



**L-Università
ta' Malta**

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

**SECONDARY EDUCATION CERTIFICATE LEVEL
2026 MAIN SESSION**

SUBJECT: **Computing**
 PAPER NUMBER: I – Level 1-2-3
 DATE: 29th May 2026
 DURATION: 2 hours 5 minutes

Directions to Candidates

Write your index number were indicated at the top of the page.

Answer questions of Section A in the spaces provided. You are **not** allowed to use extra sheets other than those provided in this booklet.

The answer of Section B must be coded using Thonny IDE.

The answer of Section B must be printed according to the instructions provided at the end of the examination paper.

Good English and orderly presentation are important.

The use of flowchart templates is permitted.

The use of calculators is **not** permitted.

This paper carries 100 marks.

Question Number	1	2	FOR MARKERS' USE
For Markers' use only	Total number of marks obtained by candidate		
MARKS			

SECTION A

In a school science lab, students often carry science equipment, making it difficult to open doors by hand. To improve safety and convenience, an automatic door is used.

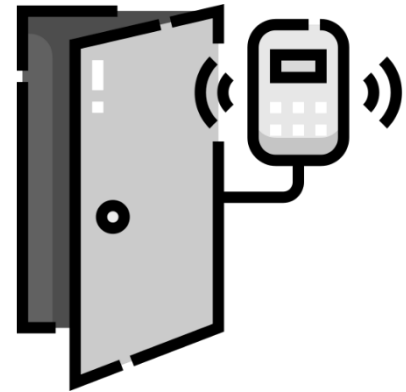
The door is controlled by an Arduino and a photocell sensor placed near the doorway. When a student stands in front of the door, the light level changes and the sensor is triggered.

The system works as follows:

- When the door is closed, the RED LED is ON
- When the sensor is triggered, the Arduino:
 - o opens the door using a servo motor
 - o switches OFF the RED LED
 - o switches ON the GREEN LED
- After 5 seconds, the Arduino closes the door again, and
 - o the GREEN LED turns OFF
 - o the RED LED turns ON

This creates a simple system where:

- When door is closed → system waits for the sensor
- When sensor is triggered → door opens → waits 5 seconds → door closes



(Source: www.flaticon.com)

Analyse the circuit (Figure 1), and the code. Then answer the questions that follow:

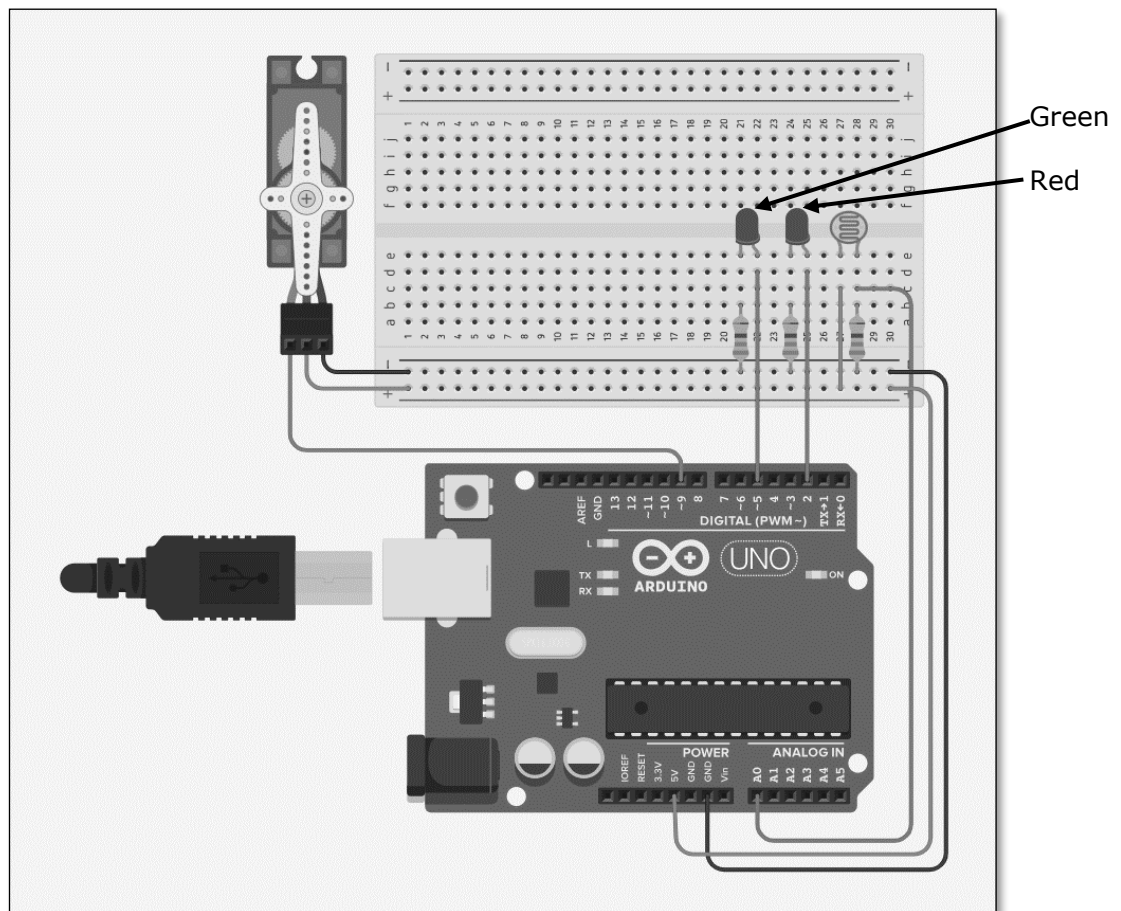


Figure 1

Code

```

Line 1:  #include <Servo.h>
Line 2:  //Defining components' pins
Line 3:  int LDR_PIN = _____; // Photocell pin
Line 4:  int RED_LED = 2; // Red LED pin
Line 5:  int GREEN_LED = _____; // Green LED pin
Line 6:  int SERVO_PIN = 9; // Servo control pin
Line 7:
Line 8:  int DOOR_CLOSED_ANGLE = 0;
Line 9:  int DOOR_OPEN_ANGLE = 90;
Line 10: int lightThreshold = 300;
Line 11: _____ detected = false;
Line 12: Servo doorServo;
Line 13:
Line 14: void setup() {
Line 15:     doorServo. _____ (SERVO_PIN);
Line 16:     pinMode(_____);
Line 17:     pinMode(GREEN_LED, INPUT);
Line 18:     doorServo.write(DOOR_CLOSED_ANGLE);
Line 19:     digitalWrite(RED_LED, HIGH);
Line 20:     digitalWrite(GREEN_LED, LOW);
Line 21:     Serial.begin(9600);
Line 22: }
Line 23:
Line 24: void loop {
Line 25:     // Read the LDR value (0 to 1023)
Line 26:     int sensorValue = _____ (LDR_PIN);
Line 27:     Serial.print("LDR value: ");
Line 28:     Serial.println(sensorValue);
Line 29:     if (sensorValue < lightThreshold) {
Line 30:         doorServo. _____ (DOOR_OPEN_ANGLE);
Line 31:         digitalWrite(_____);
Line 32:         digitalWrite(_____);
Line 33:         detected = _____;
Line 34:         delay(5000);
Line 35:         doorServo.write(DOOR_CLOSED_ANGLE);
Line 36:         digitalWrite(RED_LED, HIGH);
Line 37:         digitalWrite(GREEN_LED, LOW);
Line 38:         detected = false;
Line 39:     }
Line 40: }

```

This question continues on the next page.

a. Complete the code of the following lines:

- i. Line 3: _____ (1)
- ii. Line 5: _____ (1)
- iii. Line 11: _____ (1)
- iv. Line 15: _____ (1)
- v. Line 16: _____ (1)
- vi. Line 26: _____ (1)
- vii. Line 30: _____ (1)
- viii. Line 31: _____ (1)
- ix. Line 32: _____ (1)
- x. Line 33: _____ (1)

b. Give the line number of **ONE** example of each of the following constructs:

- i. Condition: _____ (1)
- ii. Input: _____ (1)
- iii. Library import: _____ (1)
- iv. Variable initialisation: _____ (1)

c. Determine whether the photocell is attached to a suitable pin. Justify your answer.

