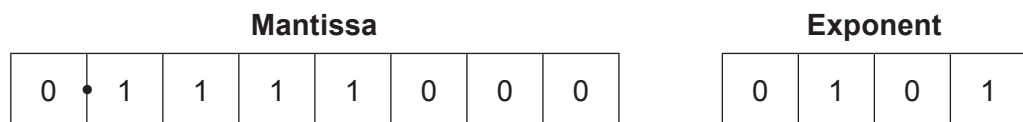
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- (ii) In the same computer system, a floating-point representation of a real number is shown below.



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

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

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

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

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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**

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

[4]

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	(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.

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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.

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

[6]

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9. Explain lossy data compression techniques.

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10. (a) Describe the terms file and record within a computer system.

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- (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.

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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.

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

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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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[10]

[illegible]

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