



L.88/89



Pre-Leaving Certificate Examination, 2022

Computer Science

Marking Scheme

Ordinary Pg. 4

Higher Pg. 25

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Pre-Leaving Certificate Examination, 2022

Computer Science

Ordinary & Higher Level

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Pre-Leaving Certificate Examination, 2022

Computer Science

Ordinary & Higher Level

Explanation

Conventions Used

1. A **dash** – before an answer indicates that the answer is a separate answer, which may be considered as independent of any other suggested answers to the question.
2. A **single forward slash** / before an answer indicates that the answer is synonymous with that which preceded it. Answers separated by a forward slash cannot therefore be taken as different answers.
3. A **double forward slash** // is used to indicate where multiple answers are given but not all are required.
4. **Round brackets** () indicate material which is not considered to be essential in order to gain full marks.
5. ‘etc.’ is used in this marking scheme to indicate that other answers may be acceptable.
In all other cases, only the answer given or ‘words to that effect’ may be awarded marks.
6. Marks for diagrams are shown as follows (e.g. 0m, 3m, 5m), where 0m indicates the lowest possible and 5m the highest.
7. Answers which are given in this marking scheme should not be considered as the only possible answers that may be accepted. Answers which are synonymous with or equivalent to those in this marking scheme are also acceptable.

Current Marking Scheme

Assumptions about these marking schemes on the basis of past SEC marking schemes should be avoided. While the underlying assessment principles remain the same, the exact details of the marking of a particular type of question may vary from a similar question asked by the SEC in previous years in accordance with the contribution of that question to the overall examination in the current year. In setting these marking schemes, we have strived to determine how best to ensure the fair and accurate assessment of students’ work and to ensure consistency in the standard of assessment from year to year. Therefore, aspects of the structure, detail and application of the marking schemes for these examinations are subject to change from past SEC marking schemes and from one year to the next without notice.

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Pre-Leaving Certificate Examination, 2022

Computer Science

Ordinary Level Marking Scheme (185 marks)

Section A	Short Answer Questions	(45 marks)
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Answer any nine questions.

Question 1	(5 marks)
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- (a) Explain the difference between the World Wide Web and the Internet. (3m)**

- the Internet is the physical network of computers, cables and other devices that transport data
- the World Wide Web is software that lets you use that data

** Accept other appropriate answers.

3 marks	** Very good explanation - clear understanding demonstrated.
2 marks	** Good explanation - clear information, lacking full understanding.
1 mark	** Fair explanation - limited understanding.

- (b) How many gigabits (Gb) are in one gigabyte (GB)? (2m)**

- 8

** Award 1m for any attempt to convert units.

Question 2**(5 marks)**What is the output of the following piece of Python code? **(5m)**

1	x = 3
2	y = 4
3	print((x+y) **2)

– 49

** Award 2m for evidence that $(x + y) = 7$ calculated.**Question 3****(5 marks)**(a) Convert the decimal number 58 to a binary number. **(3m)**

– 111010

** Award 1m for evidence of use of power of 2.

(b) Convert the hexadecimal number F8 to a decimal (denary) (base 10) number. **(2m)**

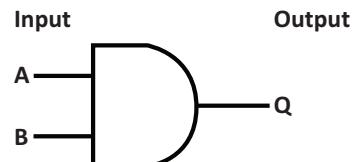
– 248

** Award 1m for evidence of use of power of 16 or its mention.

Question 4**(5 marks)**

Complete the truth table for the AND logic gate, shown in **Figure 1.** (5m)

INPUTS		OUTPUT
A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

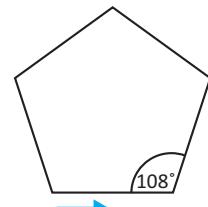
**Figure 1**

- ** Award 1m each for first three correct answers.
- ** Award 2m for fourth correct answer.

Question 5**(5 marks)**

Figure 2 shows a pentagon. Each corner is an angle of 108° and each side is 2 cm long.

Using pseudocode or Python, write out the instructions to draw the pentagon, starting at the bottom left corner and moving in the direction of the arrow.

**Figure 2**

Any 1: (5m)

Pseudocode

- move forward 2 cm
- turn left 72°
- move forward 2 cm
- turn left 72°
- move forward 2 cm
- turn left 72°
- move forward 2 cm
- turn left 72°
- move forward 2 cm

Python

- pic=forward(2)
- pic=left(72)
- pic=forward(2)
- pic=left(72)
- pic=forward(2)
- pic=left(72)
- pic=forward(2)
- pic=left(72)
- pic=forward(2)

- ** Award 3m if student uses 108° .

- ** ‘Import’ not needed in Python solution for marks.

- ** If student uses a loop in Python, only one forward and one left needed.

- ** Accept other appropriate answers.

Question 6**(5 marks)**

The Unicode representation for the ‘winking face’ character shown in **Figure 3** is the hexadecimal number 1F609.

Describe **two** differences between American Standard Code for Information Interchange (ASCII) and Unicode.

**Figure 3**

Any 2: (3m + 2m)

ASCII

- represents a maximum of 256 characters //
- stores as a single byte //
- only standard and English symbols // *etc.*

Unicode

- at least 2^{21} possibilities //
- stores in byte sequence, *e.g.* UTF-32 //
- all languages // *etc.*

** Accept other appropriate answers.

Question 7**(5 marks)**

(a) As of May 2021, there are 70 operational data centres in Ireland, with a further eight under construction.

(i) Identify **one** advantage of having data centres in Ireland.

Any 1: (2m)

- local employment in construction and maintenance, *etc.* //
- attracts tech companies to Ireland //
- drives demand for STEM jobs // *etc.*

** Accept other appropriate answers.

(ii) Identify **one** disadvantage of having data centres in Ireland.

Any 1: (1m)

- burden on power grid //
- security concerns //
- use up valuable land //
- increase national carbon emissions // *etc.*

** Accept other appropriate answers.

(b) Describe the role of a data controller within an organisation. **(2m)**

- (the data controller is) the principal party for data collection and security in an organisation; he/she determines, either alone or jointly with others, the purposes for which and the way in which data is processed, *etc.*

** Accept other appropriate material.

Question 8**(5 marks)**

The image in **Figure 4** shows a printed circuit board (PCB).

Describe **two** advantages of using a PCB in a computer or an embedded system.

- Any 2: **(3m + 2m)**
- cheap //
 - easy to manufacture //
 - low electrical noise //
 - reliable //
 - easy to repair //
 - immune to movement // etc.
- ** Accept other appropriate answers.

**Figure 4****Question 9****(5 marks)**

List **three** datatypes that may be used in Python programming.

- Any 3: **(2m + 2m + 1m)**
- string //
 - integer //
 - complex //
 - float //
 - list //
 - dictionary //
 - tuple // etc.
- ** Accept other appropriate answers.

Question 10**(5 marks)**

(a) Explain the difference between primary and secondary data storage. **(2m + 1m)**

- primary storage refers to the main storage of the computer or main memory, which is the RAM, ROM, cache or registers. It interacts directly with the CPU
 - secondary storage refers to the other storage devices used to store data on a long-term basis, *etc.*
- ** Do not accept ‘temporary’ or ‘volatile’ for primary storage.
** Accept other appropriate answers.