_____ (2)

d. List **TWO** programming practices, which help improve code efficiency and/or readability.

_____ (2)

e. The automated door would still work if Lines 27 and 28 are removed. Explain.

_____ (1)

f. Suggest **ONE** reason why Lines 27 and 28 could be useful.

_____ (1)

g. This program has a syntax error.

i. Identify the line where there is a syntax error. _____ (1)

ii. Write its appropriate modification. _____ (1)

h. This program has a logical error.

i. Identify the line where there is a logical error. _____ (1)

ii. Write its appropriate modification. _____ (1)

To make the system more accessible for users with hearing impairments, a buzzer is added.

- When door opens, the buzzer makes FIVE short beeps.
- When door closes, the buzzer makes ONE longer beep.

The flowchart below (Figure 2) shows part of the algorithm once the buzzer has been added.

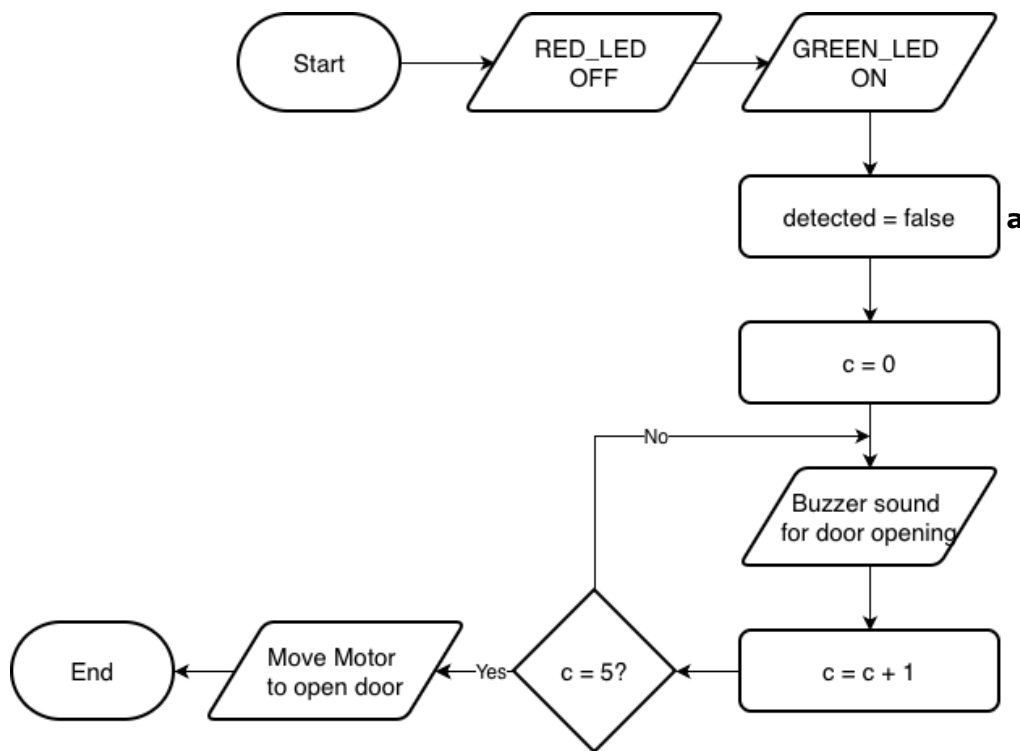


Figure 2

i. Tick **TWO** statements that define a process in a flowchart.

(2)

☐	A branching instruction.
☐	An instruction that changes the state of variables or data.
☐	An instruction that causes a part of an algorithm to loop.
☐	An instruction that can perform an arithmetic operation.

This question continues on the next page.

j. Label the following on the flowchart in Figure 2 (The first one has been done as an example):

Example: Label (a) an instruction that assigns a value to a Boolean variable.

- i. Label (i) **ONE** output instruction on the above flowchart. (1)
- ii. Label (ii) a process instruction on the above flowchart. (1)
- iii. Label (iii) a decision instruction on the above flowchart. (1)
- iv. Label (iv) a terminator on the above flowchart (1)

k. Is the flowchart in Figure 2 representing the moment when the door is opened or when it is closed? Explain why.

(2)

l. A potentiometer (POT_PIN) has been added to control how long the door stays open. The potentiometer can be turned to adjust the door opening time from 5 to 60 seconds. (Figure 3). If the door is set to open for less than 20 seconds, an alarm will alert the user that the door will only remain open for a short time before opening the door.

