Pre-Leaving Certificate Examination, 2021

Computer Science

Sections A & B

Ordinary Level

Time: 1 hour, 30 minutes

130 marks

Name:
School:
Address:
Class:
Teacher:

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	60 marks	12 questions
Section B	Long Questions	70 marks	3 questions
Section C	Programming	80 marks	1 question

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   60 marks

Answer **any nine** of the twelve questions.

Question 1

A warehouse uses secondary storage to store data about its stock. The warehouse also allows for a number of other companies to access this information using cloud computing.

(a)   What is meant by the term 'secondary storage'?

(b)   What is meant by the term 'cloud computing'?

Question 2

RAM is a form of memory used in computers to store working data and machine code.

(a)   Place an **X** next to the statement(s) that are true.

There are four types of RAM.	
There are two types of RAM.	
The more RAM a computer has, the more operations it can handle at the same time.	

(b)   What does the acronym RAM stand for?

Question 3

Tablet computers have a number of in-built technologies that allow users to input data in a number of ways; an example of one of these in-built technologies is through the use of touchscreen capabilities.

Identify **three** other in-built technologies that allow data to be input to a typical tablet computer.

1.	
2.	
3.	

Question 4

A binary bit pattern is shown below:

1010100

(a) Convert the binary bit pattern into **decimal** form.

(b) Convert the binary bit pattern into **hexadecimal** form.

Question 5

Arrange the following units from smallest to largest (where 1 is the smallest and 5 is the largest).

Size	Ranking
Gigabyte	
Bit	
Megabyte	
Kilobyte	
Byte	

Question 6

What is the output of the following piece of Python code:

```
1   a = "5"
2   a = "6"
3   print(a+b)
```

Question 7

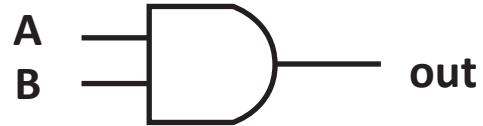The Python programming language has a variety of in-built data types.

Give an example of the following datatypes:

(a) String:

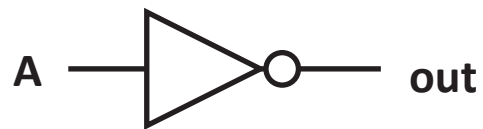**(b)** Float:

(c) Boolean:

Question 8

Identify **each** of the following **logic gates** by name and **complete** their respective **truth tables**.

Logic Gate Name:		
A	B	OUT
0	0	0
0	1	0
1	0	
1	1	

A
B ⟩ out

Logic Gate Name:	
A	OUT
0	
1	

A ▷o— out

Question 9

What is an analogue input?
Give **two** examples of analogue inputs you have studied during your course.

Question 10

A teacher uses **search algorithms** to search through an array containing students' results.
The teacher wants to quickly find out if any student scored a mark of 82.

```
1   student_results_array = [100,25,38,99,65,56,45,78,100,82]
```

The array with the results of the exam is shown above.

(a) Should the teacher use a **linear** search **or** a **binary** search algorithm to search the array in its current form?

(b) Explain your answer to part (a).

Question 11

Read the following article and answer the questions that follow.

On May 30th 2020, the first crewed orbital spaceflight from American soil since 2011 carried astronauts Bob Behnken and Doug Hurley to the International Space Station.

The Demo-2 mission was the final major test before NASA's Commercial Crew Program certified SpaceX's Crew Dragon capsule for operational, long-duration missions to the space station. As SpaceX's final flight test, it needed to validate all aspects of its crew transportation system, which included the Crew Dragon capsule spacecraft, spacesuits, Falcon 9 launch vehicle, launch pad 39A and other relevant operational capabilities.

While en route to the International Space Station, Behnken and Hurley took control of the Crew Dragon capsule for two manual flight tests. This was to demonstrate their ability to control the spacecraft should an issue with the spacecraft's automated flight systems arise.

During operational missions, the Crew Dragon capsule will be able to launch with as many as four crew members at a time and carry more than 220 pounds of cargo, allowing for an increased number of crew members aboard the Space Station and increased cargo on board the ISS, meaning that more research in the unique microgravity environment can be investigated. Increased cargo loads on return journeys to Earth also mean that more results and information from experiments on board the ISS can be brought back to Earth.

