2022-L089-1-EL-01/28

Pre-Leaving Certificate Examination, 2022

Computer Science

Sections A & B

Higher Level

Time: 1 hour, 30 minutes

105 marks

CANDIDATE DETAILS

EXAM ID | | | | | | **Optional** 4 or 5-digit number (only if provided by your school)

NAME | | | | | | | | | | | | | | | | | |

SCHOOL

TEACHER

For Examiner use only	
Section	**Mark**
A	
B	
C	
Total	

c9376889-e34c-46e9-9323-b9904f327988

2022-L089-1-EL-01/28

Instructions

There are **three** sections in this examination. Section A and B appear in this booklet. Section C is in a separate booklet that will be provided for the computer-based element.

Section A	Short Answer Questions	Attempt any nine questions All questions carry equal marks	45 marks
Section B	Long Questions	Attempt any two questions	60 marks
Section C	Programming	One question Answer all question parts	80 marks

Calculators may **not** be used during this section of the examination.

The superintendent will give you a copy of page 78 (Logic Gates) of the *Formulae and Tables* booklet on request. You are not allowed to bring your own copy into the examination.

Write your answers for Section A and Section B in the spaces provided in this booklet. There is space for extra work at the end of the booklet. Label any such extra work clearly with the question number and part.

Section A — Short Answer Questions — 45 marks

Answer any nine questions.

Question 1

(a) Define the term local area network (LAN).

(b) State **two** advantages of connecting computers together in a LAN.

1.

2.

Question 2

Table 1 shows information on two standard character sets.

Character set	Bit length
ASCII	8
Unicode	32

Table 1

(a) How does bit length affect the size of the character set?

This question continues on the next page.

(b) Mary claims that Unicode can represent more than 4 times the number of characters that ASCII can. Is she correct? Explain your answer.

Question 3

(a) Define the term embedded system.

(b) Give **two** examples of electronic products that contain embedded systems.

1.
2.

Question 4

Use an insertion sort to place these Irish towns in alphabetical order. In your answer you should show the state of the list after each pass.

Roundstone	Palmerstown	Oranmore	Ballymahon	Millstreet

Question 5

James works from home; his computer has a MAC address.

(a) Explain what is meant by a MAC address.

(b) Identify **two** benefits of using layers when working with network protocols.

1.
2.

Question 6

A robot moves on a checkered board as shown in **Figure 1**.

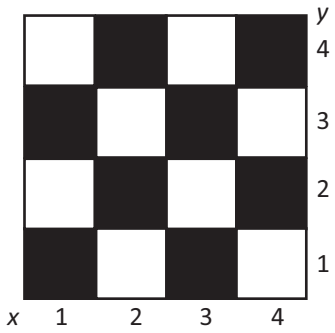


Figure 1

The subroutine telling the robot how to move is shown in **Figure 2**. This subroutine is part of a larger flow chart.

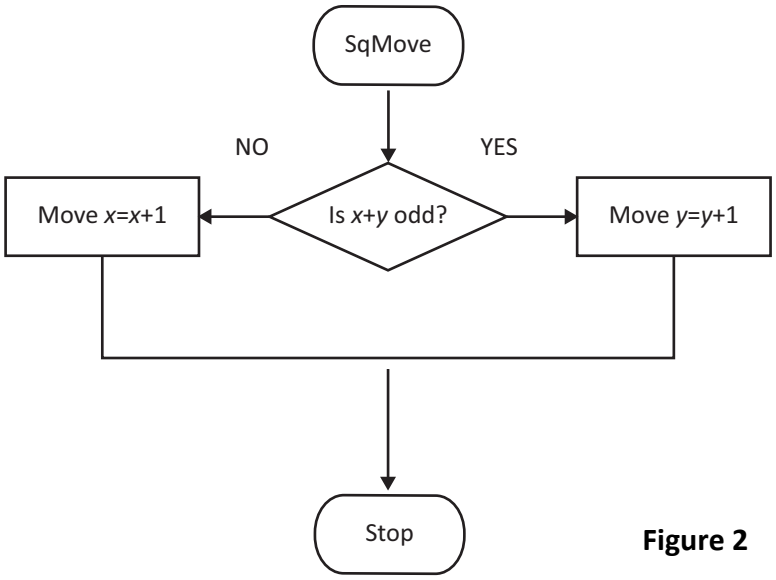


Figure 2

Draw a flow chart to show how the robot moves. The flow chart should:

- Ask the user to enter which square the robot starts on
- Run the subroutine SqMove in a loop
- Stop when the robot reaches the top or the right of the board.

Question 7

Complete the truth table below for the logic circuit shown in **Figure 3**.

