Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A LEVEL

2500U10-1

S19-2500U10-1

COMPUTER SCIENCE – AS unit 1
Fundamentals of Computer Science

TUESDAY, 21 MAY 2019 – MORNING

2 hours

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

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01

ADDITIONAL MATERIALS

A calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Answer **all** questions.

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

Write your answers in the spaces provided in this booklet. If you run out of space, use the continuation pages 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.

The total number of marks available is 100.

Assessment will take into account the quality of written communication used in your answers.

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Answer **all** *questions.*

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

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(b) Describe the use of the following networking protocols:

(i) Universal Datagram Protocol (UDP). [1]

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(ii) Dynamic Host Configuration Protocol (DHCP). [1]

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(iii) Simple Mail Transfer Protocol (SMTP). [1]

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2. This is an algorithm which should have four outputs, `a`, `b`, `c` and `d`. The algorithm does not work as intended.

```
1    define myFunction
2    declare c as integer
3    declare d as integer
4          set c = 3
5          set d = 4
6    end myFunction
7
8    Start MainProg
9    declare a as integer
10   declare b as integer
11
12   set a = 0
13
14   if a = 0 then
15         set b = 1
16   end if
17
18   call myFunction
19
20   output a
21   output b
22   output c
23   output d
24
25   End MainProg
```

(a) State the outputs that this algorithm will give. [2]

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(b) Explain why this algorithm does not work as intended. [4]

3. Apart from buses, describe the function of **three** main components in a contemporary Von Neumann type CPU architecture. [6]

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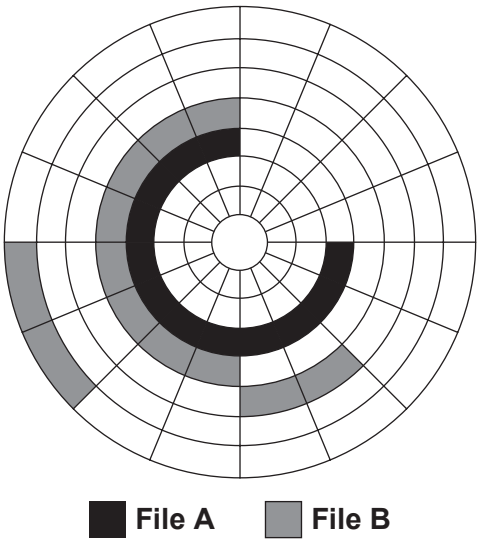
4. **Files A** and **B** are stored on an external hard disk drive (HDD).



(a) Describe the functional characteristics of a HDD. [5]

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(b) (i) Explain why there would be a difference in disk access speeds when loading **File A** and **File B** into main memory. [3]

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(ii) An alternative secondary storage medium which does not have the same issue as question *(b)*(i) is a Solid State Drive (SSD). Explain why this is the case. [2]

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5. Give the simplest Boolean expression for each truth table.

(a)

Input		Output
A	**B**	**C**
0	0	0
1	0	1
0	1	0
1	1	0

[1]

.....

.....

.....

.....

(b)

Input		Output
P	**Q**	**R**
0	0	1
1	0	0
0	1	0
1	1	0

[1]

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(c)

Input		Output
X	**Y**	**Z**
0	0	1
1	0	0
0	1	0
1	1	1

[1]

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6. Parameters can be passed to procedures by reference.

(a) Explain what is meant by the term parameter and how passing parameters by reference works. [2]

(b) Describe another method for passing parameters to a procedure. [2]

(c) Give **one** disadvantage of passing parameters by reference. [1]

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7. *(a)* Draw a clearly labelled diagram that shows how a transaction file and master file are used during an update. [4]

(b) Describe the data used and the organisation of transaction files and a master file for an application of your choice. [4]

(c) Describe the most suitable mode of operation for your chosen application. [3]

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8. Clearly showing each step, simplify the following Boolean expression using Boolean algebra and identities: [6]

$$A.(B + C) + A.(0 + \bar{A}) + B.(1 + C)$$

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9. Describe methods used in file security to prevent accidental data loss from computer systems. [6]

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10. Two different types of search algorithm are binary search and linear search.

(a) The following is a binary search algorithm.

```
1    declare myArray[0 to 10]
2    declare start is integer
3    declare end is integer
4    declare found is Boolean
5    declare mid is integer
6
7    set start = 0
8    set end = 10
9    set found = FALSE
10
11   input searchValue
12
13   repeat
14         set mid = (start + end) DIV 2
15         if searchValue = myArray[mid] then
16               set found = TRUE
17               Output "searchValue found at position", mid
18         end if
19
20         if searchValue > myArray[mid] then
21               set start = mid + 1
22         end if
23
24         if searchValue < myArray[mid] then
25               set end = mid – 1
26         end if
27
28   until (found = TRUE) OR (end < start)
```

By crossing out or shading the discarded elements in the diagram below, show how the algorithm will reduce the part of the array being searched at each repetition.

`searchValue` = 22 [3]

	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Original Data	12	22	27	31	38	54	63	71	73	87	92
Repetition 1	12	22	27	31	38	54	63	71	73	87	92
Repetition 2	12	22	27	31	38	54	63	71	73	87	92
Repetition 3	12	22	27	31	38	54	63	71	73	87	92

`myArray`

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(b) Write a linear search algorithm, using pseudo-code, for the following array.

(1)	(2)	(3)	(4)	(5)
45	12	98	54	56

`myArray`

Your algorithm should output the position of the `searchValue` if it is found or a suitable message if the `searchValue` is not found.

Your algorithm should be written using self-documenting identifiers. [8]

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(c) Describe an appropriate circumstance for the use of each search type. [2]

11. *(a)* Convert $6C_{16}$ and AF_{16} into binary and add them together using binary addition. [3]

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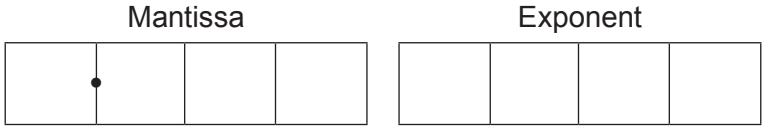
(b) In a certain computer system, real numbers are stored in **normalised** floating-point form using a positive 4 bit mantissa and a positive 4 bit exponent.



Calculate the denary range of positive real numbers that can be stored in this normalised floating-point form.

Show all your workings. [6]

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

12. Describe the different methods of investigation used by a systems analyst. [6]

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13. Discuss the advantages of using database systems and their associated features to store data. [11]

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