Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A LEVEL

2500U10-1

S18-2500U10-1

COMPUTER SCIENCE – AS unit 1
Fundamentals of Computer Science

MONDAY, 4 JUNE 2018 – MORNING

2 hours

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

2500U101
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 page 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. Complete the following truth table. [4]

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

2. State the use of the following network protocols:

(a) DHCP [1]

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(b) SMTP [1]

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(c) HTTP [1]

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3. *(a)* Describe the dangers that can arise from the use of computers to store personal data. [4]

(b) Describe processes that protect the security and integrity of data. [4]

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4. Clearly showing each step, simplify the following expression using Boolean identities and rules:

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

[8]

Examiner only

5. (a) Convert 31_{16} and $6D_{16}$ into binary numbers and add them together using binary addition. [3]

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(b) (i) In a certain computer system, real numbers are stored in floating point form using two's complementation, a 12 bit mantissa and a 4 bit exponent.

Convert the number 16.125_{10} into this floating point form. [3]

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(ii) In a different computer system, real numbers are stored in floating point form using two's complementation, a 5 bit mantissa and a 3 bit exponent.

Showing your workings, calculate the largest positive denary number that this computer system can store. [3]

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Turn over.

Examiner only

6. *PhoneRecycle* allows customers to trade in their handsets in return for vouchers that can be spent in other retail stores.

The total number of handsets traded-in with each member of staff is recorded each month as shown in the grid below:

Staff Code	Total number of handsets recycled each month					
	Jan	**Feb**	**Mar**	**Apr**	**May**	**…**
001	34	43	23	51	…	…
002	26	47	54	14	…	…
003	…	…	…	…	…	…
…	…	…	…	…	…	…

(a) State the full name of this type of data structure and state why this structure is the most appropriate for *PhoneRecycle*. [2]

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(b) State the most suitable data type for this structure. [1]

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(c) *PhoneRecycle* also stores customer details. State the most suitable data structure to store this information and justify your choice. [2]

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Examiner only

7. Certain central processing units (CPUs) use parallel processing and caching to improve performance.

Explain parallel processing and caching in a CPU. [5]

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Examiner only

8. *EuroTravel* is a travel agency that offers its customers the option of purchasing foreign currency.

Assume the conversion from pounds (£) into euros (€) is:

£1.00 = € 1.14

EuroTravel wants to be able to enter a value in pounds and provide its customers with a conversion into euros for each value £5 below and £5 above the initial value input.

For example, if the user inputs £500.00, the algorithm will output:

£495.00 = €564.30
£496.00 = €565.44
£497.00 = €566.58
£498.00 = €567.72
£499.00 = €568.86
£500.00 = € 570.00
£501.00 = €571.14
£502.00 = €572.28
£503.00 = €573.42
£504.00 = €574.56
£505.00 = €575.70

Write an algorithm for *EuroTravel* to meet these requirements, using pseudo-code.

Your algorithm should output a suitable error message for any data entered that is not a number.

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

Examiner only

Turn over.

Examiner only

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

(a) Explain how these search algorithms operate. [6]

(b) Describe appropriate circumstances for the use of each search algorithm. [3]

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10. The following bubble sort algorithm attempts to sort integers stored in myArray, but contains an error.

```
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 = TRUE)
18
19   End Procedure
```

(a) Suggest appropriate test data to dry-run this type of algorithm in order to identify possible errors. [3]

Test Data Set 1

Test Data Set 2

Test Data Set 3

(b) Describe how a bubble sort algorithm should operate. [2]

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(c) Explain why the bubble sort algorithm in this question will fail. [2]

(d) Suggest a suitable change that could be made to the algorithm to overcome this problem. [1]

(e) Name and describe a different sort algorithm. [3]

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11. Operating systems manage computer resources and provide users with a range of utility software.

(a) Explain the use of a range of utility software in computer systems. [5]

(b) Explain how an operating system manages computer resources. [6]

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12. Compare bespoke and off-the-shelf software. [8]

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13. An analyst has been commissioned to produce a new computer based system for weather forecasting.

Discuss the purpose of a feasibility study and describe the processes that an analyst would carry out during a feasibility study.

Describe the role of the computer in weather forecasting. [11]

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For continuation only.