(b) Describe **two** advantages of solid state drives (SSDs) over hard disk drives (HDDs).

Any 2: **(2 × 1m)**

- smaller //
- faster //
- quieter //
- no moving parts //
- consumes less power //
- not affected by magnetic fields // *etc.*

** Accept other appropriate answers.

Question 11**(5 marks)**

Figure 5 shows a map of a new fibre optic link between Europe and North America, which is due to go live in 2022. The Grace Hopper cable is named in honour of pioneering computer scientist Grace Brewster Murray Hopper.

Describe **two** advantages and **one** disadvantage of using fibre optic cable rather than copper cable for the transmission of data.

(2m + 2m + 1m)

Advantages

Any 2:

- faster signals - allow much more cable length than copper twisted pair cables //
- much more bandwidth than copper twisted pair cables //
- no electricity used, so there is no electrical interference and related noise //
- much more secure for data transfer //
- thinner and lighter than copper cables //
- mass production (of glass for fibre optic cables) is cheaper than for copper cables // etc.

** Accept other appropriate answers.

Disadvantage

Any 1:

- difficult to splice (join together) //
- there can be data loss due to fibre optic cable splicing //
- due to their physical nature, fibre optic cables can be damaged easily //
- expensive to install // etc.

** Accept other appropriate answers.

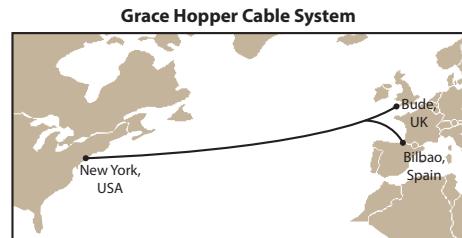


Figure 5

Question 12**(5 marks)**

Which one of the following is the odd one out? **(2m)**

Operating System

Semiconductor

Serial Bus

Hard Drive

- operating system

Justify your answer. **(3m)**

- (operating system) is software, the others are types of hardware, etc.

** Accept other appropriate answers.

Section B**Long Questions****(60 marks)**

Answer any two questions.

Question 13**(30 marks)**

- (a)** A bubble sort is a type of sorting algorithm. What is an algorithm? **(8m)**

- a process or set of rules / instructions to be followed in calculations or other problem-solving operations, especially by a computer, *etc.*
- ** Accept other appropriate material.

8 marks	** Very good explanation - clear understanding demonstrated.
4 marks	** Good explanation - clear information, doesn't reference calculations or problem-solving operations.
2 marks	** Fair explanation - limited understanding.

- (b)** The table below sets out the operation of the ascending bubble sort algorithm to sort the list of integers [5, 3, 2, 4, 1]. **(10)**

Complete the table below to show the state of the list after passes 1 and 2. **(10 × 1m)**

5	3	2	4	1
---	---	---	---	---

Original	5	3	2	4	1
Pass 1	3	2	4	1	5
Pass 2	2	3	1	4	5

** Award full marks if Pass 2 is completed correctly.

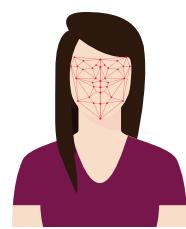
Question 13 (cont'd.)

- (c) Facial recognition software uses algorithms to recognise people.

(12)

This type of software can be installed in CCTV cameras.

Describe **two** potential advantages and **two** potential disadvantages of using facial recognition software.

**Figure 6**Potential advantages

Any 2: **(2 × 3m)**

- helps to catch criminals //
- helps to find missing people //
- helps advertisers personalise on-street advertising / can improve shopping experience //
- strengthens security measures, e.g. at airports //
- reduces the number of touchpoints //
- can help to improve medical treatment // etc.

** Accept other appropriate answers.

Potential disadvantages

Any 2: **(2 × 3m)**

- privacy issues //
- profiling issues //
- data vulnerabilities //
- issues with state control //
- imperfect technology //
- technology can be fooled // etc.

** Accept other appropriate answers.

Question 14**(30 marks)**

- (a)** User-centred design (UCD) is an iterative design process in which designers focus on the users and their needs in each phase of the design process.

You are part of a design team working on a new smart home device that allows users to control other smart devices by voice control.

Describe **two** aspects of UCD that the design team should focus on for the project. Explain your reasoning for **each** aspect you have chosen. (10)

** Aspect named (3m), Reasoning explained (2m).

Any 2: **(2 × 5m)**

- design for the users and their tasks //
- maintain consistency //
- use simple and natural dialogue //
- reduce unnecessary mental effort by the user //
- provide adequate feedback //
- provide adequate navigation mechanisms //
- let the user take charge //
- present information clearly //
- offer assistance //
- error free // etc.

** Accept other appropriate answers and material.

** Reasoning should be appropriate to each aspect chosen.

- (b)** One of the stories of 2021 was the rise, fall and rise of Dogecoin.

This is a form of crypto currency that was heavily influenced by social media and a number of high-profile individuals.

Describe **two** positive impacts and **two** negative impacts of social media on culture and society in the 21st century. (4)



Figure 7

Positive impacts

Any 2: **(2 × 1m)**

- connectivity - helps to reduce loneliness / sense of isolation //
- education //
- helps improve well-being //
- helps increase political and social awareness //
- business - professional networking // etc.

** Accept other appropriate answers.

Negative impacts

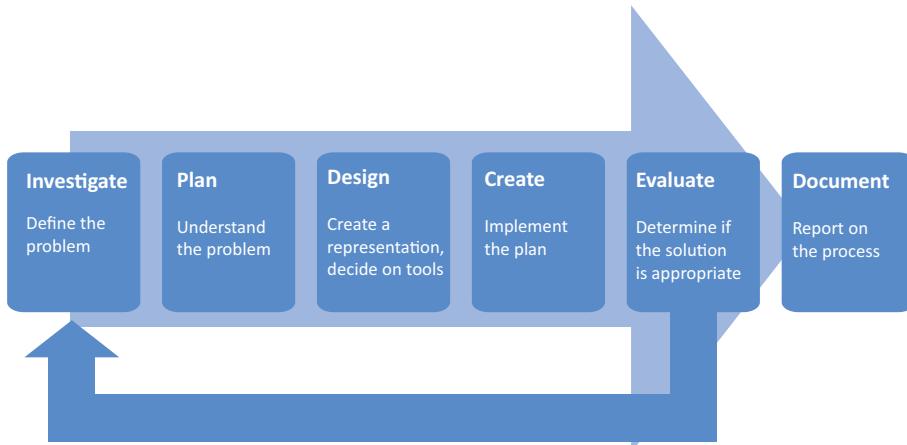
Any 2: **(2 × 1m)**

- cyberbullying / anonymous trolling //
- social media addiction //
- posts are difficult to completely erase / remove //
- can end up spending too much time on social media - endless scrolling //
- posts may not be truthful / reflective of real life //
- misinformation // etc.

** Accept other appropriate answers.

Question 14 (cont'd.)

- (c) Leaving Certificate Computer Science places special emphasis on the iterative design process. (6)

**Figure 8**

- (i) Give **one** example of where you have used the iterative design process in one of your Applied Learning Tasks (ALTs). (3m)
 ** Any relevant example
- (ii) Explain how the iterative design process helped you achieve your goal. (3m)
 ** Any relevant explanation of how the iterative design process helped to achieve goal

3 marks	** Good explanation of how goal achieved.
1 mark	** Fair explanation of how goal achieved.

