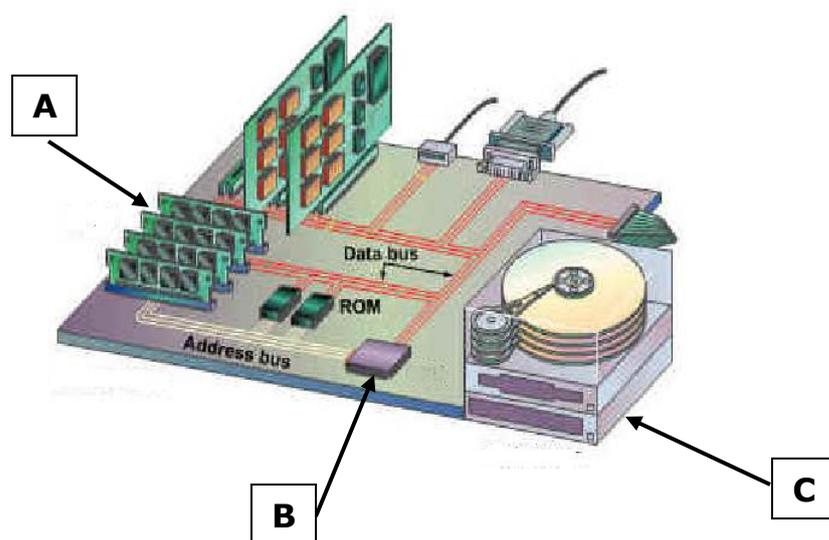


Section A

Question 1

- a. The motherboard is the main printed circuit found in microcomputers. It makes it possible for all the internal components such as the CPU, Disk Drives and RAM to communicate with each other. From the diagram below identify the components shown in bold according to the letter.



- A:** RAM [1]
B: CPU [1]
C: Disk drives [1]

- b. i. Fill in the missing term/s:

Data is entered in a digital device by means of Input devices. It is [½]
then processed by the Computer (CPU) and made available to the [½]
users as Information by means of Output devices. [½]

- ii. According to the definition in (i), what is the difference between **Data** and **Information**?

Data is raw (not processed). Information is processed data which is [½]
useful for the user.

Question 2

The main memory (MM) of computers is composed of the **RAM** and **ROM**.

State whether the following statements are **True** or **False**.

- i. The RAM is required to run programs: True [1]
- ii. When the power is switched off, the contents of the ROM will not change: True [1]
- iii. The RAM is non-volatile: False [1]
- iv. The RAM stores the bootstrap loader: False [1]
- v. The more RAM available the better the performance: True [1]

Question 3

"The Internet is becoming the town square for the global village of tomorrow."
(Bill Gates)



- a. What do you understand by the term **Internet**?

A type of network where digital devices can connect together worldwide.

[1]

- b. Websites are created using Hyper-text Markup Language (HTML). Name the application that converts HTML into a website.

Web browsers

[1]

- c. Write the appropriate term used for the following statements:

- i. When clicked on, this will link to other information or websites.

Hypertext/Hyperlink

[1]

- ii. This is used to find websites based on titles and keywords.

Search engine

[1]

- iii. This protocol is designed to transfer files over the Internet.

FTP

[1]

Question 4

Input devices are a vital component of a digital device.

The wearable system shown on the right is first synchronised with the eye retina so it can then be used as an input device to move the screen cursor according to the eye movement.



- a. For which of the following scenarios would the above wearable device be best suited?

- Individuals with physical impairment
 - Individuals with visual impairment
 - To improve the visual component of a game
- [1]

- b. Another specialised input device is the **braille** keyboard. Who can benefit from using this device? And why?

Visually impaired people because such a keyboard contains braille letters/characters embossed on the keys, thus making it possible for such individuals to use it.

[1]
[1]

- c. With regards to your answer in part (b), name a specialised software that can also be used.

Screen Magnification, screen readers, speech-to-text

[1]

[accept other relevant software]

- d. Students with dyslexia may have difficulties in reading, writing and spelling. Name **ONE** feature in a word processor which can help these students.