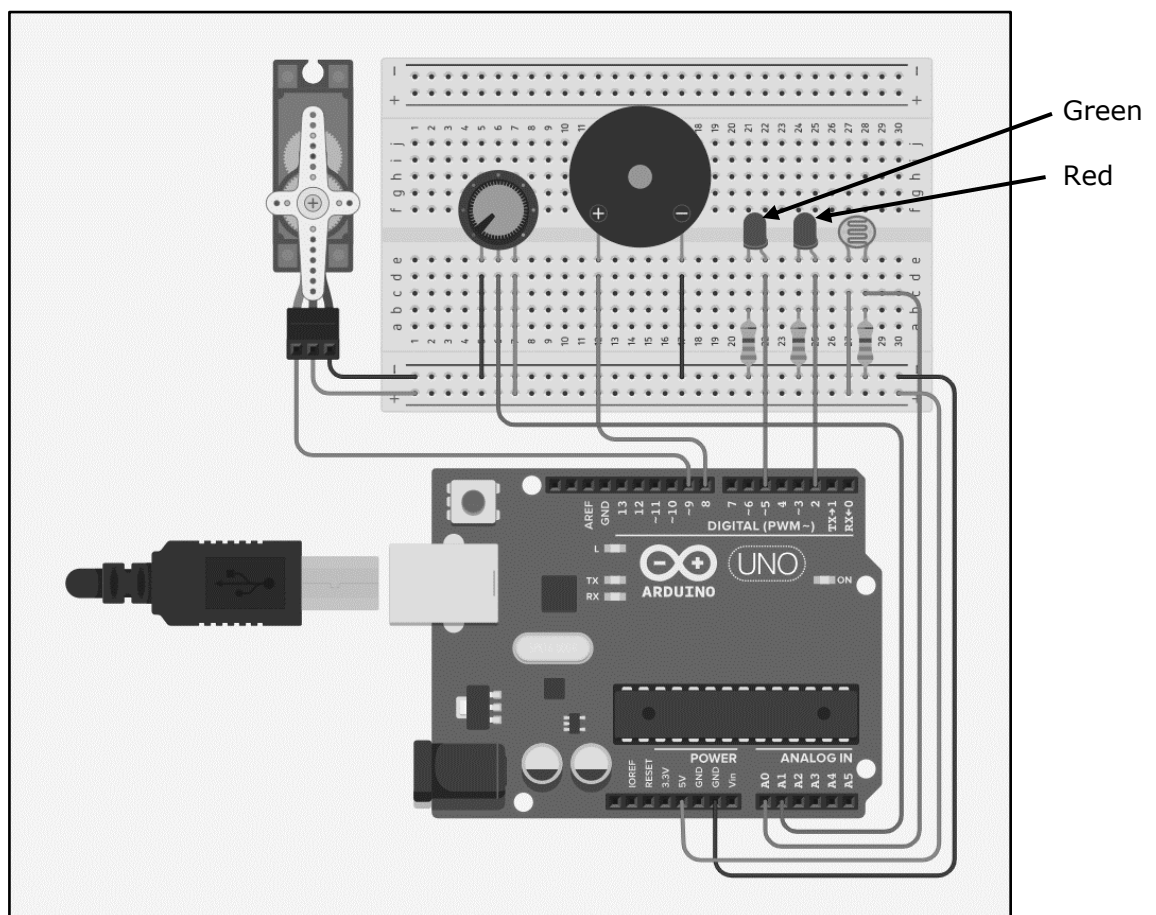


Figure 3

The following code shows the modification in the loop() function.

Line 24:	void loop() {
Line 25:	int sensorValue = analogRead(LDR_PIN);
Line 26:	int potValue = _____;
Line 27:	
Line 28:	Serial.print("LDR value: ");
Line 29:	Serial.println(sensorValue);
Line 30:	
Line 31:	if (sensorValue < lightThreshold) {
Line 32:	int openTime = map(potValue, 0, 1023, __, __);
Line 33:	if (openTime < 20000){
Line 34:	for (_____) {
Line 35:	digitalWrite(RED_LED, HIGH);
Line 36:	tone(BUZZER_PIN, 3000);
Line 37:	delay(200);
Line 38:	digitalWrite(RED_LED, LOW);
Line 39:	noTone(BUZZER_PIN);
Line 40:	delay(200);
Line 41:	}
Line 42:	}
Line 43:	}

- i. Rewrite Line 26 such that `potValue` holds the potentiometer reading.

_____ (1)

- ii. Rewrite Line 32 to fill in the **TWO** missing values.

_____ (2)

- iii. Considering that the Arduino's ADC resolution is 10 bits, explain whether the variable `openTime` can have the value 1024 or not.

_____ (1)

This question continues on the next page.

-
- iv. Tick the **TWO** statements that define a loop. (2)

☐	A loop involves a number of instructions executed repeatedly.
☐	No loop may execute repeatedly forever.
☐	A loop may be repeated until an-end condition is met.
☐	A loop is a branching instruction.

- v. Complete Line 34 such that lines 35 to 40 loop 5 times.

(2)

- vi. Tick the correct statement/s. (2)

☐	The for statement at Line 34 will always be executed if the if statement at Line 31 is satisfied.
☐	The for statement at Line 34 will always be executed if the if statement at Line 33 is satisfied.
☐	The for statement at Line 34 may be executed if the if statement at Line 31 is satisfied (subject to the statement at Line 33).
☐	The for statement at Line 34 will be executed if the if statements at Line 31 and Line 33 are both satisfied.

- vii. Briefly explain how the system alerts the user that the door will only be open for a short time in the code snippet on Page 7.

(2)

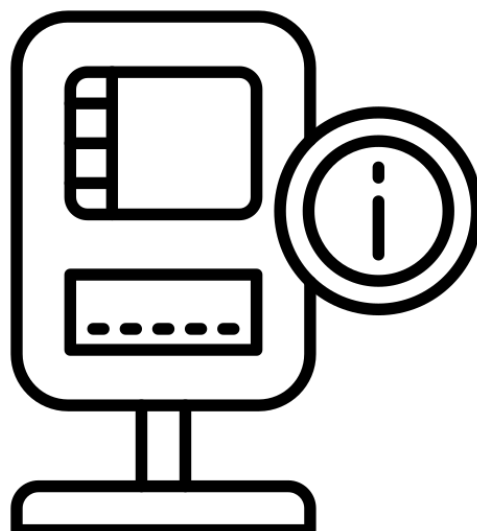
SECTION B

A local pizza shop wants to introduce a self-service ordering system installed on the various kiosk displays available in the shop.

Before developing the full graphical system, a simple text-based prototype will be created to test how the ordering system works. The prototype will run in a console window and will use keyboard input.

The program should allow a customer to:

- view the pizza and drinks menu;
- choose one or more pizzas and drinks;
- receive a receipt showing the subtotal, VAT and the final amount to pay.



(Source: www.flaticon.com)

The system should also:

- inform the customer if they qualify for free delivery on their next order when the total reaches €20.00 or more;
- apply a 5% discount when 3 or more pizzas are ordered.

For this task:

Create a folder on the desktop. It should be named **Index Number** (e.g. 99999). All work for this program must be saved in this project folder.

Use Thonny IDE to write a Python program simulating this pizza ordering system, with the following specifications:

Code Functionality

- Your script should use the appropriate data structure/s to handle a menu including: (4)
 - the following list of pizzas and their corresponding prices:
Margherita – 5.50, Pepperoni – 6.75, Vegetariana – 6.00, Funghi – 6.50, Capricciosa – 8.60
 - the following list of beverages and their corresponding prices:
Water – 0.85, Juice – 1.50, Coke – 2.00
- When the script is run, it should display the screen below (Figure 4), including:
 - The menu options and their respective prices (2)
(Prices are to be displayed in Euros, formatted to 2 decimal places)

This question continues on the next page.

ii. The following information: (2)

- the name of the pizza shop, 'Pizza on Wheels'.
- a message explaining that the user can select pizzas and beverages by their corresponding menu number.
- a message stating that the user can finalise order by typing 'q' or 'Q'.
- a message explaining special offers:

`Special Offers!

Free delivery for orders with a minimum total of €20.00.

Orders of three (3) or more pizzas get a 5% discount.'

PIZZA ON WHEELS

Select your pizzas and beverages by typing their menu number
Type 'q' or 'Q' to finalise order

1. Margherita	: €5.50
2. Pepperoni	: €6.75
3. Vegetariana	: €6.00
4. Funghi	: €6.50
5. Capricciosa	: €8.60
6. Water	: €0.85
7. Juice	: €1.50
8. Coke	: €2.00

Special Offers!

Free delivery on next order when spending €20 or more.
Orders of three (3) or more pizzas get a 5% discount.

Select item number (or 'q' to quit): -> |

Figure 4

- c. The program prompts the user to select an item.
- i. The customer can select as many items as needed by their corresponding number. (8)
 - ii. Each valid item selected is added to the customer's order. (2)
 - iii. The customer can finish the order and proceed to checkout by inputting the letter 'q' (case-insensitive) (2)
- d. At checkout the system should display a receipt (see Figure 5) that includes:
- i. A list of all valid items in the order and their price. (2)
 - ii. The subtotal (the cost of all items in the order). (2)
 - iii. A discount if the order qualifies for it. (2)
 - iv. A free delivery if the total (after discount) amounts to €20.00 or more. (2)
 - v. The VAT to be paid at a rate of 18%. (2)

- vi. The total including the VAT. (2)
- vii. Display all values using a two decimal places format. (1)

RECEIPT	

Item	Price

Margherita	€ 5.50
Vegetariana	€ 6.00
Capricciosa	€ 8.60
Water	€ 0.85
Juice	€ 1.50

Subotal	€22.45
Discount	€ 1.12
Discounted Total	€21.33
VAT due	€ 3.84
Total inc VAT	€25.17
Free Delivery on your next order!	