Question 14 (cont'd.)

- (d) The age of digital consent is the minimum age a user must be before a social media or other online service can collect, process and store their data. In 2018, the European Union set the default age of digital consent at 16 years. (10)

Give **two** reasons for lowering the age of digital consent and **two** reasons for maintaining the age of digital consent at 16 years.

Reasons for lowering the age of digital consent

- Any 2: **(3m + 2m)**
- so online services, e.g. counselling or advice, that can help children (under the age of 16) can store their data //
 - under 16 year olds have a right to access the internet //
 - online educational opportunities might not be available to children under the age of 16 years //
 - children are a lot more ‘tech savvy’ at a younger age nowadays // etc.
- ** Accept other appropriate answers.

Reasons for maintaining the age of digital consent

- Any 2: **(3m + 2m)**
- monetisation of children’s personal data //
 - children’s data held long term interferes with the ‘right to be forgotten’ laws //
 - a child may not be mature enough to understand the concept of digital consent //
 - no long-term research on effects of use of social media on a child’s mental health // etc.
- ** Accept other appropriate answers.

Question 15**(30 marks)**

- (a)** As part of your Leaving Certificate Computer Science course you used an embedded system in Applied Learning Task 4 (ALT4).

- (i)** What is an embedded system? **(3m)**

- a computer system that performs a dedicated task either on its own or as part of a larger system, *etc.*
- ** Award 1m if an example is given but no mention of a dedicated task.
 ** Accept other appropriate material.

- (ii)** Name **three** analogue sensors that may be attached to an embedded system.

Any 3: **(3 × 1m)**

- light //
- temperature //
- sound //
- pressure //
- humidity // *etc.*

** Accept other appropriate answers.

- (b)** Lisa and Max have decided to buy a gaming computer.

The specifications of the computer they decided to buy are:

- Intel Core i9-101850K CPU
- ASUS ROG Strix Z590-F Gaming Wifi
- 32GB Corsair Vengeance 3000MHz RAM
- 6GB GeForce RTX 2060 GPU
- 1TB Seagate BarraCuda HDD
- Windows 10 Home



Figure 9

- (i)** They have opted for 32GB of RAM. What is RAM? **(5m)**

(14)

- RAM, random-access memory, is a form of computer memory that can be read and changed in any order, typically used to store data and code. It is both volatile memory and primary storage, *etc.*

** Accept other appropriate material.

5 marks	** Very good explanation mentioning random access memory, primary storage and/or volatile.
3 marks	** Good explanation mentioning any two of random access memory, primary storage and volatile.
1 mark	** Fair explanation mentioning only one of random access memory, primary storage and volatile.

Question 15 (cont'd.)**(b) (cont'd.)**

(ii) Explain why Lisa and Max opted for the additional 6GB GPU, instead of just the i9 CPU.

Any 1: **(3m)**

- greater number of cores //
- able to deal with larger number of calculations //
- able to dedicate processing to graphics in the game // etc.

** Accept other appropriate answers.

(iii) The i9 CPU has 8 cores. Name **two** components of a CPU core.

Give the function of **one** of the components you have named.

** Function should correspond to the component named.

Component

Function

Any 2: **(2 × 2m)**

Any 1: **(2m)**

- | | |
|---|---|
| <ul style="list-style-type: none"> – ALU // – program centre // – bus // – MDR // – MAR // – cache // – accumulators // etc. | <ul style="list-style-type: none"> – carries out arithmetic and logic operations // – contains the address (location) of the instruction being executed at the current time // – connection between parts of the CPU that carries data // – holds data that is being transferred to or from memory // – stores the memory address from which data will be fetched to the CPU, or the address to which data will be sent and stored // – high-speed memory in the CPU // – a register in which intermediate arithmetic and logic data is stored // etc. |
|---|---|

** Accept other appropriate answers and material.

Question 15 (cont'd.)

(c) Describe, using examples, the difference between a digital signal and an analogue signal. **(10m)** (10)

<u>Digital signal</u>	<u>Analogue signal</u>
– square wave	– sine wave //
– on/off	– continuous //
– limited number of values	– can have an infinite number of values //
– can be easily stored	– takes time to be stored //
– does not produce noise // etc.	– produces noise // etc.

** Accept other appropriate material.

<u>Examples of a digital signal</u>	<u>Examples of an analogue signal</u>
– computers //	– human voice //
– digital pens // etc.	– photocopier // etc.

** Accept other appropriate answers.

10 marks	** Clearing understanding including examples.
5 marks	** Basic understanding or just examples given.
3 marks	** Poor understanding with no examples given.

Section C**Programming****(80 marks)**

Answer all question parts.

Question 16

(a) Possible solution

1	# Question 16(a)	
2	# Name and School:	
3	import random	# (v)
4	term = 0	# (iv)
5	s_vac2 = ["A", "B", "C"]	# (v)
6	while term != "END":	# (iv)
7	s_name = input("Enter your surname: ")	# given
8	f_name = input("Enter your first name: ")	# given
9	age = int(input("Enter your age: "))	# (i)
10	e_code = input("Enter your Eircode: ")	# (iii)
11	s_vac = (input("Do you agree to enrol in a vaccine trial? Type 'Yes' or 'No': "))	# (v)
12		
13	print("Hello", f_name, s_name, "you are", age, "years old and your Eircode is", e_code)	# given & (i), (iii)
14	x = int(e_code[-1])	# (iii)
15	if x%2 !=0:	# (iii)
16	print("You must attend Northfield for your vaccine")	# (iii)
17	else:	
18	print("You must attend Eastwood for your vaccine")	# (iii)
19		
20	if s_vac == "Yes":	# (v)
21	print("You are now enrolled in the trial to receive Super vaccine", random.choice(s_vac2))	# (v)
22	if age>=12 and age<50:	# (ii)
23		
24	print("You will receive the mRNA vaccine")	# (ii)
25		
26	else:	
27	print("You will receive the ADENO vaccine")	# (ii)
28		
29	term = input("If you are finished entering people's details type 'END', otherwise press RETURN: ")	# (iv)
30		

Question 16 (cont'd.)

- (a) Open the program called **Question16_A.py** from your device.
The source code is shown and described briefly below.

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.

Vaccines against the SARS-2 (Covid-19) virus have helped to overcome the pandemic. Age was the main factor that determined which type of vaccine a person received during the vaccine rollout.

Vaccine Type	Age Group (years)
MRNA	12 – 49
ADENO	50+

Table 1 shows the types of vaccines available and the age groups they are suitable for.

Table 1

The program below is for a vaccine registration portal. When Jack Saunders enters his name, a message appears saying “Hello Jack Saunders”.

```

1 # Question 16 (a)
2 # Name and School:
3
4 s_name = input("Enter your surname: ")
5 f_name = input("Enter your first name: ")
6 print("Hello", f_name, s_name)

```

Make the following changes to the program:

- (i) Amend the program to allow Jack to enter his age. He is 42 years old. **(15m)** (15)
When the program is run the output may look as follows:

Enter your surname:	Saunders
Enter your first name:	Jack
Enter your age:	42
Hello Jack Saunders, you are 42 years old	

15 marks	** Correct response. Input used and print adjusted accordingly.
10 marks	** Almost correct response. Input or print is correct. Syntax error only. Forgets to use <i>int</i> .
5 marks	** Response with some merit. Attempt made to add new line of code.
0 marks	** Response of no substantial merit. No attempt.