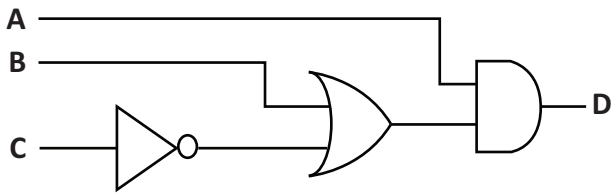


Figure 3

INPUTS			OUTPUT
A	B	C	D
0	0	0	
1	1	1	
1	0	0	
0	0	1	
0	1	1	

Question 8

(a) What is meant by the term 'relational database'?

(b) A company, Computers-R-Us, has two tables in their database: *Customer Details* and *Sales Transactions*.
How can a primary key (in the *Customer Details* table) be used to find information on the sales transactions of a particular customer?

Question 9

The following code displays exam results for a set of students.

```
1  student_name = 'Jack'
2
3  marks = {'James': 90, 'Julia': 55, 'Arthur': 77
4
5  for student in marks
6  if student = student_name:
7     print(marks[student])
       break

8  else:
9     print("No entry with that name found.")
```

(a) Identify the **three** mistakes in the above code.

1.
2.
3.

(b) What will be the output if the program runs correctly?

This question continues on the next page.

(c) What will be the output if 'Jack' is replaced with 'Julia' in **line 1**?

Question 10

Computers can encounter overflow when adding binary numbers.

(a) Give an example of an 8-bit binary addition where an overflow occurs.

(b) Explain how a computer deals with the overflow.

Question 11

Figure 4 shows the specifications for a mid-range computer.

Operating system	Windows 10 (64-bit)
PERFORMANCE	
Processor	– AMD Ryzen 7 4700U Processor – Octa-core – 2.0 GHz/4.1 GHz – 8 MB cache
RAM	8 GB DDR4 (2133 MHz)
Storage	1 TB SSD

Figure 4

(a) Explain the difference between RAM and ROM.

(b) In the context of CPU architecture, explain the term 'core'.

Question 12

In 2021, the HSE was hit by a 'zero-day' attack, a form of ransomware that is very hard to protect against. As criminal groups and state actors increase their use of cyber attacks, cyber security becomes more important.

Explain, with examples, each of the following terms: Malware, Phishing and Denial of Service.

Malware:
Phishing:
Denial of Service:

Section B	Long Questions	60 marks

Answer any two questions.

Question 13

(a) Network (net) neutrality is the principle that all Internet traffic should be treated equally.

Discuss the potential positives and negatives of the concept of net neutrality and how they align with the European Union's principles of a free market and freedom of expression.

This question continues on the next page.

(b) In 2021, there are over 3 billion people using social media. The point in time is approaching where governments may try to break up these platforms or control their content.

(i) Outline **two** benefits of social media to society.

1.
2.

(ii) Outline **two** challenges of social media to society.

1.

This question continues on the next page.

2.

(c) Social media companies use complex algorithms to push content to users based on their preferences.

Explain the term algorithm and give an example of an everyday task that uses algorithmic thinking.

Algorithm:

Everyday task that uses algorithmic thinking:

This question continues on the next page.

(d) The following code represents a type of sorting algorithm.

```
1  def sort(list1):
2      for i in range(len(list1)):
3          for j in range (len(list1)-1):
4              if list1[j] > list1[j+1]:
5                  list1[j], list1[j+1] = list1[j+1], list1[j]
6  list1 = [2, 33, 23, 11, 7]
7  sort (list1)
8  sort (list1)
```

(i) Identify the sorting algorithm shown above.

(ii) Comment on the complexity of this algorithm in both test case and average case situations.

Question 14

(a) Outline the function of a transistor in a computer system.

(b) Any computing machine that is to solve a complex mathematical problem must be 'programmed' for this task. This means that the complex operation of solving that problem must be replaced by a combination of the basic operations of the machine.

– John von Neumann, The Computer and the Brain

Describe the fetch-decode-execute cycle of a central processing unit (CPU) using the concept of von Neumann architecture.

This question continues on the next page.

(c) Explain why direct current (DC) is needed for a CPU to work.

(d) In logic gate theory, what is the purpose of a ‘half-adder’?

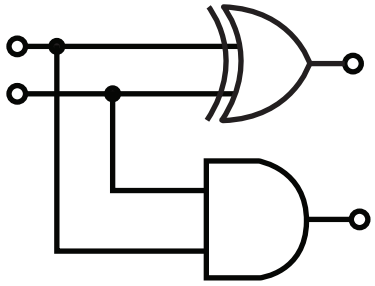


Figure 5

Question 15

Figure 6 shows two design philosophies used in software development.