At the conclusion of the mission to the ISS, Behnken and Hurley boarded the Crew Dragon capsule, which then autonomously undocked and departed the space station, and reentered Earth's atmosphere. Upon splashdown off Florida's Atlantic coast, the crew were picked up by a SpaceX recovery ship and returned to Cape Canaveral.

NASA's Commercial Crew Program is working with SpaceX and Boeing to design, build, test and operate safe, reliable and cost-effective human transportation systems to low-Earth orbit.

(a) Identify **two** ways in which the use of the Crew Dragon spaceship can improve scientific research carried out on board the ISS.

1.
2.

(b) Outline **one** positive result of allowing computers to autonomously control dangerous tasks such as piloting a spacecraft.

Question 12

Bubble sort is one example of a sorting algorithm you have used during your studies.

(a)   Explain how a bubble sort works.

(b)   An ascending bubble sort algorithm is applied to the data set shown below.
What will the final form of the data be after the bubble sort algorithm is applied?

9	4	1	8	6

Answer **any two** of the following three questions.

Question 13

(a)   What is an 'algorithm'?

(b)   Develop an algorithm using **either pseudo-code or a flowchart** that allows a bus company to calculate how much a bus fare should be.

The algorithm should:
- Prompt the user to enter the journey distance in kilometres.
- The distance entered must be greater than zero.
- The user should be made to re-enter the distance until the distance entered is valid.
- Prompt the user to enter the number of passengers (no validation is required).
- Calculate the bus fare by charging €2 for every passenger regardless of the distance and charging a further €1.50 for every kilometre regardless of the number of passengers.
- Output the final bus fare.

(c) Abstraction and decomposition are two aspects of computational thinking.

(i) Define what is meant by the term 'abstraction', in the context of computational thinking.

(ii) A program is required to enter a set of students' examination grades. The program also must count the number of students who obtained each grade and then output to the user the value of students who achieved each grade. The only valid grades are between the letters A-F.

Explain how decomposition could be used in designing a solution to this problem.

Question 14

(a) The function **compare** returns an integer value when called.
Explain why a Boolean return value could **not** be used in this function.

```
1   def compare(x,y):
2       if(x>y):
3           return(1)
4       elif(x<y):
5           return(-1)
6       else:
7           return(0)
```

(b) What integer value is **returned** when the function is called with the following arguments.

Arguments	Value returned
Compare (3,3)	
Compare (-2,-4)	
Compare(compare(3,3),compare(-2,-4))	

(c) The function above compares two integer values and returns an integer value of 1, -1 or 0 depending on the arguments supplied to the function. **Change** the function so it will take three integers and return the largest. The arguments you should use are **x**, **y** and **z**. You should also have an output if all three arguments are the same.

(d) Tick the box if the following code **will** result in an error and explain the reason for the error.

Type in	Error?	Explanation
print ("hello world")		
print "hello world"		
Print ("hello world")		

Question 15

Many new vehicles come with advanced hardware that provides an autopilot feature. An autopilot feature may allow a vehicle to steer, accelerate, brake and park autonomously. Hardware such as cameras and sensors provide the input to the vehicle's computer system, which then takes the required action without the need of the driver.

(a) What is meant by a 'computer system'?

(b) Modern vehicles have numerous **input** and **output** devices.

    (i) Why does the autopilot computer system require input devices?

    (ii) Identify **one** form of adaptive technology that can assist drivers with special needs and describe how it would be used.

(c) A modern vehicle's onboard computer systems have numerous CPUs (Central Processing Units).

    (i) State **one** task performed by a CPU.

    (ii) Explain why the autopilot's driving instructions are stored using binary representation.

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Pre-Leaving Certificate Examination, 2021

Computer Science

Section C

Ordinary Level

Time: 1 hour

80 marks

Instructions

There is one section of the examination paper in this booklet.

Section C   Programming   80 marks   1 question

Answer all parts of the question on your digital device.

Instructions are provided for each question.

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

Do not change the file names or save your work under different file names.

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.

Section C   Programming   80 marks

Answer all question parts.