Question 16 (cont'd.)

- (ii) Amend the program using the information given in **Table 1** so that it tells Jack which vaccine he will receive.

When the program is run the output may look as follows: **(15m)**

(15)

Enter your surname:	Saunders
Enter your first name:	Jack
Enter your age:	42
Hello Jack Saunders, you are 42 years old	
Jack, you will receive the mRNA vaccine	

15 marks	** Correct response. Conditional used and print adjusted accordingly.
10 marks	** Almost correct response. Evidence of use of conditional statements. Syntax error only. Forgets to use <i>elif</i> .
5 marks	** Response with some merit. Attempt made to add new line of code.
0 marks	** Response of no substantial merit. No attempt.

- (iii) Jack needs to input his Eircode (K78 E625) in order to be assigned to a vaccination centre. Eircodes ending with an odd number are assigned to Northfield and those ending with an even number are assigned to Eastwood.

Amend the program so that Jack is assigned to the correct vaccination centre.

When the program is run the output may look as follows: **(10m)**

(10)

Enter your surname:	Saunders
Enter your first name:	Jack
Enter your age:	42
Enter your Eircode:	K78 E625
Hello Jack Saunders, you are 42 years old and your	
Eircode is K78 E625	
You must attend Northfield for your vaccine	
Jack, you will receive the mRNA vaccine	

10 marks	** Correct response. Input used. Appropriate output and conditional.
7 marks	** Almost correct response. Input or print or conditional is correct. Syntax error only. Forgets to use !=.
3 marks	** Response with some merit. Attempt made to add new line of code.
0 marks	** Response of no substantial merit. No attempt.

Question 16 (cont'd.)

- (iv) Using a **while** loop or similar, amend the program to give Jack the option to register another person. The code should terminate when you enter the word 'END' or allow you to enter the details for Mary Saunders, 65 years old, Eircode K66 E644.
- When the program is run the output may look as follows: **(10m)**

(10)

```

Enter your surname:           Saunders
Enter your first name:       Jack
Enter your age:              42
Enter your Eircode:          K78 E625
Hello Jack Saunders, you are 42 years old and your
Eircode is K78 E625
You must attend Northfield for your vaccine
Jack, you will receive the mRNA vaccine
If you have finished entering people's details type END,
otherwise press RETURN:
Enter your surname:           Saunders
Enter your first name:        Mary
Enter your age:               65
Enter your Eircode:           K66 E644
Hello Mary Saunders, you are 65 years old and your
Eircode is K66 E644
You must attend Eastwood for your vaccine
Mary, you will receive the ADENO vaccine

```

10 marks	** Correct response. Correct use of while loop and appropriate input.
7 marks	** Almost correct response. While loop constructed but not initialised. Syntax error only. Forgets to use <i>output</i> .
3 marks	** Response with some merit. Attempt made to add new line of code.
0 marks	** Response of no substantial merit. No attempt.

Question 16 (cont'd.)

- (v) Jack wants to enrol in a vaccine trial. Amend the program to ask Jack if he agrees to enrol in a vaccine trial and to randomly assign one of the three super vaccines (A, B, C) to him. (Hint: create a list containing A, B, C and use **import.random** and **random.choice**).

When the program is run the output may look as follows: **(10m)**

(10)

```

Enter your surname:          Saunders
Enter your first name:       Jack
Enter your age:              42
Enter your Eircode:          K78 E625
Do you agree to enrol in a vaccine trial?
Type 'Yes' or 'No'           Yes
Hello Jack Saunders, you are 42 years old and your
Eircode is K78 E625
You must attend Northfield for your vaccine
You are now enrolled in the trial to receive Super vaccine B
If you have finished entering people's details type 'END',
otherwise press RETURN:
```

10 marks	** Correct response. Import.random, random.choice and list in correct location.
7 marks	** Almost correct response. Import.random outside loop. Syntax error only. Forgets to use <i>put list outside loop</i> .
3 marks	** Response with some merit. Attempt made to add new line of code.
0 marks	** Response of no substantial merit. No attempt.

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.

Question 16 (cont'd.)

- (b)** Possible solution

```

1 # Question 16(b)
2 # Name and School:
3 list1 = [4, 5, 9, 8, 10, 17, 99, 77]
4 list1.sort()
5 mid = len(list1) // 2
6 res = (list1[mid] + list1[mid-1]) / 2
7     print("Median of list is: " + str(res))

```

- (b)** Find the median of the following list of numbers, without using an in-built Python function: **(20m)** (20)

List 1 = [4, 5, 9, 8, 10, 17, 99, 77]

- median = 9.5

20 marks	** Correct answer of 9.5 and the code is acceptable if the elements of the list are changed.
15 marks	** 9 or 8.5 or 90 given and evidence that the code tries to sort the list and split the list to find the middle element.
10 marks	** Use of sort to create a new list <u>or</u> use of imported functions other than sort, e.g. gets mean or mode.
5 marks	** Any attempt to create a list and sort <u>or</u> find any statistical quantity.

Save your file using the format **StudentNameQuestion16_B.py**. For example, you would save the file as **MaryMurphyQuestion16_A.py** if your name was Mary Murphy.

Pre-Leaving Certificate Examination, 2022

Computer Science

Higher Level Marking Scheme (185 marks)

Section A	Short Answer Questions	(45 marks)
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Answer any nine questions.

Question 1	(5 marks)
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(a) Define the term local area network (LAN). (2m)

- a network that covers a single site or area only, *etc.*
- ** Accept other appropriate material.

2 marks	** Very good definition - clear understanding demonstrated.
1 mark	** Fair definition - limited understanding <u>or</u> gives example only.

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

- Any 2: **(2m + 1m)**
- communication is cheap and easy between devices on LAN //
 - sharing files is easier on LAN //
 - shared hardware decreases costs //
 - internet connection is shared //
 - install and update software centrally //
 - user accounts stored centrally //
 - single point of access to web means easier to protect from attack // *etc.*
- ** Accept other appropriate answers.

Question 2**(5 marks)**

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? **(2m)**

- using more bits to represent characters generally increases the size of the set, *etc.*
- ** Accept other appropriate material.

2 marks	** Very good explanation - clear understanding demonstrated.
1 mark	** Fair explanation - limited understanding.

- (b)** Mary claims that Unicode can represent more than 4 times the number of characters that ASCII can. Is she correct? **(1m)**

- yes / she is correct

Explain your answer. **(2m)**

- Unicode can represent 2^{32} characters, which is more than 4×2^8 by ASCII, *etc.*
- ** Accept other appropriate material.

Question 3**(5 marks)**

- (a)** Define the term embedded system. **(3m)**

- a computer built into another device that has a dedicated task, *etc.*
- ** Accept other appropriate material.

3 marks	** Very good definition - clear understanding demonstrated.
1 mark	** Fair definition - limited understanding <u>or</u> gives example only.