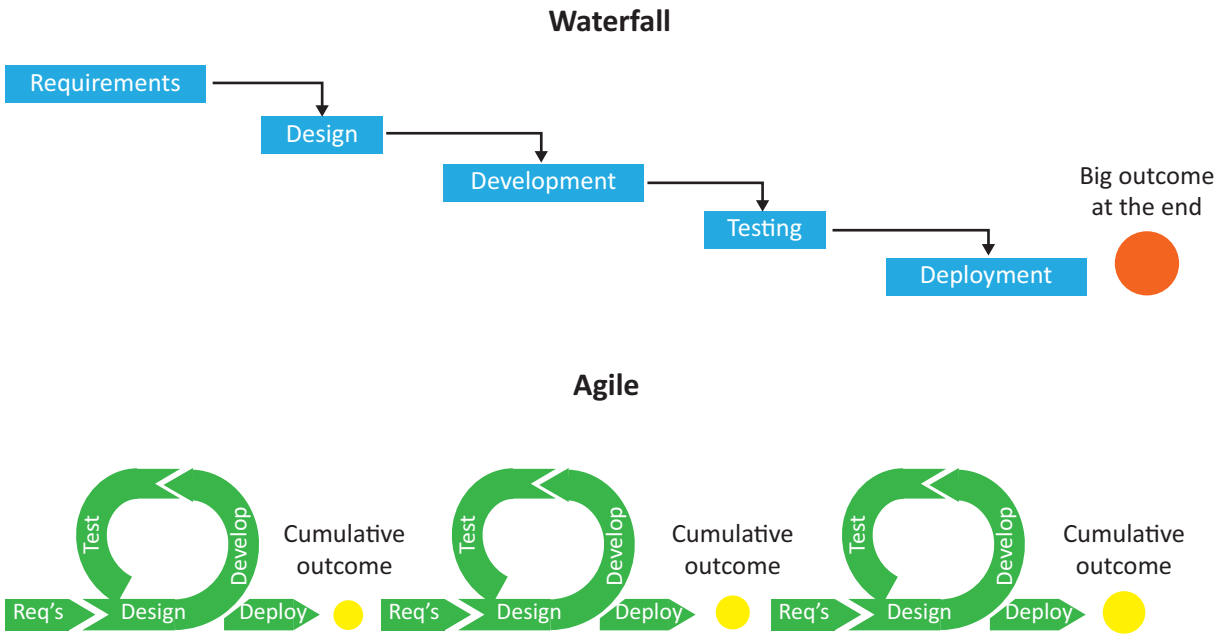
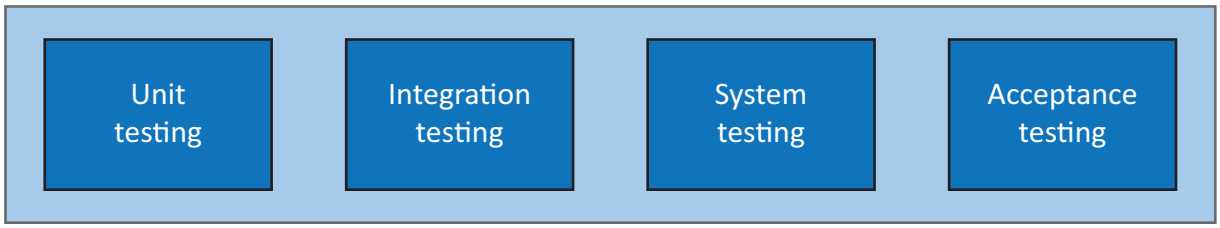


Figure 6

(a) Discuss the potential benefits and challenges of moving a design team from a waterfall design philosophy to an agile design philosophy.

(b) Testing is a key part of software development to the point where terms like "beta testing" have entered into people's everyday conversations.

Functional Testing



Explain, using examples, the difference between:

(i) Black box testing and white box testing.

This question continues on the next page.

(ii) Alpha testing and beta testing.

Space for extra work

Indicate clearly the number and part of the question(s) you are answering.

Space for extra work

Indicate clearly the number and part of the question(s) you are answering.

Space for extra work

Indicate clearly the number and part of the question(s) you are answering.

Space for extra work

Indicate clearly the number and part of the question(s) you are answering.

Acknowledgements

Images

Images on page 6:	DEB Exams
Image on page 7:	DEB Exams
Image on page 13:	DEB Exams
Image on page 19:	DEB Exams
Image on page 20:	DEB Exams
Image on page 22:	DEB Exams

Texts

Text on page 17:	John von Neumann. *The Computer and the Brain.* Yale University Press, 1969

Pre-Leaving Certificate Examination, 2022 – Higher Level

Computer Science – Sections A & B

Time: 1 hour, 30 minutes

c9376889-e34c-46e9-9323-b9904f327988

2022-L089-1-EL-28/28

Pre-Leaving Certificate Examination, 2022

Computer Science

Section C

Higher Level

Time: 1 hour

80 marks

c9376889-e34c-46e9-9323-b9904f327988

Instructions

There is one section in this paper.