Spellchecker

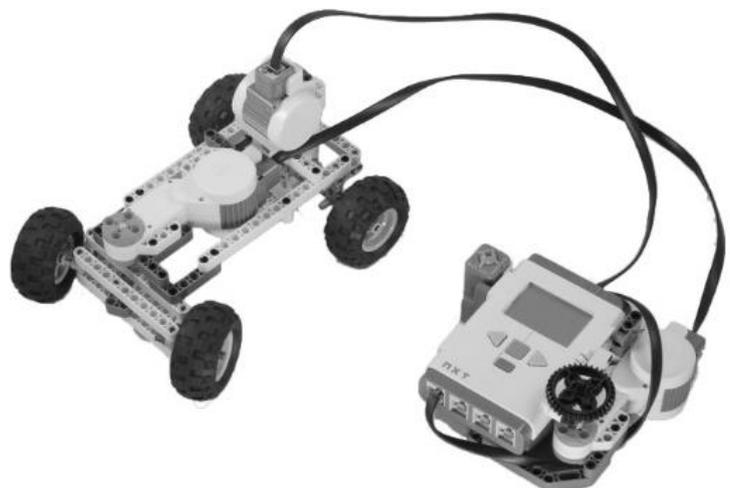
[1]

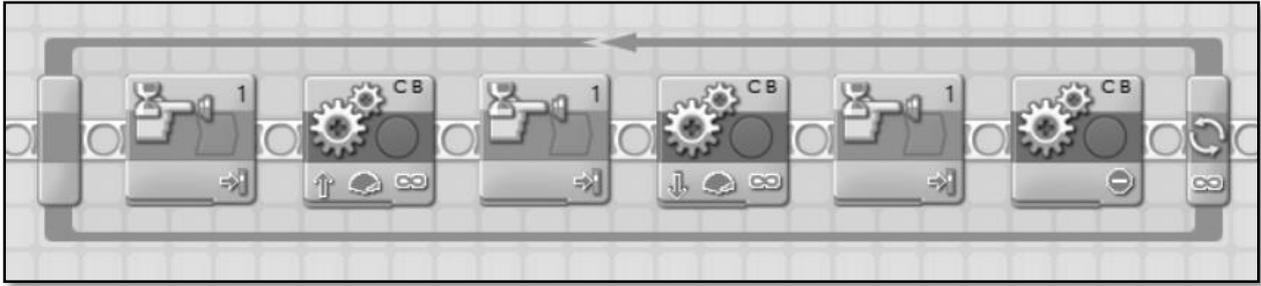
Question 5

This 4-wheeled car shown on the right turns its front wheels to the left and to the right like a real car.

It is controlled by a wired remote control which has:

- a steering wheel to control the steering,
- a touch sensor that makes the car go forward, in reverse or stop.





- a. The above program snippet is used to program our 4-wheeled car. To which ports are the touch sensor and the motors attached?

TOUCH SENSOR:	1	[1/2]
MOTORS:	B, C	[1/2]

- b. What is the duration time set for this program?

Infinite [1]

- c. What is the function of the above snippet?

The car alternates in moving forward, backwards and stops movement whenever the touch sensor is pressed. [accept relevant answers] [1]

- d. Which sensor can be used so that the car will stop moving forward if an obstacle is detected?