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

- Any 2: **(2 × 1m)**
- central heating systems //
 - engine management systems in vehicles //
 - control units in domestic appliances, *e.g.* dishwashers, TVs and digital phones //
 - digital watches //
 - electronic calculators //
 - GPS systems //
 - fitness trackers // *etc.*
- ** Accept other appropriate answers.

Question 4**(5 marks)**

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. **(5m)**

- ** Award 1m for each correct line.
 ** Award 2m for the final line correct, if others are correct.

Roundstone	Palmerstown	Oranmore	Ballymahon	Millstreet
Palmerstown	Roundstone	Oranmore	Ballymahon	Millstreet
Oranmore	Palmerstown	Roundstone	Ballymahon	Millstreet
Ballymahon	Oranmore	Palmerstown	Roundstone	Millstreet
Ballymahon	Millstreet	Oranmore	Palmerstown	Roundstone

Question 5**(5 marks)**

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

(a) Explain what is meant by a MAC address. (2m)

- a MAC (media access control) address is a unique identifier that is assigned to every network-enabled device and is used to direct data to the right device in the network, *etc.*
- ** Accept other appropriate material.

2 marks	** Very good explanation - clear understanding demonstrated.
1 mark	** Fair explanation - limited understanding <u>or</u> gives example only.

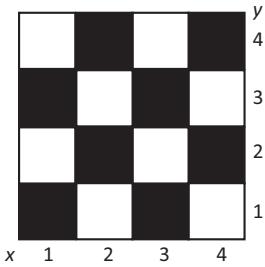
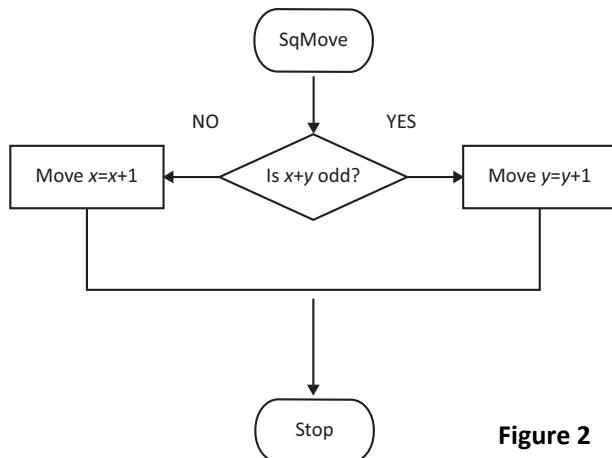
(b) Identify **two benefits of using layers when working with network protocols.**

- Any 2: **(2m + 1m)**
- break network communication into manageable pieces //
 - allow developers to focus on one area of network without affecting the other areas //
 - layers are self-contained //
 - have set rules //
 - allow interoperability and universality among users //
 - speed up packet delivery //
 - ensure that a device at one layer can function at the next higher layer // *etc.*
 - ** Accept other appropriate answers.

Question 6**(5 marks)**

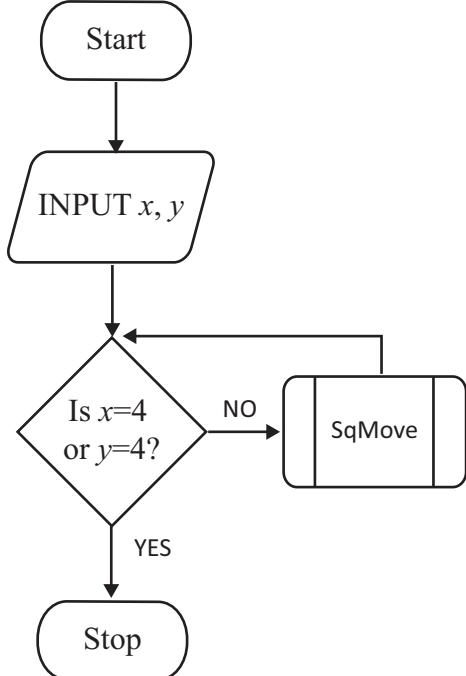
A robot moves on a checkered board as shown in **Figure 1**.

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



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

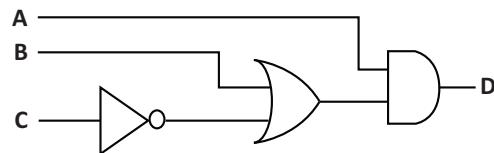
- Ask the user to enter which square the robot starts on
 - Run the subroutine SqMove in a loop
 - Stop when the robot reaches the top or the right of the board. (**5 × 1m**)
- ** Award (1m) for each correct position.



- ** Accept other appropriate answers.

Question 7**(5 marks)**

Complete the truth table below for the logic circuit shown in **Figure 3.** (5 × 1m)

**Figure 3**

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

Question 8**(5 marks)**

(a) What is meant by the term ‘relational database’? (2m)

- (a relational database) stores data points in tables, and the data in the different tables are related to each other, *etc.*
- ** Accept other appropriate material.

2 marks	** Very good explanation - clear understanding demonstrated.
1 mark	** Fair explanation - limited understanding <u>or</u> gives example only.

(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?

Any 1: **(3m)**

- a unique identifier (*e.g.* customer number) would exist in both tables, as a primary key in Customer Details table and a foreign key in the Sales Transactions table //
- a query can be made if the relationship between the tables can be made by having a field Customer_ID in both tables. This field would be the primary key in the first table // *etc.*

- ** Accept other appropriate answers.

3 marks	** Very good explanation - clear understanding demonstrated.
1 mark	** Fair explanation - limited understanding.