Section C	Programming	One question Answer all question parts	80 marks

Answer all parts of the question on your digital device.

Calculators may be used during this section of the examination.

The *Formulae and Tables* booklet cannot be used for this section of the examination.

The superintendent will give you a copy of the *Python Reference Guide*.

Ensure that you save your work regularly and when you complete each question part.

Save your files using the naming structure described at the beginning of each question part.

If you are unable to get some code to work correctly, you can comment out the code so that you can proceed. The code that has been commented out will be reviewed by the examiner.

Rough work pages are provided at the end of this booklet. Please note that this booklet is not to be handed up and will **not** be reviewed by an examiner.

At the end of the examination it is your responsibility to ensure that you have saved all of your files onto your external media.

Do not hand this paper up

Section C — Programming — 80 marks

Answer all question parts.

Question 16

(a) Open the program called **Question16_A.py** from your device.

Before making any changes, you should save your working copy of the file using the format **StudentNameQuestion16_A.py**. For example, you would save the file as **MaryMurphyQuestion16_A.py** if your name was Mary Murphy.

Enter your Name and School in the space provided on **line 2** in your Python file.

```
1  # Question 16(a)
2  # Name and School:
```

One of the most powerful aspects of Python is its ability to "read in" data from external sources and to perform complicated analysis on that data. You will find a file of a poem by Percy Bysshe Shelley called **shelley.txt** in the same folder as your seed file.

Mutability by Percy Bysshe Shelley

We are as clouds that veil the midnight moon;
How restlessly they speed and gleam and quiver,
Streaking the darkness radiantly! yet soon
Night closes round, and they are lost for ever: –

Or like forgotten lyres, whose dissonant strings
Give various response to each varying blast,
To whose frail frame no second motion brings
One mood or modulation like the last.

We rest – a dream has power to poison sleep;
We rise – one wandering thought pollutes the day;
We feel, conceive or reason, laugh or weep,
Embrace fond woe, or cast our cares away: –

It is the same! – For, be it joy or sorrow,
The path of its departure still is free;
Man's yesterday may ne'er be like his morrow;
Nought may endure but Mutability.

(i) Using the **`.readlines()`** built-in function in Python, open the **shelley.txt** file, read the file into your program, then close the **.txt** file.
Indicate that it has worked using an appropriate print statement.
The output should look as follows:

```
The poem has been read correctly by the program
```

Make the following changes to the program:

(ii) Modify the program to output the last line of the poem.

When the program is run the output may look as follows:

```
The poem has been read correctly by the program
The last line is: "Nought may endure but Mutability."
```

(iii) Modify the program to count the numbers of lines, words and characters in the poem (Hint: use **`.split()`** to create a list containing all the words from the different lines.)
When the program is run the output may look as follows:

```
The poem has been read correctly by the program
The last line is: "Nought may endure but Mutability."
There are 19 lines, 130 words and 700 characters
```

(iv) The **shelley.txt** file shows that there are 16 lines, not 19 lines as indicated in part **(iii)**. Modify the program to output the correct number of lines.
When the program is run the output may look as follows:

```
The poem has been read correctly by the program
The last line is: "Nought may endure but Mutability."
There are 16 lines, 130 words and 700 characters
```

(v) It would be nice to be able to search the poem for a particular word and to know its location. Create a function so that, when called, it will tell you if an input word is present or absent and, if present, what line it is on. (Hint: be mindful of the fact that the poem has 16 lines, not 19!)
When the program is run the output may look as follows:

```
The poem has been read correctly by the program
Please enter a word to search for: path
The word "path" was found in line 14
The last line is: "Nought may endure but Mutability."
There are 16 lines, 130 words and 700 characters
```

Save your file using the format **StudentNameQuestion16_A.py**. For example, you would save the file as **MaryMurphyQuestion16_A.py** if your name was Mary Murphy.

(b) You will find a second file called **alt_shelley.txt** in the folder.

Create a new file called **Question16_B.py**.

Write a program that compares the two poems line by line, checking to see if they are the same.

Save your file using the format **StudentNameQuestion16_B.py**. For example, you would save the file as **MaryMurphyQuestion16_B.py** if your name was Mary Murphy.

Space for rough work.

This page will not be reviewed by an examiner.

Space for rough work.

This page will not be reviewed by an examiner.

Acknowledgements

Texts

Text on page 3: https://www.poetryfoundation.org/poems/54563/mutability-we-are-as-clouds-that-veil-the-midnight-moon (Accessed 22 October 2021).

Pre-Leaving Certificate Examination, 2022 – Higher Level

Computer Science – Section C

Time: 1 hour