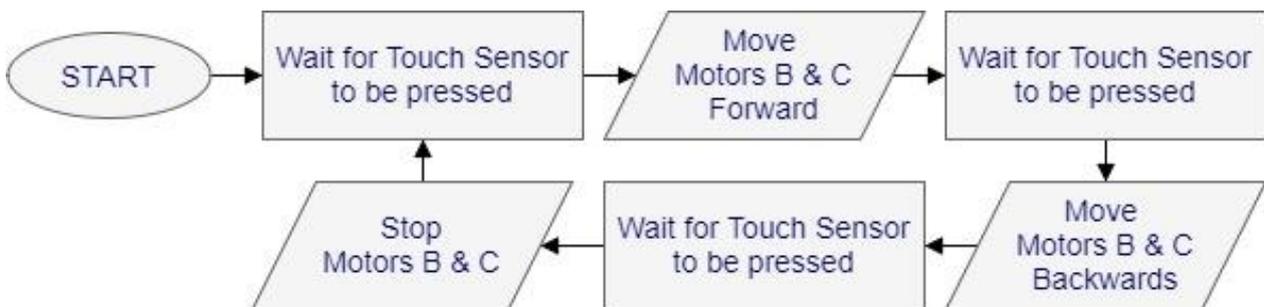
Ultrasonic sensor. [1]

- e. What programming concept should be added to the program snippet shown above so that the car will stop moving forward when an object is detected?

Switch OR Decision [1]

Question 6

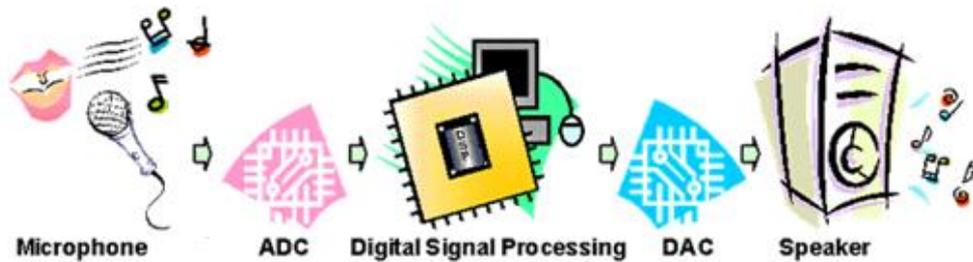
Draw a flowchart for the program snippet as shown in question 5 part (a)



[1/2 mark for START] [1/2 mark for each process]
 [1/2 mark for each motor output] [1/2 mark for proper data flow]
 [1/2 mark for mentioning the ports] [1/2 mark for not using END – indefinite loop]

Question 7

7. Marija wanted to create an **Audio Book** as part of a school project. She used a microphone to record her voice (**analogue data**). Afterwards, she used a sound editing application to edit her recordings prior to finalising her project. The entire process is simplified in the diagram below.



- a. What do you understand by Audio Book?

A book that contains voice recordings of its text that the user can listen to rather than read. [1]

- b. Name the input and output device used in the diagram.

Input: Microphone [½]

Output: Speaker [½]

- c. What do the acronyms **ADC** and **DAC** stand for?

ADC: Analogue to Digital Converter [½]

DAC: Digital to Analogue Converter [½]

- d. Explain why ADC and DAC are two very essential processes in this particular situation.

The analogue sound from the microphone needs to be digitised because the CPU only understands binary. It then needs to be converted back to analogue because a speaker is an analogue device. [1]

- e. Which component inside Marija's Laptop is used as an ADC/DAC for creating an Audio Book?

Component: Sound card [1]

Question 8

8. Ray Tomlinson was a pioneering American computer programmer known and credited as the inventor of email back in 1971. Nowadays, there are over 2.6 billion active users and over 4.6 billion email accounts in operation.

- a. Give two reasons why email is the most important and widely used communication medium on the Internet.

Reason 1: Reasonably cheap, Multiple copies

Reason 2: Speed [accept relevant answers] [1]

- b. Mention and briefly explain one precaution that every user should take when using emails.

Do not open attachments from unknown users, viruses

[Accept relevant answers]. [1]

- c. Generally, there is a limit in the size of the files that can be attached with an email. What **system software** can be used to send more than one file together as one attachment to minimize the file size as much as possible?

Software: Compression software [Accept Winzip]. [1]

- d. Initially, when Ray Tomlinson invented email, messages could only be sent to others who used the same computer. He then used the @ sign **to separate the user name from the name of the email server**. This is the idea behind the format of the email addresses as we know it today which permitted emails to be used worldwide.