Question 16

(a)   Open the program called **Question16_A.py** from your device.
Enter your name in the space provided on **Line 2.**

A small business wants to update its web page so that it can process online sales. It hopes in doing this it can increase its sales and create a new source of revenue for the business. It is currently developing its online ordering system so that customer orders will be processed quicker by a member of staff before being delivered.

```
1   # Question 16(a)
2   # Student name:
3
4   print("Welcome to the new online ordering system.\n")
5
6   total_cost = 0
7   items_count = 1
8
9   price_of_item = float(input("Enter the price of item {}".format(item_count)+" : € "))
10  total_cost+=price_of_item
11
12  print("You entered",item_count,"items and the total is €",total_cost)
```

This program is the interface that staff use to process orders. Currently, though, the program does not have a lot of functionality, and staff are restricted to only processing orders one item at a time.

```
Welcome to the new online ordering system.

Enter the price of item 1 : € 4.75
You entered 1 items and the total is € 4.75
```

(i)   Add a comment at the start of the program that says '**This program is a simple ordering system**'.

(ii)   Modify the program so the staff member who is processing the order can enter their name.
A **suitable variable** should be used to **store** the name:

```
Please enter your user name: Martin
```

(iii) Modify the program to output the user name created in part (ii) to the screen.

```
The member of staff who processed your order was: Martin
```

(iv) Currently the program can only process orders one item at a time.

Modify the program so:

a. It asks the user how many items are in the order.
b. Use a **for** loop or **otherwise** to calculate the **total value** of the order.
c. **Display** the total cost of the order.

The output of the program may look as follows:

```
How many items are in the customers order: 3
Enter the price of item 1 : € 3.54
Enter the price of item 2 : € 2.37
Enter the price of item 3 : € 5.00
You entered 3 items and the total due is € 10.91
```

(v) Customers are required to create an account that they lodge money to when placing their orders. During the processing of the order, a member of staff will check to see if the balance of the customer's account is enough to finalise the order.

Modify the program so:

a. The staff member can **enter** the **current balance** of the customer's account.
b. **Calculate** and **display** the **remaining balance** in the customer's account after the order has been processed.

Suitable variable(s) should be used to store name(s):

The output of the program may look as follows:

```
You entered 2 items and the total due is € 5.96
What is the customers current account balance € 10
Your remaining balance: € 4.04
```

(vi) Modify the program so that it tells the user:

a. If the customer does not have enough credit in their current account.
b. The output should tell the user how much money is still owed.

The output of the program may appear as shown below:

```
The customer does not have enough credit in their account, they still owe: € 2.01
```

(vii) **Output** a message, if the number of items in an order entered is below 0.

```
How many items are in the customers order: -2
Invalid option
```

You can use the data in this table to test the functionality of your program.

Item Number	Item Cost
1	10.00
2	3.45
3	11.36
4	8

Total cost = 32.81 euro
Customer account balance = 30 euro
Customer still owes = 2.81 euro

(b) Open the program called **Question16_B.py** from your device.
Enter your name in the space provided on **Line 2**.

```
1   # Question 16(b)
2   # Student name:
3
4   Standard_Postal_List = []
```

Countries that qualify for standard postage and packaging costs			
Netherlands	Denmark	Poland	Portugal
Finland	Romania	France	Germany
Greece	Spain	Hungary	Sweden
Ireland			

(i) When the business posts orders that have been placed online it has a list of **thirteen** countries that qualify for standard postage and packaging costs. These countries are shown in the table above.

Place these countries in the list called **'Standard_Postal_List'**.
Note: Python is case sensitive. Ireland and ireland are two different items because of the size of the letter i.

(ii) Modify the code so:

  a. It asks the user to enter the name of the country they want to ship an order to.
  b. Use an **if statement** to compare the user input to the Standard_Postal_List. If the country is an element of the list, output a message saying "**This country uses standard postage and packaging costs**".
  c. If the country is not in the standard postal list then the output should be a message stating "**This country is not on the approved delivery list".**

The output may appear as follows:

```
Please enter the country that you wish to send the order to: India
This country is not on the approved delivery list.
```

(iii)   Modify the code so:

    a.   If the country the user enters in part (ii) is not on the list, the program should ask the user if they want to add this new country to the Standard_Postal_list.

    b.   If user chooses 'yes', the new country will be added to the Standard_Postal_list.

    c.   If user chooses 'no', the new country will not be added to the Standard_Postal_list and a message is displayed confirming this.

The output may appear as follows:

```
Please enter the country that you wish to send the order to: India
This country is not on the approved delivery list.
Would you like to add this country to the approved Postal List for future
deliveries, y/n: y
India has been added to the Standard Postal List
```

(iv)   Print the list to the **Standard_Postal_list** to the screen with any new countries that may have been added.

Display the list in alphabetical order.

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