Question 9**(5 marks)**

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])
8         break
9     else:
10        print("No entry with that name found.")

```

(a) Identify the **three** mistakes in the above code. ($3 \times 1\text{m}$)

- curly bracket missing after “77” on line 3
 - colon missing after “marks” on line 5
 - a second “=” needed on line 6
- ** Accept ‘indent missing on line 6’.

(b) What will be the output if the program runs correctly? (**1m**)

- no entry with that name found

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

- 55

Question 10**(5 marks)**

Computers can encounter overflow when adding binary numbers.

- (a)** Give an example of an 8-bit binary addition where an overflow occurs. **(2m)**

** Award 2m for any example where 2 8-bit binary numbers give a 9-bit answer.

$$\begin{array}{r} 11111111 \\ + 00000001 \\ \hline 11111111 \end{array}, \text{etc.}$$

** Accept other appropriate answers.

- (b)** Explain how a computer deals with the overflow. **(3m)**

– the computer will flag the error to the user and store the extra bit in memory / modern computers have a 64-bit CPU. CPU and programmers make sure their code is adjusted to stop these errors from happening, etc.

** Accept other appropriate material.

3 marks	** Very good explanation - clear understanding demonstrated.
1 mark	** Fair explanation - limited understanding.

Question 11**(5 marks)**

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

Operating system	Windows 10 (64-bit)
PERFORMANCE	
Processor	<ul style="list-style-type: none"> – 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. (3m)

RAM

- RAM (random access memory) is volatile memory that temporarily stores the files you are working on. Read/write, fast, more expensive CPU has direct access, *etc.*
- ** Accept other appropriate material.

ROM

- ROM (read-only memory) is non-volatile memory that permanently stores instructions for your computer. Read only, slower, cheaper, CPU doesn't have direct access, *etc.*
- ** Accept other appropriate material.

3 marks	** Very good explanation - clear understanding demonstrated.
1 mark	** Fair explanation - limited understanding.

- (b)** In the context of CPU architecture, explain the term 'core'. (2m)

- a core is a small CPU or processor built into a big CPU or CPU socket. It can independently perform or process all computational tasks. Most modern CPUs consist of multiple cores, *etc.*
- ** Accept other appropriate material.

2 marks	** Very good explanation - clear understanding demonstrated.
1 mark	** Fair explanation - limited understanding demonstrated.

Question 12**(5 marks)**

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. **(2m + 2m + 1m)**

Malware

- malware is the collective name for a number of malicious software variants. Shorthand for malicious software, malware typically consists of code developed by cyber attackers to *e.g.* infect networks, steal sensitive data, send spam and remotely control machines. Examples include computer viruses, ransomware, adware and spyware, *etc.*
- ** Accept other appropriate material.

Phishing

- phishing is a cyber attack that uses disguised email / text as a weapon. The goal is to trick the recipient into believing that the message is something they want or need and to click a link or download an attachment. It may involve using some kind of social engineering to manipulate users into clicking on links, opening attachments or revealing confidential information, *e.g.* telling users that their accounts will be shut down unless they take action. Examples include texts or emails from Revenue, banks, vaccinators, *etc.*
- ** Accept other appropriate material.

Denial of Service

- a denial of service (DoS) attack is an attack meant to shut down a machine or network, making it inaccessible to its intended users. DoS attacks accomplish this by flooding the target with traffic, or sending it information that triggers a crash of the service or resource. An example is the 503 error when trying to access a website, *etc.*
- ** Accept other appropriate material.

Section B**Long Questions****(60 marks)**

Answer any two questions.

Question 13**(30 marks)**

- (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.



(8)

- ** Any two positives stated with examples ($2 \times 2m$).
- ** Any two negatives stated with examples ($2 \times 2m$).
- ** Basic positives / negatives (1m) given, each to a max. of (4m).

Positives

Any 2: **(2 × 2m)**

- freedom to choose from all available services, products, content, e.g. Vimeo and/or YouTube //
 - illegal content and websites are monitored and can be shut down immediately //
 - allows equal access for all businesses, large or small, to advertising, online and via social media //
 - allows choice when selecting streaming services, e.g. Tidal or Spotify; Netflix or Amazon Prime //
 - prevents slowing down (throttling) the delivery of certain websites / services // etc.
- ** Accept other appropriate material.

Negatives

Any 2: **(2 × 2m)**

- what happens to your data? //
 - possible abuses of free speech //
 - too much regulation could inhibit growth and development of online technologies //
 - companies who pay the most can be given preferential treatment //
 - companies could charge more to consumers for fast / premium internet service // etc.
- ** Accept other appropriate material.

Question 13 (cont'd.)

- (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. (8)

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

Any 2: **(2 × 2m)**

- connectivity - helps to reduce loneliness / sense of isolation //
- education //
- help improve well-being //
- help increase political and social awareness //
- business - professional networking // etc.

** Award 1m for each benefit poorly explained to a max. of 2m.

** Accept other appropriate answers.

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

Any 2: **(2 × 2m)**

- cyberbullying / anonymous trolling //
- social media addiction //
- posts are difficult to completely erase / remove //
- can end up spending too much time on social media - endless scrolling //
- decrease in ‘real-life’ relationships //
- posts may not be truthful / reflective of real life //
- misinformation // etc.

** Award 1m for each disadvantage poorly explained to a max. of 2m.

** Accept other appropriate answers.

- (c)** Social media companies use complex algorithms to push content to users based on their preferences. (4)

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

Algorithm (2m)

- an algorithm is a plan, a set of step-by-step instructions to resolve a problem, etc.
- ** Accept other appropriate material.

Everyday task that uses algorithmic thinking

Any 1: (2m)

- recipe //
- basic arithmetic //
- assembly instructions // etc.

** Accept other appropriate answers.

Question 13 (cont'd.)

- (d) The following code represents a type of sorting algorithm. **(10m)** (10)

```

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.

– bubble sort

- (ii) Comment on this algorithm in both test case and average case situations.

10 marks	** Identifies bubble sort algorithm and $O(n^2)$ for both situations.
8 marks	** Identifies bubble sort algorithm and any one situation's complexity.
6 marks	** Identifies bubble sort algorithm and no complexity.
3 marks	** Identifies any complexity, $O(n)$, $O(n^1)$, etc.

Question 14**(30 marks)**

- (a) Outline the function of a transistor in a computer system. (10m)** (10)

- a transistor functions as a switch with a binary function - if it contains a certain voltage, it is ‘ON’, less than this voltage is ‘OFF’. A computer can carry out billions of operations per second because the transistor can change between these states (‘ON’ and ‘OFF’) many times a second and there are millions of these transistors in a computer, *etc.*
- ** Accept other appropriate material.

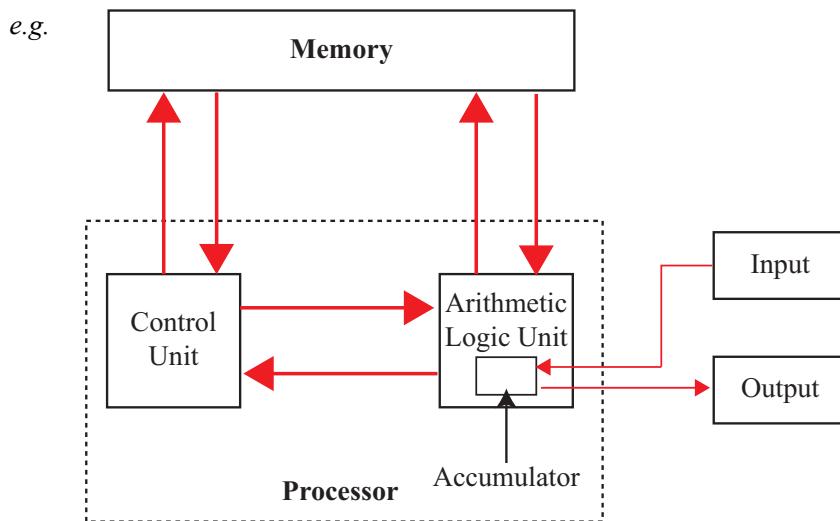
10 marks	** Very good description - clear understanding demonstrated.
8 marks	** Good description - basic understanding demonstrated.
6 marks	** Fair description - limited understanding demonstrated <u>or</u> gives example only.
2 marks	** Poor description - just gives example <u>or</u> attempts diagram.