By giving an example of an email address, briefly explain the sentence written in **bold**.

Address: Accept relevant answers. [1]

Explanation: Username is the name chosen by the user & email server is the name of the server containing the mailbox [1]

Question 10

- a. For the Malta Robotics Olympiad, the organizers decided to advertise the event by using posters printed on A4 size papers to distribute in schools and public places, as well as using billboards across Malta and Gozo. When developing the design of these adverts, the graphic designer noticed that the high resolution images used for the posters could not be used for the billboards. The reason being that the images could not be enlarged without losing quality.

- i. What **type** of images would be appropriate to use for an A4 size poster? **Explain.**
- ii. What **type** of images would you recommend for a billboard size advert design? **Explain.**

i. **Type:** Raster [½]

Explain: A raster image is made of pixels – a printer can be used to produce raster images. [½]

ii. **Type:** Vector [½]

Explain: Vector images are made of geometrical lines and curves (paths)– a plotter will be used to produce vector images. [½]

- b. The printer they used to print the A4 size posters has the following specifications:

- Resolution (Black): 600x600 dpi
- Resolution (Colour): 600x600 dpi
- Print Technology: Laser
- Processor Speed: 1200Mhz



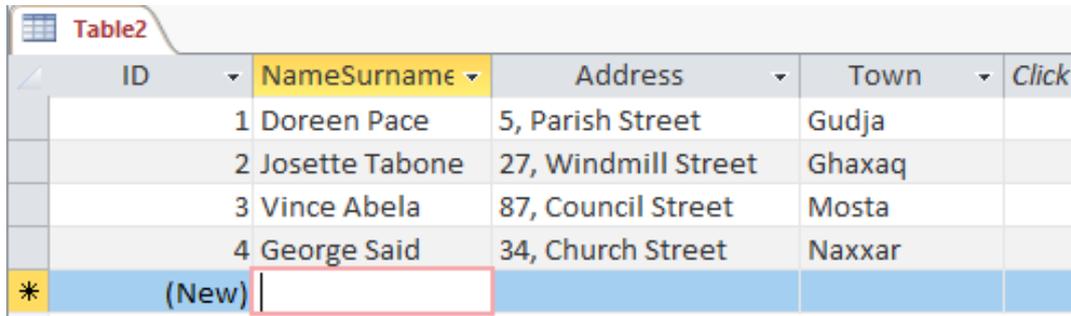
i. The processor speed of this printer is 1200MHz. What is the measure in GHz?
1.2GHz [1]

ii. The resolution of this printer is that of 600 x 600 dpi. What is meant by dpi?
The amount of dots per inch. [1]

iii. Define the term resolution in relation to printers.
Number of pixels, implying sharpness of image. [1]

Question 11

A car dealer holds information about the cars and clients in a Database (DB). The screenshot below is a sample of the clients' DB file (table) that the auto dealer uses.



ID	NameSurname	Address	Town	Click
1	Doreen Pace	5, Parish Street	Gudja	
2	Josette Tabone	27, Windmill Street	Ghaxaq	
3	Vince Abela	87, Council Street	Mosta	
4	George Said	34, Church Street	Naxxar	
*	(New)			

- a. Distinguish between **spreadsheets** and **databases**.

Spreadsheets are mainly used for calculations, while databases are used to store information for queries and reports. [1]

- b. From the diagram above give an example of a **field** and a **record**.

Field: NameSurname – or a relevant answer [½]

Record: 1, Doreen Pace – or a relevant answer [½]

- c. What is a **key field**?

Uniquely identifies a record. [1]

- d. How can a user sort the above file by **surname**?

By first dividing the NameSurname field in two fields i.e. Name and Surname, and then sort by surname. [1]

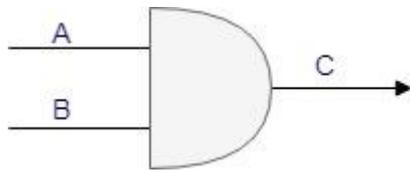
- e. The cars' and clients' files (tables) are related together. Why are **relational** databases important?