Figure 5

Validation Checks

- e. The program should handle invalid input by displaying an appropriate error message as follows.
- If the user enters a value that does not match any option in the menu, the program should display an 'Invalid Option' error message. (2)
 - The program should allow the user to proceed to check out by entering the special value 'q', in either uppercase or lowercase. (2)
 - For every invalid input, the program should prompt the user to enter a valid choice again without affecting the subtotal. (2)

This question continues on the next page.

Code Quality

f. The code should be modular and include the following user-defined functions:

show_menu() (2)

Parameters: None

Returns: None

Description: Displays the menu and special offers for the customer.

place_order() (2)

Parameters: None

Returns: pizzas_bought

Description: Collects user selections, validates input, and returns chosen items, prices, and pizza count.

print_receipt(pizzas_bought) (2)

Parameters: pizzas_bought

Returns: None

Description: Prints receipt with subtotal, discounts, VAT, and free delivery message.

main() (2)

Parameters: None

Returns: None

Description: Calls show_menu(), place_order(), and print_receipt() in sequence to run the program.

g. Use of meaningful variable names. (2)

h. Use of proper inline comments. (2)

i. User-friendly interface:

- Proper formatting of menu screen and receipt showing two columns: numbered items and prices. (2)

- All Euro values formatted correct to two decimal places. (1)

j. The program should run without syntax errors. (1)

k. Save the program as SEC2026_OrderingSystem.py in the folder that you have previously created on the desktop. (1)

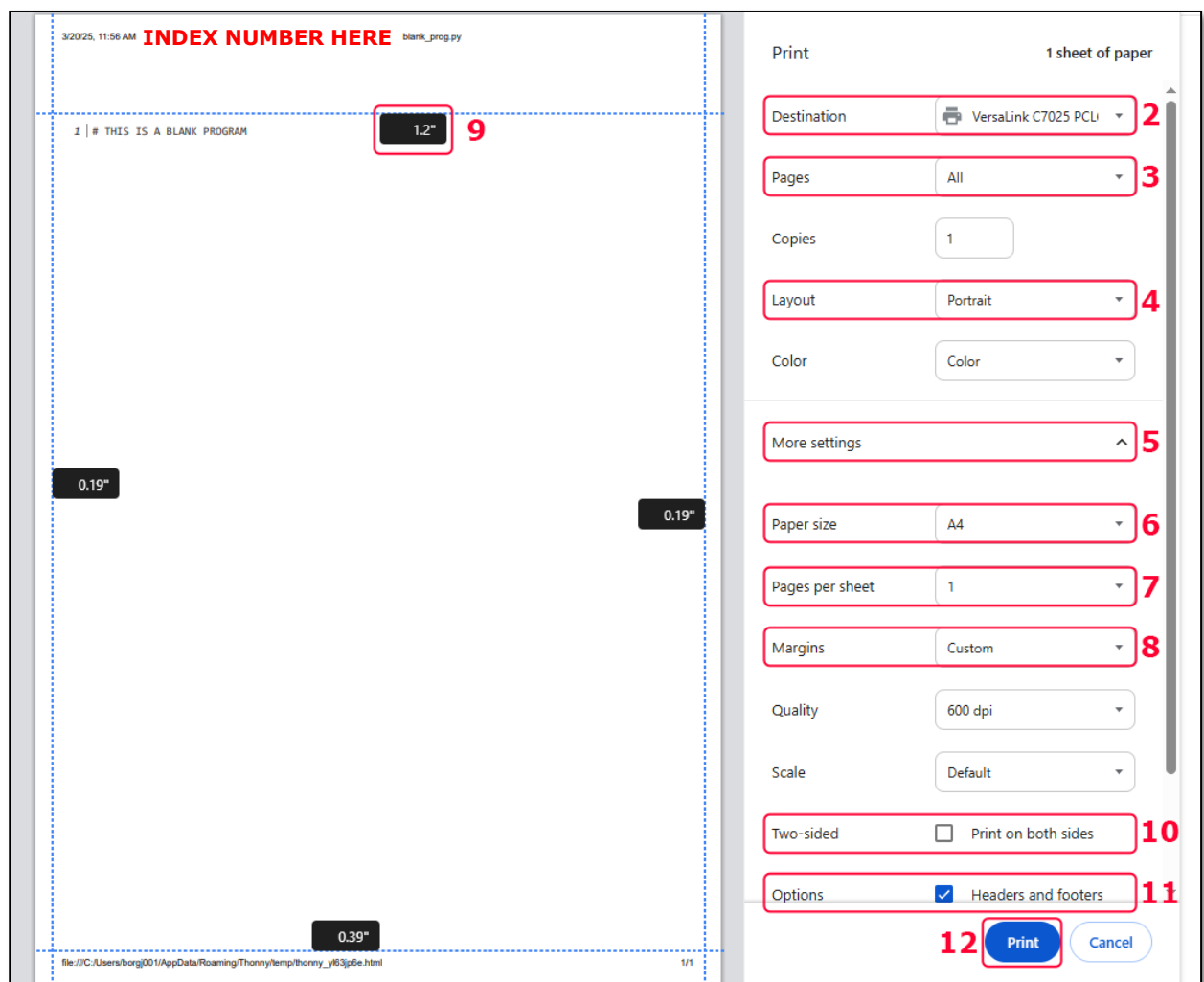
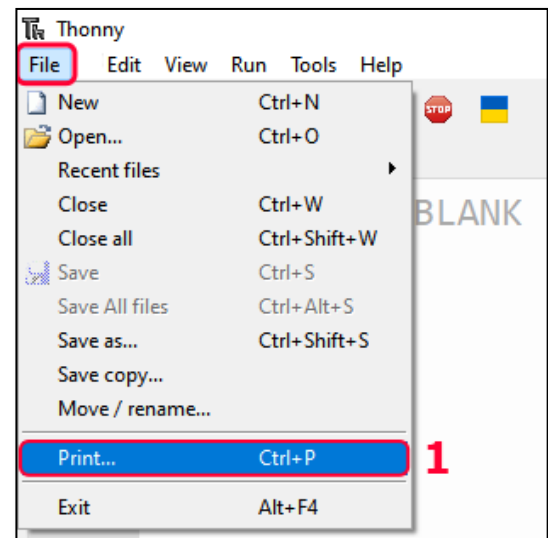
Follow instructions to

print the source code

in the next page.

Printing Instruction:

1. From the File main menu option choose Print...
2. Select the printer that will be used in the 'Destination' option.
3. Make sure to select All pages.
4. Make sure that the layout is set to Portrait.
5. Expand the More Settings section.
6. Make sure that the Paper size is A4.
7. Make sure that the 'Pages per sheet' option is set to 1.
8. Choose Custom Margin.
9. Change top margin to 1.2"
10. Untick the 'Print both sides' option.
11. Enable the 'Headers and Footers' option.
12. Press the Print button.
13. After printing, write down the Index Number in the header next to the Date and Time.



