Surname	Centre Number	Candidate Number
Other Names		2

GCE AS

B500U10-1

S18-B500U10-1

COMPUTER SCIENCE – AS component 1
Fundamentals of Computer Science

MONDAY, 4 JUNE 2018 – MORNING

2 hours

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

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01

ADDITIONAL MATERIALS

A calculator.

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.

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.

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)* Explain the importance of networking standards. [4]

(b) Describe the difference between the SMTP and IMAP protocols. [2]

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(c) Describe how traffic is routed on a packet switched network. [3]

Examiner only

2. Compare the functional characteristics of a Solid State Drive (SSD) and Blu-ray Optical Drive (BD).

Give a typical use and storage capacity for each. [8]

Examiner only

3. *(a)* Complete the following truth table. [4]

A	B	A AND B	A OR B	(A OR B) XOR (A AND B)	Not ((A OR B) XOR (A AND B))
0	0				
0	1				
1	0				
1	1				

(b) The following data is stored in an 8 bit register.

0	0	1	1	1	0	0	1

(i) Demonstrate a process that can be used to discover the state of the most significant bit in the register. [3]

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(ii) Demonstrate how this register can be cleared using a logical operator. [3]

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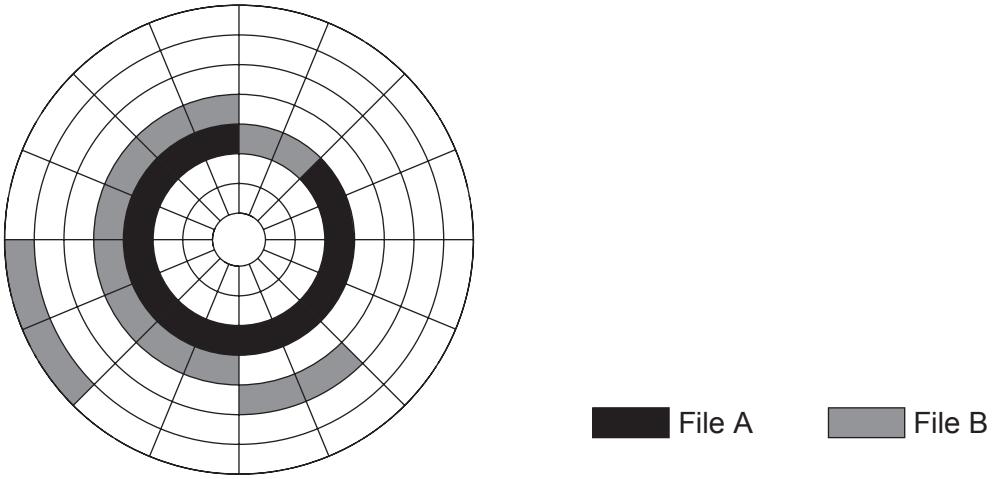
4. Describe the difference between fixed and variable length records. Give an example of data that would be contained in a variable length field and an example of data that would be contained in a fixed length field. [5]

Examiner only

5. The following two files are stored on an external hard disk drive (HDD).



Compare the difference in disk access speeds when loading File A and File B into main memory. Explain why there is a difference and how this can be overcome. [6]

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6. *(a)* Convert $6F_{16}$ and AB_{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, an 8 bit mantissa and a 4 bit exponent.

Convert the number 15.875_{10} into this floating point form. [3]

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

Mantissa								Exponent			
0 •	1	1	0	1	0	0	0	0	1	0	1

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

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

Examiner only

7. State the minimum storage requirements in bits for each of the following data types. [4]

Data Type	Minimum Storage Requirements
Boolean	
ASCII Character	
ASCII String	
Short Integer (Signed range: $-32{,}768_{10}$ to $+32{,}767_{10}$)	

Examiner only

8. Betty's Bakery wants to convert imperial measurements for weight (lb) into metric measurements (kg).

The conversion from pounds into kilograms is:

1 lb = 0.453592 kg

Write an algorithm, using pseudo-code, which will allow a user to input a series of imperial measurements and output the equivalent metric measurements.

As the number of measurements to be input is unknown, your algorithm should terminate when a user inputs a rogue value (less than 0.0).

Your algorithm should output a suitable error message for any data entered that is not a real data type, e.g. a, B, z, @.

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

Examiner only

9. Describe the main features of batch processing and give an application that would be suitable for this mode of operation. [4]

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Examiner only

10. Clearly showing each step, simplify the following Boolean expression: [8]

$$P.(\overline{Q} + R) + Q.(P + \overline{Q}) + R.(P + R) + \overline{S}.S$$

Examiner only

11. The following insertion sort algorithm attempts to sort data stored in myArray, but contains an error.

```
1  Declare Subroutine InsertionSort (myArray)
2
3  i is integer
4  j is integer
5  n is integer
6  currentItem is integer
7  inserted is boolean
8
9  set inserted = FALSE
10
11 set n = ubound[myArray]        {number of items in array}
12
13 for i = 1 to n - 1
14    currentItem = myArray[i]
15    inserted = FALSE
16    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 = TRUE)
27
28 next i
29
30 End Subroutine
```

(a) Describe the term sequence in algorithms. [2]

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(b) Describe how insertion sort algorithms operate. [2]

(c) Explain why the insertion 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]

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

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12. Name and describe three different file attributes. [6]

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13. A systems analyst has been commissioned to produce a new computer based system.

Discuss the ways in which the systems analyst could carry out an investigation and analysis, to ascertain the needs of the client and describe the possible effects of increasing the use of computers in the workplace in terms of the nature of employment and wider society. [10]

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END OF PAPER

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