To avoid duplication of data. [1]

Section B

Question 12

- a. The symbol for the **AND** gate together with its truth table are shown below:

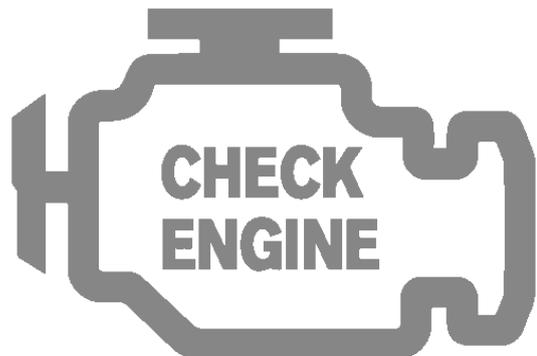


A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

In the space below draw the symbol and truth table for the **OR** and **NOT** gate.

<p style="text-align: center;">OR gate symbol</p>	<p style="text-align: center;">OR gate truth table</p> <table border="1" style="margin: auto;"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	A	B	C	0	0	0	0	1	1	1	0	1	1	1	1
A	B	C														
0	0	0														
0	1	1														
1	0	1														
1	1	1														
[2]																
<p style="text-align: center;">NOT gate symbol</p>	<p style="text-align: center;">NOT gate truth table</p> <table border="1" style="margin: auto;"> <thead> <tr> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> </tr> </tbody> </table>	A	B	0	1	1	0									
A	B															
0	1															
1	0															
[2]																

- b. Modern cars have a number of sensors to warn the driver of any malfunction. Two of these sensors are the Oxygen Sensor (**O2**) which measures how much fuel is the engine burning and the Mass Flow Sensor (**Mf**) which measures the amount of air that enters the engine to determine how much fuel is needed to run the engine efficiently.



A Check-Engine Light (**CeL**) is displayed on the dashboard (CeL=1) if:

1. **ANY ONE** of the above-mentioned sensors is faulty (O2=1) (Mf=1)
2. The engine is switched on (E = 1)

- i. Draw the Logic Circuit for the Check-Engine Light
- ii. Justify your answer by drawing the Truth Table

i. *Space for logic circuit*

[3]

ii. *Space for truth table*

O2	Mf	E	CEL
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

[4]

- c. When the Check-Engine Light is displayed, it is recommended that the driver goes to a mechanic as soon as possible to avoid further engine damage. The mechanic plugs a diagnostic device to the car's CPU, called the Electronic Control Unit (ECU), to check for any error messages. In this situation the diagnostic device can either display **ERR_6B** or **ERR_D3**; where 6B and D3 are hexadecimal values.

The technical section on the car's manual indicates that error with value 211_{10} indicates a faulty O2 sensor.

- i. According to the above HEX codes that could be generated by the diagnostic device, which error message indicates a faulty O2 sensor? Show how you arrived to your answer (working).
- ii. Hence, what would be the error value in decimal of a faulty Mf sensor? Show how you arrived to your answer (working).

i. **Answer:** ERR_D3 - with working [2]

ii. **Answer:** 107₁₀ - with working [2]

Question 13

The local council of Nadur, in Gozo, decided to allow locals to borrow books from the library for free. Therefore, the current Lending System software needed an update to be able to better manage the increase in the daily transactions. After analysing the situation, it was decided that three essential files/tables are required. One of these tables is called the 'Members' table and includes the following fields:



- Member ID
- Name
- Surname
- Date of Birth
- Address
- Contact Number
- Email

- a. List the other two tables that are required for the system to work efficiently. Also, state the primary key to be used for each table.