- (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. (10m) (10)

- the fetch-execute cycle (also known as fetch-decode-execute cycle) is followed by a processor to process an instruction. The cycle consists of several stages:
 - the memory address held in the program counter is copied into the memory address register (MAR)
 - the address in the program counter is then incremented - increased - by one. The program counter now holds the address of the next instruction to be fetched
 - the processor sends a signal along the address bus to the memory address held in the MAR
 - the instruction / data held in that memory address is sent along the data bus to the memory data register (MDR)
 - the instruction / data held in the MDR is copied into the current instruction register (CIR)
 - the instruction / data held in the CIR is decoded and then executed. Results of processing are stored in the accumulator (ACC)
 - the cycle then returns to the next step or terminates, *etc.*

Question 14 (cont'd.)**(b) (cont'd.)**

** Accept other appropriate material.

10 marks	** Very good description - clear understanding demonstrated.
8 marks	** Good description - basic understanding demonstrated.
6 marks	** Fair description - limited understanding <u>or</u> gives example only.
2 marks	** Poor description - just gives example <u>or</u> attempts to name some parts.

(c) Explain why direct current (DC) is needed for a CPU to work. **(5m)** (5)

- registers and transistors only operate on a clean DC power producing binary in the form of 1s and 0s. The basic structure of a transistor precludes the current used from changing direction, which it would in an AC set-up, *etc.*

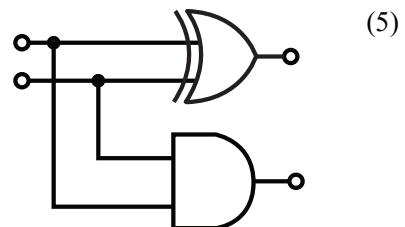
** Accept other appropriate material.

5 marks	** Very good explanation - clear understanding demonstrated.
2 marks	** Fair explanation - limited understanding demonstrated.

Question 14 (cont'd.)

(d) In logic gate theory, what is the purpose of a ‘half-adder’? **(5m)**

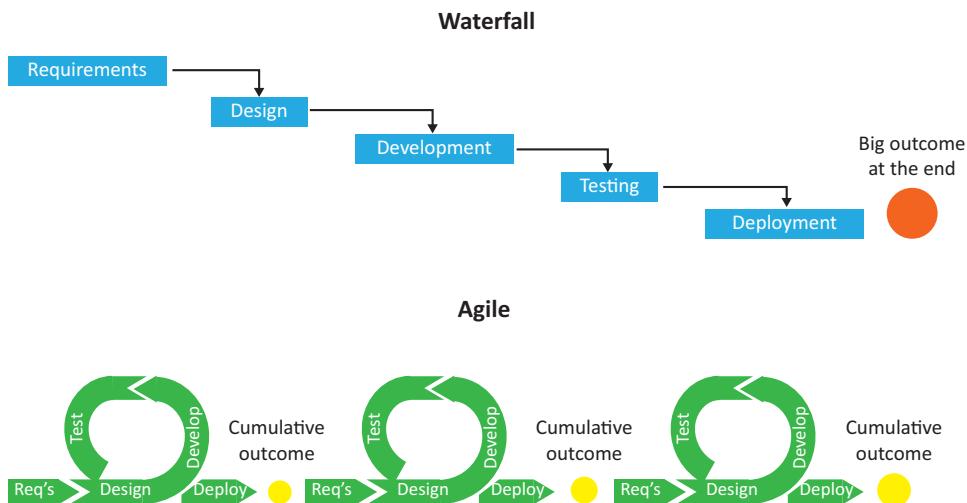
- a ‘half-adder’ is used for adding together the two least significant digits in a binary sum. It allows for a ‘1’ to be carried. Without this ability, binary addition would be an inefficient process, *etc.*
- ** Accept other appropriate material.
- ** Accept table or binary sum with explanation.

**Figure 5**

5 marks	** Very good explanation - clear understanding demonstrated.
2 marks	** Fair explanation - limited understanding demonstrated.

Question 15**(30 marks)**

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. **(10m)**

Potential benefits

- flexibility and adaptivity //
 - creativity and innovation //
 - time-to-market //
 - lower cost //
 - improved customer satisfaction //
 - improved team cohesion // etc.
- ** Accept other appropriate material.

Potential challenges

- scalability //
 - training and skill required //
 - fixed deadlines might be missed //
 - not suited to simpler tasks or projects //
 - requires more planning and managerial oversight // etc.
- ** Accept other appropriate material.

10 marks	** Very good discussion - clear understanding demonstrated.
8 marks	** Good discussion - basic understanding demonstrated.
6 marks	** Fair discussion - limited understanding demonstrated.
2 marks	** Poor discussion - just gives example.

Question 15 (cont'd.)

- (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:

(20)

- (i) Black box testing and white box testing. (10m)

Black box testing

- a tester does not have any information about the internal working of the software system.
Black box testing is a high level of testing that focuses on the behaviour of the software, *etc.*
- ** Accept other appropriate material.

White box testing

- a testing technique which checks the internal functioning of the system. In this method, testing is based on coverage of code statements, branches, paths or conditions. The white box testing method assumes that the path of the logic in a unit or program is known and that the tester is familiar with how to read and interpret code, *etc.*
- ** Accept other appropriate material.

10 marks	** Very good explanation - clear understanding demonstrated.
8 marks	** Good explanation - basic understanding demonstrated.
6 marks	** Fair explanation - limited understanding <u>or</u> gives example only.
2 marks	** Poor explanation - just gives example.

Question 15 (cont'd.)

(b) (cont'd.)

(ii) Alpha testing and beta testing. (10m)

Alpha testing

- a type of acceptance testing; performed to identify all possible issues and bugs before releasing the final product to the end users. Alpha testing is carried out by testers who are internal employees of the organisation, etc.
- ** Accept other appropriate material.

Beta testing

- performed by “real users” of the software application in a “real environment”. It is the final test before shipping a product to the customers. Direct feedback from customers is a major advantage of beta testing. This testing helps to test products in the customer’s environment, etc.
- ** Accept other appropriate material.

10 marks	** Very good explanation - clear understanding demonstrated.
8 marks	** Good explanation - basic understanding demonstrated.
6 marks	** Fair explanation - limited understanding or gives example only.
2 marks	** Poor explanation - just gives example.

Section C **Programming** **(80 marks)**

Answer all question parts.

Question 16 **(80 marks)**

(a) Possible solution

1	# Question 16(a)	
2	# Name and School:	
3	line1 = open('shelley.txt', 'r')	# (i)
4	line2 = line1.readlines()	# (i)
5	line1.close()	# (i)
6	lines = 0	# (iii)
7	words = 0	# (iii)
8	characters = 0	# (iii)
9	blank=0	# (iv)
10		
11	for line in line2:	# (iii)
12	line = line.strip()	# (iii)
13	if len(line)== 0:	# (iv)
14	blank+=1	# (iv)
15	word = line.split()	# (iii)
16	lines += 1	# (iii)
17	words += len(word)	# (iii)
18	characters += len(line)	# (iii)
19		
20	def word_search(s_word):	# (v)
21	found = 0	# (v)
22	index = 0	# (v)
23	blank2=0	
24		
25	for line in line2:	# (v)
26	index += 1	# (v)
27	if s_word in line:	# (v)
28	found = 1	# (v)
29	break	# (v)
30	for line in line2[0:index]:	# (v)
31	line=line.strip()	# (v)
32	if len(line)==0:	# (v)
33	blank2+=1	# (v)
34	if found == 0:	# (v)
35	print('The word ''', s_word , ''' was not found')	# (v)

36	<code>else:</code>	# (v)
37	<code> print('The word '' , s_word, '' was found in Line',</code> <code>index-blank2)</code>	# (v)
38	<code>print("The poem has been read correctly by the program")</code>	# (i)
39	<code>word_search(input("Please enter a word to search for: "))</code>	# (v)
40	<code>print('The last line is '' ,line2[-1], ''')</code>	# (ii)
41	<code>print("There are",lines-blank,"lines," ,words,"words</code> <code>and",characters,"characters")</code>	# (iii) (iv)

Question 16 (cont'd.)

