

Surname	Centre Number	Candidate Number
First name(s)		2



GCE AS

B500U10-1



TUESDAY, 13 MAY 2025 – AFTERNOON

COMPUTER SCIENCE – AS component 1

Fundamentals of Computer Science

2 hours

ADDITIONAL MATERIALS

A calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces 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 additional page(s) 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.

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

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Answer **all** questions.

1. Determine the Boolean expression described by each truth table.

(a)

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

R =

[1]

(b)

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

Z =

[1]



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- [9]



3. (a) State the purpose of a network protocol. [1]

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(b) Name the most appropriate networking protocols for the following:

(i) Uploading or downloading files to and from a remote server. [1]

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(ii) Streaming real-time applications, like video and online gaming, and providing fast data transmission by sacrificing some reliability. [1]

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(iii) Viewing and managing messages stored on a mail server, and maintaining synchronisation between the server and a local device. [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 issue 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) In a certain computer system, numbers are represented using sign and magnitude.

Give the denary range for a **signed** integer data type in a 7-bit register.

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(b) Describe the use and advantages of standardised character sets, such as Unicode. [3]

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(c) Compare the storage requirements for a Unicode character and a string data type. Give suitable examples. [2]

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5. Explain the scope and lifetime of variables in a program.

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[8]



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7. (a) Determine the largest value that can be represented by a two-digit denary number and a two-digit hexadecimal number.

Convert these numbers into their equivalent binary numbers and carry out binary addition to add them.

Show **all** of your workings.

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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.

Mantissa	Exponent
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Convert the number 7.625_{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 0 1 1 1 0 0	0 0 1 0

Calculate the denary value of the mantissa and exponent, and determine the denary value of this floating-point number.

[3]

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8. Consider a library system.

Each copy of a book has a unique ID, a title and a genre. Each author is identified by a unique ID and has a name. Each book is written by one author, but an author can have multiple books. Members are identified by their member ID and have a name. Each loan is identified by a loan ID and loan date. Each member can have multiple loans.

Complete the diagram by applying entity-relationship modelling to this problem.

[5]



9. Describe the merits of **two** different methods of investigation that a systems analyst could use when analysing the requirements for a new computerised system. [4]

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10. A well-known game called Battleships populates a 2D array with the following:

- **0** – to represent an empty square
- **S** – to represent one of the 10 battleship locations.

battleships										
	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	S	0	0	0	0	0
3	0	0	0	0	S	0	0	0	0	0
4	0	0	0	0	S	0	0	0	0	0
5	0	0	0	0	S	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	S	S	S	0
8	0	S	S	S	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0

Write an algorithm that allows a user to input co-ordinates to 'fire a missile' and let the user know if they have been successful in hitting a battleship (**S**) location or not.

A user is allowed 20 attempts at hitting the battleships in order to hit all locations and win the game.

If the user is unsuccessful in finding all battleship (**S**) locations after 20 attempts, then the user should be informed that the game is over. If the user hits all 10 locations, then the user should be informed that the game is won.

(Hint: Replace the S with a 0 if the battleship is hit)

You can assume that the 2D array is automatically pre-populated at random each game.

Your algorithm should be written using self-documenting identifiers.

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11. (a) The operating system enables the user to set up a hierarchal directory structure in backing store.

Draw a clearly labelled diagram to illustrate this and give **one** advantage of using this structure. [2]

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- (b) Name and state the purpose of **three** different file attributes. [6]

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13. Explain how the Data Protection Act (2018) impacts on data stored in a computer system. [5]

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



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