Table 1:	<i>Books -> ISBN</i>	
	<i>[½ mark for table & ½ mark for field]</i>	[1]
Table 2:	<i>Loans -> Transaction Num ...accept relevant answers</i>	
	<i>[½ mark for table & ½ mark for field]</i>	[1]

It was also decided that a number of functions are required to facilitate the librarian's work. Three of these functions are:

- 'Add a new member' function which allows the librarian to enter the necessary members' details.
- 'List of active members' function which generates a list of all members including their details and counts the total number of active members.
- 'Overdue Books' function which generates a list of members who have overdue books.

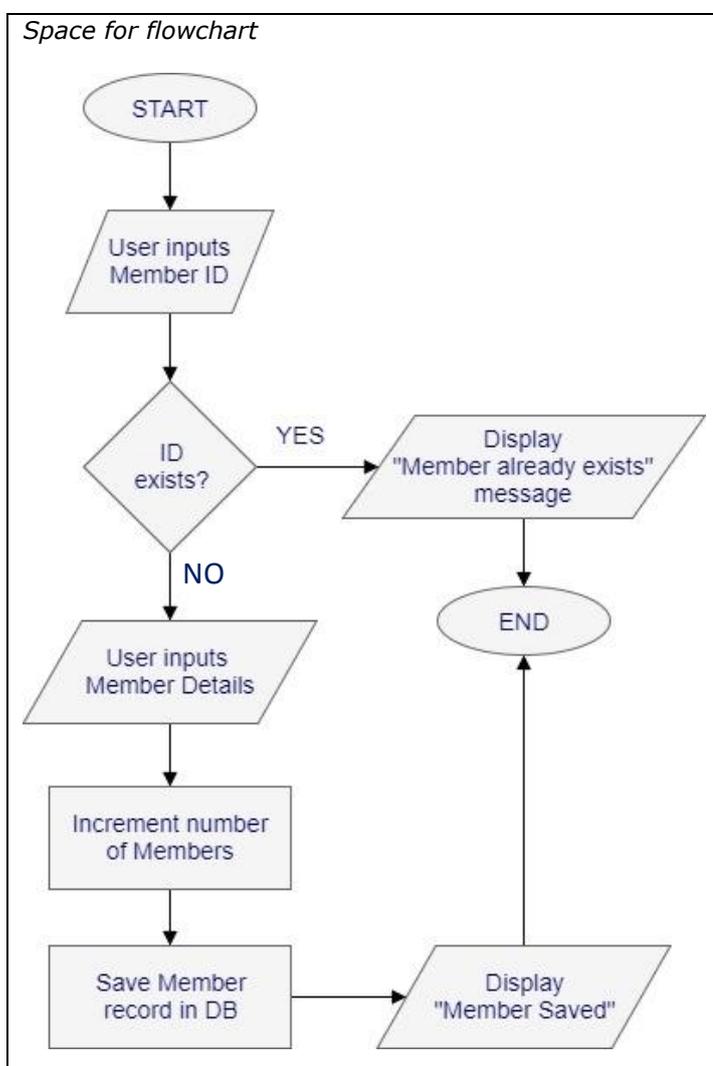
- b. List any other 2 functions that you think will further facilitate the librarian's work.

Function 1:	<i>Accept relevant answers</i>	[1]
Function 2:	<i>Accept relevant answers</i>	[1]

c. The function 'Add a new Member' works as follows:

- The librarian inputs the member's ID
- The system checks whether the ID is already in the system or not
- If it already exists, it displays 'Member already exists' message
- If the ID is not already in the system
 - it allows the librarian to enter the rest of the member's details,
 - increments the number of members by 1,
 - saves details of new record in database, and
 - displays 'Member Saved' message
- Ends the 'Add a new Member' function

i. Draw the flowchart for this scenario.



[½ mark for START]
 [½ mark for END]
 [1 mark for proper decision]
 [½ mark for proper YES/NO]
 [1 mark for each input]
 [1 mark for each output]
 [1 mark for each process]
 [½ mark for proper data flow]

[9 marks in all]

ii. Besides flowcharts, name **two** other methods that can be used to describe a system.

Method 1: *Structure Diagrams*

Method 2: *Pseudo-code*

[2]