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|---------------|---------------|------------------|
| Surname | Centre Number | Candidate Number |
| First name(s) | | 0 |



GCSE

3500U10-1



FRIDAY, 19 MAY 2023 – AFTERNOON

COMPUTER SCIENCE

Unit 1: Understanding Computer Science

1 hour 45 minutes

| For Examiner's use only | | |
|-------------------------|--------------|--------------|
| Question | Maximum Mark | Mark Awarded |
| 1. | 9 | |
| 2. | 8 | |
| 3. | 8 | |
| 4. | 16 | |
| 5. | 4 | |
| 6. | 9 | |
| 7. | 12 | |
| 8. | 4 | |
| 9. | 8 | |
| 10. | 12 | |
| 11 | 10 | |
| Total | 100 | |

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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 continuation 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 is 100.

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

Answer **all** questions.

1. (a) Tick (✓) the correct box to show if each statement about CPUs is TRUE or FALSE. [4]

| STATEMENT | TRUE | FALSE |
|--|------|-------|
| A dual-core CPU will always process instructions twice as fast as a single-core CPU. | | |
| The ALU can perform comparisons on data e.g. an IF statement in a high-level language. | | |
| Overclocking is the process of setting a processor to run slower than its original design. | | |
| Cache memory has a slower disk access speed than RAM. | | |

- (b) Describe the fetch-decode-execute cycle. [3]

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- (c) Describe the difference between an embedded system and a general-purpose computer system. [2]

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2. Ahmed is considering purchasing a new personal computer from a local store.

- (a) The store recommends that Ahmed uses flash memory to store the system BIOS instead of ROM.

Explain why the store has made this recommendation.

[2]

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- (b) Ahmed's new computer will come with 4 GB of RAM as standard, but he is able to upgrade this to 8 GB. Give **two** benefits of upgrading the RAM to 8 GB.

[2]

BENEFIT 1

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BENEFIT 2

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- (c) Name **two** input and **two** output devices that Ahmed may wish to consider purchasing with his new computer.

[4]

INPUT DEVICE 1:

INPUT DEVICE 2:

OUTPUT DEVICE 1:

OUTPUT DEVICE 2:

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4. (a) Tick (✓) the box for each protocol that matches the description. [3]

| Description | HTTP | FTP | IMAP | SMTP |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| A protocol that can be used when copying a file from one location to another via a network. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| The protocol that can be used to transfer multimedia web pages over the internet. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| An email protocol that stores email messages on a mail server. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

(b) TCP and IP are two protocols that combine to allow communication between computer systems on a network.

(i) State the role of both the TCP and IP protocols in network communication. [2]

TCP

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IP

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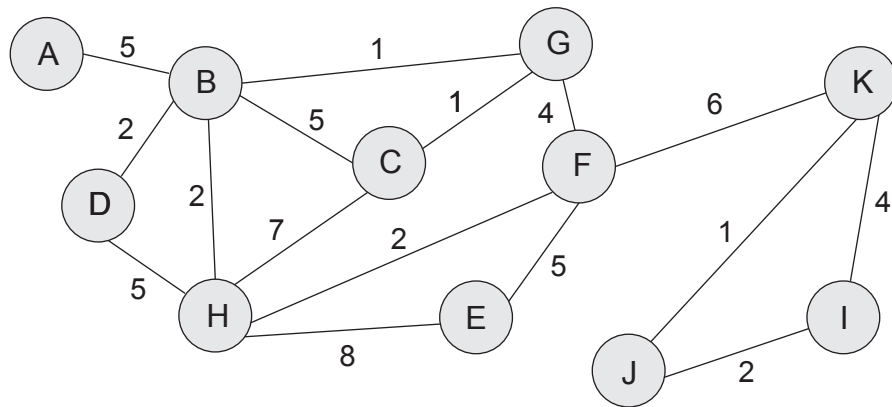
(ii) One item of information found in a TCP/IP packet is the Destination Address. Name **three** other items found in a TCP/IP packet. [3]

ITEM 1:

ITEM 2:

ITEM 3:

5. The following diagram shows the routing cost between each node for data transmitted on a certain network.



Complete the following table, indicating the lowest cost routes between each origin and destination.