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MARKS								

SECTION A

1. Luma Fork is a restaurant chain with outlets across the country. Each outlet is connected to the company's head office network.

a. List **TWO** hardware network components.

i. _____ ii. _____ (2)

b. Each outlet has its own Local Area Network (LAN) and is then connected to a Wide Area Network (WAN). Define these **TWO** types of networks.

i. LAN _____

(1)

ii. WAN _____

(1)

c. Recommend a type of network used for communication between an outlet and the head office.

(1)

d. Each outlet has smart TVs connected to the local network displaying order updates. Each Smart TV has an IP address and a MAC address. Distinguish between these two types of addresses.

(1)

e. Luma Fork uses various system and application software. Distinguish between these two types of software.

(1)

f. Explain the need of an Operating System (OS) in:
i. Input and Output Management

(1)

ii. File Management

(1)

g. Software requires a license to be used. Define the concept of a software license.

(1)

(Total: 10 marks)

2. A video-game console shop uses a stock control system to record product names, stock quantities, re-order levels, and customer order details. The system processes this data to produce low-stock warnings, re-order reports, and stock availability for customers.

a. When comparing how well consoles run games, a key factor is the amount of RAM they have. Define RAM.

(1)

b. List **TWO** peripheral devices you expect to find used on this computer system.

i. _____ ii. _____ (2)

c. Define data.

(1)

d. Define information.

(1)

e. Give **ONE** example of data from this scenario.

(1)

f. Give **ONE** example of information from this scenario.

(1)

g. The shop owners need software to keep track of stock levels and customer orders. They have the option of either tailor-made or off-the-shelf software.

i. List **ONE** advantage of tailor-made software.

(1)

ii. List **ONE** advantage of off-the-shelf software.

(1)

(Total: 9 marks)

3. A design team is producing a movie poster for online distribution using a graphics-editing software. Two of the colours selected are #3A4523 and #123456.

a. Name **ONE** reason why hexadecimal is commonly used to represent colour codes.

(1)

This question continues on the next page.

- b. The finished poster and accompanying text description will be used across different devices and OSs. Therefore, a standard character encoding system is required for the text. Define standard character encoding systems.

(1)

- c. The poster is stored as very high-resolution image, making it quite a large file. Explain how virtual memory can help a computer system handle such large files.

(1)

- d. The finished poster will be stored using either a Solid-State Drive (SSD) or cloud storage. Provide **ONE** advantage for each storage option.

- i. Provide **ONE** advantage for SSD.

(1)

- ii. Provide **ONE** advantage for cloud storage.

(1)

- iii. Provide **ONE** possible shortcoming of cloud storage.

(1)

- e. The CPU processes images, text, and numbers as binary data.

- i. Represent the value 50_{10} as it would be stored in an 8-bit CPU register.

(1)

--

- ii. Represent the value obtained after the CPU adds $0010\ 1100_2$ and $1001\ 1001_2$ as it would be stored in an 8-bit CPU register.

(1)

--

- iii. Represent the value obtained from a subtract operation of 00000101 from 00111000 as it would be stored in an 8-bit CPU register.

(2)

--

(Total: 10 marks)

4. A smartwatch uses a System on a Chip (SoC) that includes a processor, among other components. Two key components of a processor are the Control Unit (CU) and the Arithmetic Logic Unit (ALU).

a. Describe the role of the CU.

(1)

b. Describe the role of the ALU.

(1)

- c. The various components of the processor are interconnected through the system bus. List the **THREE** buses that makeup the system bus.

i. _____ ii. _____ iii. _____ (3)

- d. The smartwatch's CPU uses machine instructions, which can be represented in assembly code such as the instruction `ADD R1, R3, R2`.

i. Identify the opcode and the operand/s of this instruction.

Opcode _____ Operand(s) _____ (2)

ii. Identify whether Assembly Language is a Low-Level or a High-Level Language.

(1)

iii. Give **TWO** differences to distinguish between a Low-Level and a High-Level Language.

Difference 1: _____

Difference 2: _____ (2)

- e. The smartwatch executes millions of instructions per second, each one going through the Fetch and Execute Cycle. Define the Fetch and Execute Cycle.

(1)

(Total: 11 marks)

SECTION B

5. E-Drive Motors is a company that designs electric cars. Electric cars have several embedded digital systems to make driving safer and more efficient. This includes a digital dashboard that shows information about the car, such as the battery condition and other important data.

a. One of the first steps involves designing the algorithm for this system. What is an algorithm?

(1)

This question continues on the next page.

- b. Developers can represent an algorithm using either a flowchart or pseudocode. Distinguish between the two by highlighting a strength of each.

_____ (2)

When charging the electric car, a safety mechanism evaluates key conditions to either permit or stop the charging process. The charging process can occur only if **all** of the following conditions are true:

- The temperature is within the safe range;
- The voltage is within the safe range;
- The battery is not fully charged.

Below is the pseudocode showing how this safety mechanism will work:

Line 1	SET MIN_TEMPERATURE ← 15
Line 2	SET MAX_TEMPERATURE ← 35
Line 3	SET MIN_VOLTAGE ← 400
Line 4	SET MAX_VOLTAGE ← 800
Line 5	
Line 6	_____
Line 7	OUTPUT "Battery voltage: ", voltage, "V"
Line 8	
Line 9	IF _____
Line 10	OUTPUT "Charging stopped: Temperature not safe."
Line 11	ELSE IF voltage < MIN_VOLTAGE OR voltage > MAX_VOLTAGE
Line 12	OUTPUT "Charging stopped: Voltage not safe."
Line 13	ELSE IF fullyCharged = TRUE
Line 14	OUTPUT _____
Line 15	ELSE
Line 16	OUTPUT "Charging"

- c. The above pseudocode makes use of selection statements. Define selection statement.

_____ (1)

- d. The above pseudocode needs to be iterated (repeated) to achieve its goal. Define iteration statement.

_____ (1)

- e. Write the missing statement or part statements:

i. Line 6: _____ (1)

ii. Line 9: _____ (1)

iii. Line 14: _____ (1)

f. During testing, an overheating temperature sensor triggered the system to crash. Identify the type of error occurring here. _____ (1)

g. Once the design gets approval, E-Drive Motors needs to decide whether to use 'off the-shelf' or 'tailor-made' software for its monitoring dashboard. Define these **TWO** terms.

Off the Shelf: _____
 _____ (1)

Tailor Made: _____
 _____ (1)

h. The developers will implement a software-as-a-service (SaaS) model for their software. Define SaaS.

 _____ (1)

As outlined above, charging can occur only if **all** of the following conditions are true:

- The temperature (T) is within the safe range (1);
- The voltage (V) is within the safe range (1);
- The battery is not fully charged (F) (0);
- Then charging (C) can occur (1).

i. Logic gates can form a logic circuit to provide a specific output. Define logic gates.

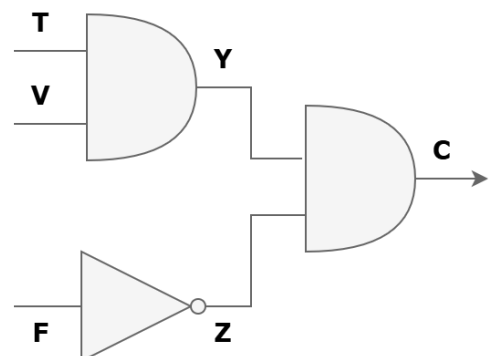
 _____ (1)

j. The circuit representing this safety mechanism is shown on the right.

i. Express its Boolean Expression.
 _____ (1)

ii. Now complete the truth table below to match the logic circuit. (3)

T	V	F	Y	Z	C
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			



This question continues on the next page.

iii. Explain why the logic circuit can be redesigned using NAND gates only.

