Surname	Centre Number	Candidate Number
Other Names		2

GCE AS/A LEVEL – NEW

2500U10-1

S17-2500U10-1

COMPUTER SCIENCE – AS unit 1
Fundamentals of Computer Science

MONDAY, 5 JUNE 2017 – MORNING

2 hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**2**	
2.	**10**	
3.	**10**	
4.	**8**	
5.	**6**	
6.	**6**	
7.	**11**	
8.	**6**	
9.	**4**	
10.	**8**	
11.	**8**	
12.	**4**	
13.	**5**	
14.	**12**	
Total	**100**	

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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.

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. [2]

A	B	A AND B	B XOR (A AND B)
0	0		
0	1		
1	0		
1	1		

2. Compare the functional characteristics of Hard Disc Drives (HDD) and Optical Drives and give a typical use and storage capacity for each. [10]

Examiner only

3. *(a)* State what is meant by a protocol. [1]

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(b) Name the most appropriate protocols for each of the following:

(i) Obtaining an IP address from a server. [1]

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(ii) Sending an email from one server to another. [1]

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(iii) The basic communication protocol used on the Internet. [1]

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(c) State the role of handshaking. [1]

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(d) Data is sometimes detected simultaneously on a bus network. State the name given to this problem and describe how the network deals with it. [2]

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

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4. Different primitive data types are used in computer systems.

(a) (i) Using the denary example 108_{10}, calculate the minimum storage requirements for an integer data type within a range of 0_{10} to 127_{10}. [2]

(ii) In a certain computer system, numbers are represented using sign and magnitude.

Give the range for a **signed** integer data type with the same storage requirements as question 4*(a)*(i). [1]

(b) Describe the use and advantages of the Unicode standardised character set. [3]

(c) Giving suitable examples compare the storage requirements for a character and a string data type. [2]

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5. Describe potential threats to computer systems and how contingency planning can help recover from disasters. [6]

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

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

[6]

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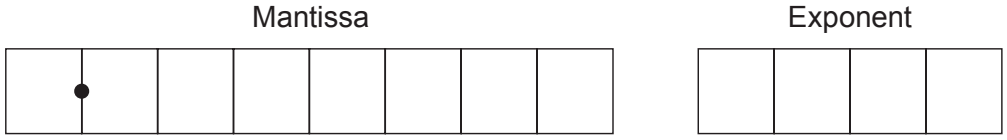
7. *(a)* Convert the denary numbers 87_{10} and 113_{10} into their equivalent unsigned 8 bit binary numbers.

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) 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 4.125_{10} into this floating-point form. [3]

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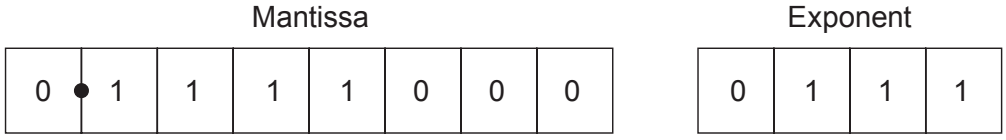
(ii) In the same computer system, the following is a floating-point representation of a real number:



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

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8. At *Myles-Hill College*, students are able to study courses that are taught by teachers. A student can study any number of courses, and each course is taught by a single teacher, although a teacher may teach more than one course.

(a) Using an example from this scenario, explain what is meant by a foreign key in a database. [2]

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(b) Describe the difference between flat file and relational database systems. [1]

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(c) Construct an entity relationship diagram to illustrate the scenario described at *Myles-Hill College*. [3]

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9. Describe the object-oriented approach to programming and the relationship between an object, class and method. [4]

Examiner only

10. Write an algorithm using pseudo-code that determines if a number entered (between 3 and 256 inclusive) is a prime number.

A prime number is a positive number that is divisible only by itself and 1.

Your algorithm should be written using self-documenting identifiers and include suitable inputs and outputs. [8]

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11. *(a)* The operating system enables the user to set up a hierarchical storage structure.

(i) Draw a clearly labelled diagram to illustrate a hierarchical structure. [1]

(ii) Give one advantage of using this structure. [1]

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(b) Attributes can be assigned to files by the operating system. For example a read only file cannot be altered.

Name and describe three other file attributes. [6]

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12. Describe how bubble sort and insertion sort algorithms operate. [4]

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13. Explain how the Data Protection Act impacts on an organisation that stores data on a computer system. [5]

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14. Describe the difference between high and low level languages.

Explain the role of the Integrated Development Environment (IDE) in developing high and low level language programs. [12]

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