GCSE

wjec cbac

C500U10-1

Z22-C500U10-1

eduqas
Part of WJEC

MONDAY, 16 MAY 2022 – AFTERNOON

COMPUTER SCIENCE – Component 1
Understanding Computer Science

1 hour 45 minutes

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

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 use of calculators is not permitted in this examination.

The total number of marks is 100.

Some questions will require you to draw on knowledge from multiple areas of your course of study.

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Answer **all** questions.

1. Cybersecurity reduces the risk to individuals and organisations of a cyberattack.

(a) Tick (✓) the threat to computer systems that matches each characteristic. [3]

Characteristic	Worm	Phishing	Denial of service
Making a website unavailable to legitimate users by swamping them with fake requests.			
Self-replicating programs that enable remote control of the infected computer.			
Fake emails asking you to confirm personal details.			

(b) Describe the following types of attack.

(i) Brute force attack. [2]

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(ii) SQL injection. [2]

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(C500U10-1) **Turn over.**

2. The following partially complete diagram represents a typical Von Neumann CPU architecture.

Central Processing Unit

Control Unit

A

Input Device

Output Device

Registers   PC   B

ACC   MAR   C

Memory Unit
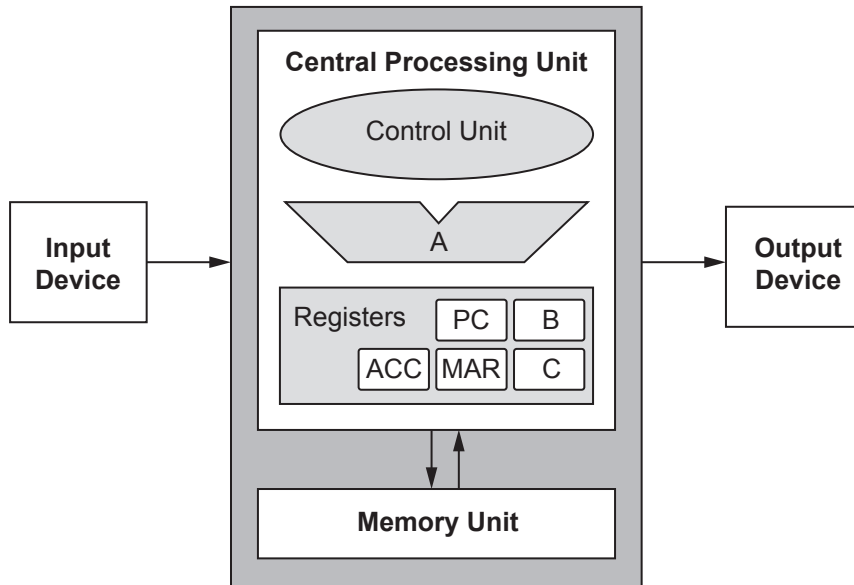
(a) State the name and purpose of each of the following components. [6]

Component	Name	Purpose
A		
B		
C		

(b) State **four** events that take place during the fetch-decode-execute cycle. [4]

Event 1: ....

....

Event 2: ....

....

Event 3: ....

....

Event 4: ....

....

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(c)   Give **two** benefits of increasing cache memory.   [2]

Benefit 1: ....

....

....

Benefit 2: ....

....

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(d)   Describe the function of virtual memory in a computer system.   [2]

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Turn over.

3. A computer network is a group of computers that use a set of common communication protocols.

(a) Describe the purpose of a protocol. [2]

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(b) State the purpose of the following protocols. [2]

HTTPS: ....

....

....

FTP: ....

....

....

(c) Circle **two** items contained in a data packet. [2]

Clock speed	Source address	Gateway	Defragmenter	Router
Checksum	Switch	Compiler address	Subroutine	Library

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

A	B	$\overline{A}$	$\overline{A} \oplus B$	$A \cdot (\overline{A} \oplus B)$

(b) State the simplest Boolean expression represented in the last column from the truth table in **4**(a). [1]

....

(C500U10-1) **Turn over.**

C500U101
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5. (a) Complete the following sentences.

(i) .... occurs when the execution of a set of instructions returns a value larger than its range. [1]

(ii) .... is the condition in a computer program where the result of a calculation is smaller than the computer can actually represent in memory. [1]

(b) Complete the table by converting between binary, denary and hexadecimal number counting systems. [3]

Binary	Denary	Hexadecimal
01010101_2		55_{16}
	117_{10}	75_{16}
10111101_2	189_{10}	

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(c) Show how 9_{10} would be subtracted from 21_{10} using two's complementation, binary addition and a 5-bit register. [4]

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(d) (i) Shift the following binary number right 2 places. [1]

$$01000100_2$$

....