(2)

(Total: 19 marks)

6. Staying Comfort Group is a hotel chain that offers a pay-per-use room service. When a room status changes from "free" to "occupied", a fixed charge for food and bedding is added automatically but the cost of water and electricity depends on how much the guest uses.

The use of water and electricity in each room is measured by IoT devices, and the readings are stored in a networked database that manages guest details, utility usage, and payments.

a. Define database.

(1)

b. The tables guest, room and reservation shown below are part of this hotel's database.

guest	room	reservation
guest_id	room_number	reservation_id
name	room_type	booked_by_guest_id
surname	floor	room_number
id_card	current_status	electricity_consumption
mobile_number	price_per_night	water_consumption
		arrival_date
		departure_date

Recommend field types for the fields:

i. id_card: _____

ii. current_status: _____

iii. electricity_consumption: _____

iv. departure_date: _____ (2)

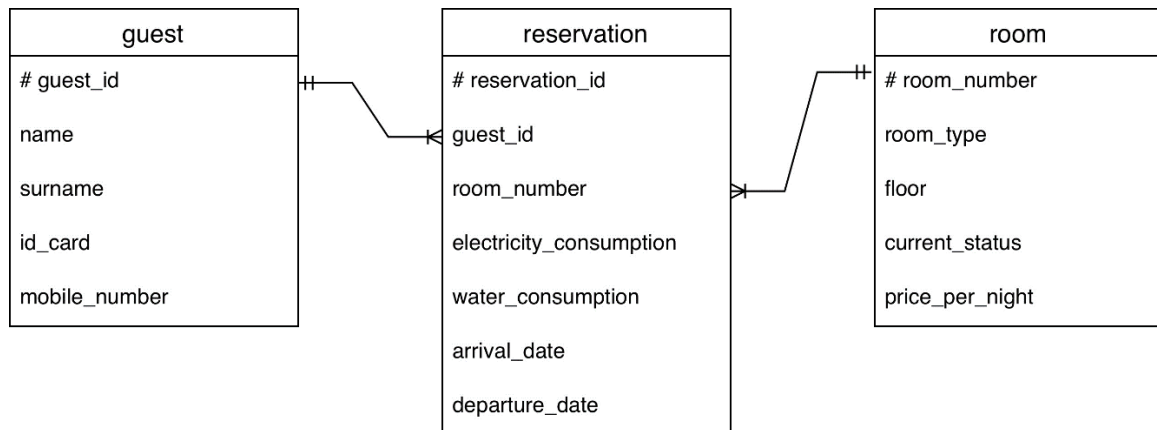
c. Data validation needs to be applied to these fields. Define data validation.

(1)

d. Explain why it is important to have correct data validation in place.

(1)

- e. Below is an ERD diagram that describes the relationship between these three tables as well as indicating the primary key in each table.



- i. Identify the primary key in the guest table. _____ (1)
- ii. Identify the primary key in the room table. _____ (1)
- iii. Identify the type of relationship between the reservation and the guest table.

_____ (1)

- f. A 4th-Generation language, such as SQL, allows users to write queries to access database data.

- i. Define a query.

 _____ (1)

- ii. Briefly describe the result of the following SQL statement.

```

SELECT booked_by_guest_id, room_number, electricity_consumption
FROM reservation
WHERE arrival_date > '2025-08-01'
ORDER BY electricity_consumption
  
```


 _____ (3)

- iii. Name **TWO** ways in which SQL differs from a High-Level Language.

 _____ (2)

- g. Devices on Staying Comfort Group's premises are networked. Define network.

 _____ (1)

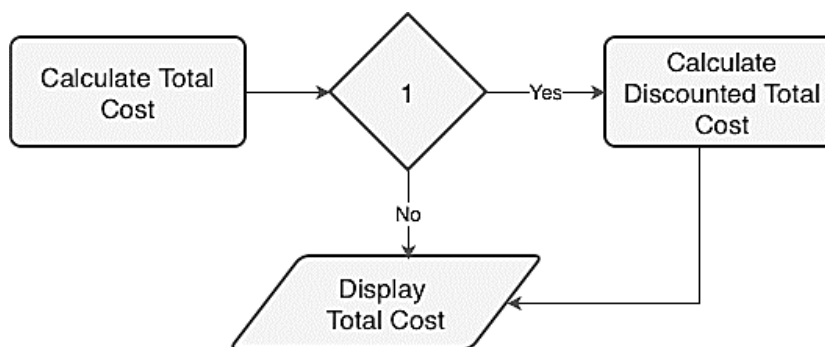
- h. Data collected from the Internet of Things (IoT) devices in each room is transmitted to the database for collection. Describe the concept of the IoT.

(1)

- i. Explain why each IoT device must be uniquely identified on this network.

(1)

- j. The incomplete flowchart below is representing an algorithm that gives a 10% discount to those clients that consumed less than €10 in water and electricity on average per night.



- i. Identify the type of construct represented by the symbol marked '1'.

(1)

- ii. Complete the flowchart by writing the necessary instruction in the symbol marked '1'.

(1)

(Total: 19 marks)

7. An organising committee for an international football tournament has developed a system called Match Manager, which is to be used in stadiums to process match data, ticket information, and crowd statistics. Match Manager can run on staff laptops, fans' mobile phones, and embedded systems like scoreboards and video assistant referee (VAR) equipment.

- a. Define an embedded OS.

(1)

- b. The developers installed a multitasking OS on the laptop and a singletasking OS on the VAR equipment. Distinguish between them.

(1)

c. One of the main jobs of the OS is process scheduling.

i. Define CPU process scheduling.

(1)

ii. Categorise the following statements as True or False.

(2)

	Statement	True	False
a.	Non-pre-emptive priority scheduling always allows a running process to be interrupted by a process with a higher priority.		
b.	Round Robin scheduling is designed to provide fairness by cycling through all ready processes in order.		
c.	Non-pre-emptive priority scheduling may cause starvation for low-priority processes.		
d.	In Round Robin scheduling, each process receives a fixed time slice called a time quantum.		

d. Match Manager uses a filing system to store data related to player statistics and match reports.

i. Define a filing system.

(1)

ii. List **TWO** examples of filing systems.

Example 1: _____ Example 2: _____ (1)

e. Developers have written a Python program to handle the goals scored in a match:

```
goals_teamA = int(input("Enter goals scored by Team A: "))
goals_teamB = int(input("Enter goals scored by Team B: "))
```

i. Define a variable.

(1)

ii. Identify the variable type of `goals_teamA` and `goals_teamB`. _____ (1)

f. A developer then tests this piece of code by inputting the value 2 for `goals_teamA` and 3 for `goals_teamB`. The next line of code to be executed is:

```
print("Final Score: Team A " , str(goals_teamA) , " - " ,
      str(goals_teamB) , " Team B")
```

i. State what will be displayed on screen by this line of code.

(1)

This question continues on the next page.

ii. Explain the use of the `str()` function in the above line of code.

_____ (1)

g. Goal difference is calculated as the difference between goals scored and goals conceded by a team in a tournament. The code below performs this calculation.