- (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: **(15m)**

(15)

The poem has been read correctly by the program

15 marks	** Correct response - correctly reads file in and prints out confirmation.
10 marks	** Almost correct response - evidence of using correct read file syntax from Python reference guide.
5 marks	** Response with some merit - attempts to print response only.
0 marks	** Response of no substantial merit - no attempt.

Question 16 (cont'd.)**(a) (cont'd.)**

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: **(10m)**

(10)

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

10 marks	** Correct response - correct output from print statement.
7 marks	** Almost correct response - evidence method was tried to identify last line.
3 marks	** Response with some merit - prints last line as a string inside a print statement.
0 marks	** Response of no substantial merit - no attempt.

- (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: **(10m)**

(10)

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

10 marks	** Correct response - correctly outputs the line, word and character counts. (Note: students might answer (iii) and (iv) together; if so, give marks for both.)
7 marks	** Almost correct response - tries to count the spaces in order to get number of words. Syntax error. Creates variable and loops but fails to count correctly.
3 marks	** Response with some merit - any attempt to create variable and loop.
0 marks	** Response of no substantial merit - no attempt.

Question 16 (cont'd.)**(a) (cont'd.)**

- (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: **(15m)**

(15)

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

15 marks	** Correct response. Output gives 16 lines instead of 19. (Note: award full marks here if students have already completed (iv) in (iii) .)
10 marks	** Almost correct response - creates variable and attempts to adjust the loop to count empty lines.
5 marks	** Response with some merit - creates a static '-3' variable and subtracts from the total lines.
0 marks	** Response of no substantial merit - no attempt.

- (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: **(10m)**

(10)

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

10 marks	** Correct response - function called through input statement and correct output as per example.
7 marks	** Almost correct response - evidence of loop correcting used and new variables inside the function to count the lines, etc.
3 marks	** Response with some merit - attempt made to add a function or call it.
0 marks	** Response of no substantial merit - no attempt.

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.

Question 16 (cont'd.)

- (b)** Possible solution

```

1 # Question 16(a)
2 # Name and School:
3 file1 = open("shelley.txt", "r")
4 file2 = open("alt_shelley.txt", "r")
5
6 i=0
7 for line1 in file1:
8     i += 1
9     for line2 in file2:
10         if line1 == line2:
11             print("Line ",i, ":\tis identical")
12         else
13             print("Line ",i, ":\tis different")
14         break
15     file1.close()
16     file2.close()

```

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

(20)

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. **(20m)**

20 marks	** Correct response - input used and print adjusted accordingly.
15 marks	** Almost correct response - syntax error. Loop and conditional present but doesn't print correctly. Any single error which if fixed allows correct run.
10 marks	** Response with some merit - evidence of a variable initialised and a loop created.
8 marks	** Response of little merit - opens one or both of the files correctly.
0 marks	** Response of no merit.

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.

Notes:

Notes:

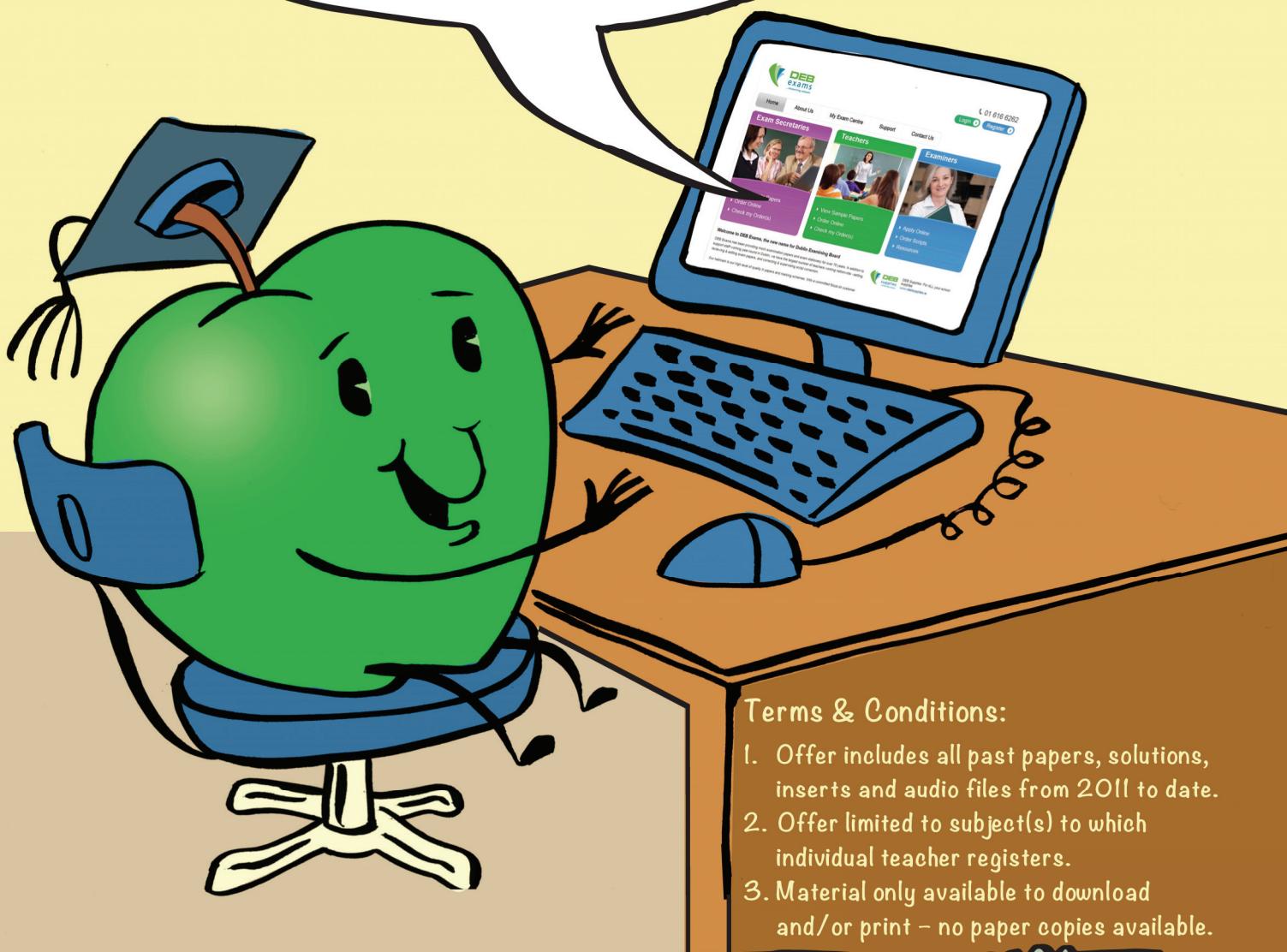
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