....

(ii) State the effect of the following arithmetic shifts. [2]

Shift left 3 places: ....

....

....

Shift right 4 places: ....

....

....

(C500U10-1) **Turn over.**

6. Clearly showing each step, simplify the Boolean expressions using Boolean algebra and identities.

Do not use truth tables in the simplifications.

(a) $A \cdot A + B \cdot (\overline{B} + C)$ [3]

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(b) $\overline{X} + \overline{X} \cdot Y + Y \cdot \overline{Y} + \overline{Y}$ [3]

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(C500U10-1)   **Turn over.**

7. A prize is awarded to the student(s) who gain the highest mark in a class test. If more than one student gains the highest mark, each of the students gaining this mark is awarded a prize. All marks are positive integers.

Write an algorithm, using pseudo-code, which inputs:
- the number of students in the group
- the mark for each student.

Its outputs should be:
- the maximum mark
- the number of prizes
- the mean mark for all students who took the test.

For instance if the inputs are:
- 8
- 17   16   11   17   16   17   14   11

the outputs should be:
- Maximum Mark = 17
- Number of Prizes = 3
- Mean Mark = 14.875 [10]

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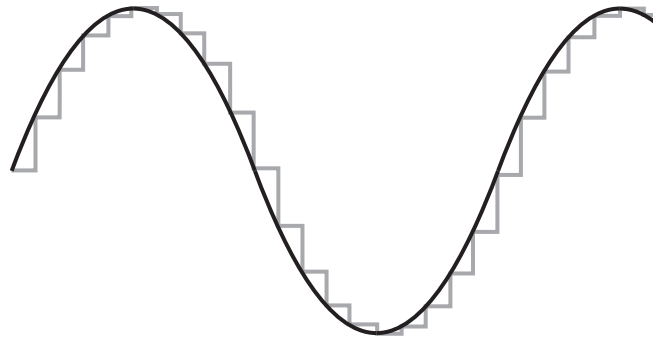
(C500U10-1) **Turn over.**

8. Sound sampling is used for the digital storage of sound.

(a) Describe the process of sound sampling. [2]

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(b) Describe how sound samples are stored. [2]

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(c) The storage requirements for a sound file can be determined using the following formula:

sound file size(bits) = duration(s) × no. of channels × sample rate(Hz) × bit depth(bits)

(i) A sound file is created using a 5 minute dual-channel sound file (at a bit depth of 16 bits) with a sample rate of 44.1 kHz.
Calculate the file size in bits. [2]

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(ii) Convert your answer to **8**(c)(i) into megabytes. [2]

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(d) Metadata describes and gives information about other data.

Give **two** examples of metadata stored in sound files. [2]

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9. Operating systems are a low-level software that support a computer's basic functions.

(a) Describe how the operating system manages:

(i) Multitasking. [2]

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(ii) Backing store. [2]

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(b) Describe the purpose of **three** different types of utility software. [6]

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10. Describe the characteristics of a merge sort algorithm. [5]

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Turn over.

11. **(a)** Label **five** Integrated Development Environment (IDE) tools in the image below. [5]

(b) Give the purpose of **two** of the tools that you have identified above. [2]

Tool 1: ....

....

....

Tool 2: ....

....

....

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12. (a) Complete the following sentences about the different stages of compilation. Use only the terms given below.

LEXICAL ANALYSIS   **CODE GENERATION**   **CODE OPTIMISATION**

SYNTAX ANALYSIS   **LOSSLESS COMPRESSION**   **SEMANTIC ANALYSIS**

(i) Variables are checked during the .... stage to ensure that they are of the correct data type. [1]

(ii) During the .... stage, keywords, constants and identifiers are replaced by 'tokens'. [1]

(iii) Tokens are checked to see if they match the spelling and grammar expected, using

standard language definitions during the .... stage. [1]

(iv) .... may be employed to make programs less resource intense. [1]

(b) Describe the function of the following translators.

(i) Interpreters. [2]

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(ii) Assemblers. [2]

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END OF PAPER

(C500U10-1)   **Turn over.**

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.	Examiner only

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