Line 1:	<code>goals_scored_per_game = [2,1,3,4,3]</code>
Line 2:	<code>goals_conceded_per_game = [1,2,2,3,4]</code>
Line 3:	<code>total_scored = 0</code>
Line 4:	<code>total_conceded = 0</code>
Line 5:	
Line 6:	<code>for scored in goals_scored_per_game:</code>
Line 7:	<code>total_scored = total_scored + scored</code>
Line 8:	<code>for conceded in goals_conceded_per_game:</code>
Line 9:	<code>total_conceded = total_conceded + conceded</code>
Line 10:	
Line 11:	<code>print('Goal Difference: ', goal_difference)</code>
Line 12:	<code>goal_difference = total_scored - total_conceded</code>

i. Identify the data structure being used in Lines 1 and 2. _____ (1)

ii. Identify a line of code that initialises a variable. _____ (1)

iii. This code implements for looping structure. Name **ONE** other looping construct in Python.

_____ (1)

iv. Explain the function of line 9.

_____ (1)

v. How many times will the loop at Line 8 be repeated? _____ (1)

vi. This code contains **TWO** errors. It does not run because of a syntax error, and it gives the wrong result because of a logic error. Identify the lines that contain these errors.

Syntax Error _____ Logical Error _____ (2)

vii. Another type of programming error is a runtime error. Define runtime error.

_____ (1)

viii. If both the errors mentioned in part (v) are fixed, what will the value of `goal_difference` be after the above code snippet is executed?

_____ (1)

h. Tick (✓) **TWO** good programming practices from the below:

(2)

☐ Use spaces for code indentation

☐ Add inline comments

☐ Use meaningful variables names

☐ Leave debugging code

(Total: 22 marks)



**L-Università
ta' Malta**

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

**SECONDARY EDUCATION CERTIFICATE LEVEL
2026 MAIN SESSION**

SUBJECT: **Computing**
 PAPER NUMBER: II – Level 2-3
 DATE: 29th May 2026
 DURATION: 2 hours 5 minutes

Write your index number were indicated at the top of the page.

Answer **ALL** questions in the spaces provided. You are **not** allowed to use extra sheets other than those provided in this booklet.

Good English and orderly presentation are important.

The use of flowchart templates is permitted.

The use of calculators is **not** permitted.

This paper carries 100 marks.

Question Number	1	2	3	4	5	6	7	FOR MARKERS' USE
For Markers' use only	Total number of marks obtained by candidate							
MARKS								

SECTION A

1. Luma Fork is a growing restaurant chain with outlets spread across the country. Each outlet is connected to the company's head office network.

a. Each outlet has smart TVs connected to the local network displaying order updates. Justify the use of Network Interface Card (NIC) on these devices.

_____ (1)

b. Smart TVs have an IP address and a MAC address. Distinguish between these two types of addresses.

_____ (1)

c. Explain the need of an Operating System (OS) in:

i. Input and Output Management;

_____ (1)

ii. File Management.

_____ (1)

d. Customers visiting a Luma Fork outlet can conveniently place their orders using the mobile application. To facilitate this, the shop has installed a Wireless Access Point. Justify this decision.

_____ (1)

e. Recommend a type of network for communication between an outlet and the head office. Justify your answer.

_____ (2)

f. The company management opted to buy a site license for the software that controls the content on the monitor. Justify this choice.

_____ (1)

g. Luma Fork uses Software as a Service (SaaS) for its restaurant management system.

i. Justify why SaaS is appropriate for Luma Fork's management system.

_____ (1)

ii. Identify **ONE** example of SaaS that may be used in this scenario.

_____ (1)

(Total: 10 marks)

2. A video-game console shop uses a computerised stock control system to record product names, stock quantities, re-order levels, and customer order details. The system processes this data to produce low-stock warnings, re-order reports, and stock availability for customers.

a. Distinguish between data and information.

(1)

b. Explain why in the above scenario re-order levels are considered data.

(1)

c. Explain why in the above scenario re-order reports are considered information.

(1)

d. The shop owners need software to keep track of stock levels and customer orders. They have the option of choosing either tailor-made or off-the-shelf software.

i. Suggest which type of software they should choose.

(1)

ii. Give **TWO** reasons to justify your choice in part d(i).

(2)

(Total: 6 marks)

3. A design team is producing a movie poster for online distribution using a graphics-editing software. Two of the colours selected are #3A4523 and #123456.

a. Name **ONE** reason why hexadecimal is commonly used to represent colour codes.

(1)

b. The finished poster will be stored using either a Solid-State Drive (SSD) or cloud storage.

i. Provide **ONE** advantage and **ONE** disadvantage for SSD.

(1)

ii. Provide **ONE** advantage and **ONE** disadvantage for cloud storage.

(1)

This question continues on the next page.

- c. The film poster together with a description are being shared across multiple platforms. Explain why standard character encodings are needed.

_____ (1)

- d. The poster is being designed on a laptop that has an 8 GB RAM and a 64-bit CPU.

- i. State the addressable memory space of the laptop.

_____ (1)

- ii. Explain how the address space impacts system performance.

_____ (1)

- iii. The poster is stored as a very high-resolution image, making the file large. Explain how virtual memory can help the computer handle such large files.

_____ (1)

- e. The CPU processes images, text, and numbers as binary data.

- i. What is the range of unsigned binary numbers that can be represented in an 8-bit register?

_____ (1)

- ii. Represent the value 50_{10} as it would be stored in an 8-bit CPU register.

(1)

- iii. Represent the value obtained after the CPU adds $0010\ 1100_2$ and $1001\ 1001_2$ as it would be stored in an 8-bit CPU register.

(1)

- iv. Represent the value obtained when 00000101_2 is subtracted from 00111000_2 .

(2)

(Total: 12 marks)

4. A smartwatch uses a System on a Chip (SoC) that includes a processor, among other components. Two key components of a processor are the Control Unit (CU) and the Arithmetic Logic Unit (ALU).

a. Distinguish between the role of the CU and that of the ALU.

(1)

b. The processor uses an instruction set. Describe the function of the instruction set.

(1)

c. Analyse the following Assembly instructions with `numA = 8` and `numB = 6`.

```
LOAD R1, numA    ; Load the value stored at memory address numA into register R1
LOAD R2, numB    ; Load the value stored at memory address numB into register R2
ADD R3, R1, R2   ; Add the contents of R1 and R2, place the result in R3
SUB R3, 4        ; Subtract 4 from R3
STORE R3, final  ; Store the value in R3 into memory address final
```

i. State the final value stored in `R3`. _____ (1)

ii. State the number of times `R3` is updated. _____ (1)

d. Which of the following statements correctly describe the roles of the CU and ALU when running the instruction `SUB R3, 4`? Tick the correct answers. (3)

☐	The CU fetches the instruction from memory.
☐	The ALU fetches the instruction from memory.
☐	The CU decodes the instruction.
☐	The ALU decodes the instruction.
☐	The CU carries out the subtraction operation.
☐	The ALU carries out the subtraction operation.

e. Assembly language programs must be translated before execution. Explain the relation between source code and executable code in this context.

(2)

f. Recommend a language translator for this scenario. _____ (1)

g. Give **TWO** reasons why a smartwatch is powered by a SoC rather than a microcontroller.

Reason 1 _____ (1)

Reason 2 _____ (1)

(Total: 12 marks)
Please turn the page.