The first row has been completed for you.

[4]

| Origin | Destination | Lowest Cost | Route |
|--------|-------------|-------------|-----------|
| G | D | 3 | G > B > D |
| A | K | | |
| J | C | | |

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6. (a) Convert the following:

(i) 89_{10} into binary.

[1]

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(ii) 01111011_2 into hexadecimal.

[1]

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(iii) FB_{16} into denary.

[1]

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(b) Describe the process of carrying out arithmetic shifts to the left and to the right.

[4]

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(c) Showing your workings, use binary addition to add 00100101_2 and 01111010_2 . [2]

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7. Parkwood Vale Groceries wants to store details of the products it sells in a database.

(a) Complete the table using:

- **Two different** data types (do not use String) [2]
- **Two different** methods of validation (do not use Format or Presence check). [2]

| FIELD NAME | DATA TYPE | EXAMPLE DATA | VALIDATION CHECK |
|--------------|-----------|--------------|------------------|
| Product ID | String | FR01234 | Format check |
| Product name | String | Cucumber | Presence check |
| | | | |
| | | | |

(b) Parkwood Vale Groceries also stores information about its staff.

- (i) Except for encryption, describe **two** software methods that could be used to protect the security of this data. [4]

METHOD 1

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METHOD 2

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- (ii) Demonstrate how 10101010_2 would be encrypted by Parkwood Vale Groceries' system and then decrypted using the XOR encryption method. The key used is 11110000_2 . [4]

ENCRYPTION

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DECRYPTION

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8. Integrated Development Environments (IDE) provide programmers with various tools that are needed to develop computer programs.

Complete the following sentences about the different tools available to a programmer.

Use only the terms given below.

| | | | |
|-----------------|-----------------------|--------------------|-------------------------|
| EDITOR | LINKER | BREAK POINT | MEMORY INSPECTOR |
| DEBUGGER | VARIABLE WATCH | TRACE | LOADER |

- (a) A is a program which loads previously compiled code into memory. [1]
- (b) is a facility which displays the order in which the lines of a program are executed, and possibly the values of variables as the program is being run. [1]
- (c) interrupts a program on a specific line of code, allowing the programmer to compare the values of variables against expected values. [1]
- (d) is a facility which will display the contents of a section of storage. [1]

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9. A program written using a high-level programming language is intended to calculate the area of a circle ($A = \pi r^2$). The program contains errors.

```

1 Start areaProc
2 area is real
3 pi is real
4 radius is real
5
6 set pi = 3.14
7
8 output "Please enter the radius"
9 input radius
10 area = pi * radius - radius
11 ouptut "The area = ", area
12
13 End areaProc

```

- (a) Identify the errors and suggest a suitable change to this code to address each error.

- (i) Syntax error.

[2]

ERROR:

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CHANGE:

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- (ii) Logical error.

[2]

ERROR:

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CHANGE:

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(b) Give **two** benefits to programmers of using a high-level programming language. [2]

BENEFIT 1

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BENEFIT 2

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(c) Name **two** stages of the compilation process. [2]

NAME 1

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NAME 2

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10. Computer systems are vital to many business operations, but they are liable to attacks targeted at accessing confidential data.

- (a) Give **two** principles of the Computer Misuse Act which help businesses protect their data.

[2]

PRINCIPLE 1

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PRINCIPLE 2

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(b) Describe **three** different types of targeted attack against confidential data.

[6]

ATTACK TYPE 1

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ATTACK TYPE 2

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ATTACK TYPE 3

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(c) Describe **two** methods of identifying vulnerabilities.

[4]

METHOD 1

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METHOD 2

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END OF PAPER