Section B

5. E-Drive Motors is a company that designs electric cars. Electric cars have several embedded digital systems to make driving safer and more efficient. This includes a digital dashboard that shows information about the car, such as the battery condition and other important data.

a. Developers can represent an algorithm using either a flowchart or pseudocode. Distinguish between the two by highlighting a strength of each.

(2)

When charging the car, a safety mechanism evaluates key conditions to either permit or stop the process. The charging process can occur only if **all** of the following conditions are true:

- The temperature is within the safe range;
- The voltage is within the safe range;
- The battery is not fully charged.

Below is the part pseudocode showing how this safety mechanism will work:

Line 1	SET MIN_TEMPERATURE ← 15
Line 2	SET MAX_TEMPERATURE ← 35
Line 3	SET MIN_VOLTAGE ← 400
Line 4	SET MAX_VOLTAGE ← 800
Line 5	
Line 6	OUTPUT "Battery temperature: ", temperature, "°C"
Line 7	OUTPUT "Battery voltage: ", voltage, "V"
Line 8	
Line 9	IF temperature < MIN_TEMPERATURE OR temperature > MAX_TEMPERATURE
Line 10	OUTPUT "Charging stopped: Temperature not safe."
Line 11	ELSE IF voltage < MIN_VOLTAGE OR voltage > MAX_VOLTAGE
Line 12	OUTPUT "Charging stopped: Voltage not safe."
Line 13	ELSE IF fullyCharged = TRUE
Line 14	OUTPUT _____
Line 15	ELSE
Line 16	OUTPUT "Charging"

b. Fill in the instruction at line 14 to complete the pseudocode.

(1)

c. Explain the function of lines 15 and 16 in the above pseudocode.

(1)

d. Explain why Lines 6 to 16 are ideally executed within a looping construct.

(1)

e. As outlined above, charging can occur only if **all** the following conditions are true:

- The temperature (T) is within the safe range (1);
- The voltage (V) is within the safe range (1);
- The battery is not fully charged (F) (0);
- Then charging (C) can occur (1).

i. Write the Boolean Expression that represents this safety mechanism.

(1)

ii. Complete the truth table below to show how the safety mechanism works.

(3)

T	V	F			C
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			

E-Drive Motors' cars include a built-in touchscreen-based system involving a 24-bit colour, 120Hz screen with a resolution of 1920 x 1080.

f. Explain how the screen quality would differ from one with a resolution of 1280 x 720.

(1)

g. Determine how many colours this screen can represent.

(1)

h. Since it has a refresh rate of 120 Hz, this screen allows a maximum of 120 frames per second. Explain how lowering the refresh rate can impact the user experience of the navigation system.

(1)

The touchscreen-based system is also used for streaming music.

i. Give **TWO** reasons why compressed audio formats (like AAC or MP3) are commonly used for streaming music in cars, rather than uncompressed formats like WAV or FLAC?

(2)

This question continues on the next page.

- j. Tick **TWO** reasons to explain why serial data transfer is used in connecting the tablet to the speaker. (2)

☐	It does not present synchronisation issues with data transfer to peripherals.
☐	It sends all bits of a byte simultaneously over multiple wires so it is faster.
☐	Fewer wires are needed, making production more cost-effective.
☐	It is the only way to send digital audio.

- k. Recommend a suitable component that would enable the tablet to determine its geographical location for use in navigation applications. (1)

- l. Recommend a suitable component that would allow the tablet to take voice input. (1)

(Total: 18 marks)

6. Staying Comfort Group is a hotel chain that offers a pay-per-use room service. When a room status changes from "free" to "occupied", a fixed charge for food and bedding is added automatically but the cost of water and electricity depends on how much the guest uses.

The use of water and electricity in each room is measured by Internet of Things (IoT) devices, and the readings are stored in a networked database system that stores and manages guest details, utility usage, and payments.

- a. The database includes three tables: 'guest', 'room', and 'reservation', as per table shown.

guest	room	reservation
guest_id	room_number	reservation_id
name	room_type	booked_by_guest_id
surname	floor	room_number
id_card	current_status	electricity_consumption
mobile_number	price_per_night	water_consumption
		arrival_date
		departure_date

Recommend field types for the fields:

- i. guest_id: _____
- ii. arrival_date: _____
- iii. current_status: _____
- iv. electricity_consumption: _____ (2)

b. Justify the field types suggested above for the following fields:

i. current_status:

(1)

ii. electricity_consumption:

(1)

c. Recommend a suitable data validation rule for the departure_date field. Justify your answer.

(2)

d. Construct an ERD, using Crow's Foot Notation, to describe the relationship between these three tables, and indicate the primary key in each table.

(5)

e. Databases may be queried using a Fourth Generation Language (4GL) like SQL.

i. Briefly describe the result of the following SQL statement:

```
SELECT booked_by_guest_id, room_number, electricity_consumption
FROM reservation
WHERE arrival_date > '2025-08-01'
ORDER BY electricity_consumption
```

(4)

This question continues on the next page.

ii. Name **TWO** ways in which SQL differs from a High-Level Language.

Difference 1 _____

Difference 2 _____(2)

f. Recommend whether the hotels should use Ethernet or Wifi to link their database server with reception computers. Explain.

_____(2)

g. Data collected from the IoT devices in each room is transmitted to the database for collection. Recommend **TWO** IoT devices used for data logging in this scenario.

Device 1: _____

Device 2: _____(2)

h. Mention **ONE** reason why data transmitted between the IoT devices and the database should be encrypted.

_____(1)

(Total: 22 marks)

7. The Global Champions Cup (GCC), which organises an international football tournament, is developing a system called 'Match Manager'. This system will be used in stadiums and processes match data, ticket information and crowd statistics.

a. Recommend the type of OS appropriate for Match Manager to run on:

i. laptops to be used by staff. _____(1)

ii. scoreboards and Virtual Assistant Referee (VAR) equipment. _____(1)

b. The OS is responsible for process scheduling. Describe round robin scheduling.

_____(1)

c. Scoreboard hardware can process input from sensors faster than the display can update. Explain how buffering is used in this situation.

_____(1)

d. A developer tests the below line of code when `goals_teamA` is 2 and `goals_teamB` is 3.

```
print(f"Final Score: Team A {goals_teamA} - {goals_teamB} Team B")
```

i. State what will be displayed on screen by this line of code.

_____(1)

- ii. Another developer offers a similar solution by writing the following code. Explain the purpose of the + symbol.

```
print("Team A " + str(goals_teamA) + " Team B " + str(goals_teamB))
```

(1)

- e. Part of the program will be used to determine which team has won the match, or whether the match was a draw. Analyse the Python code below and answer the questions that follow:

Line 1:	def show_match_result(goals_teamA, goals_teamB, penalties_teamA, penalties_teamB):
Line 2:	
Line 3:	print('Score: ', goals_teamA, '-', goals_teamB)
Line 4:	if goals_teamA > goals_teamB:
Line 5:	print('Team A won')
Line 6:	elif goals_teamA < goals_teamB:
Line 7:	print('Team B won')
Line 8:	else:
Line 9:	
Line 10:	if penalties_teamA > penalties_teamB:
Line 11:	print ('Team A won on penalties')
Line 12:	
Line 13:	else:
Line 14:	print('Team B won on penalties')
Line 15:	
Line 16:	show_match_result(2, 2, 2, 3)

- i. State with a reason at which line number (2, 9, or 12) the following code should be placed:

```
print('Match was a draw and decided on penalties')
```

(2)

- ii. Identify the decision construct used in the above code.

(1)

- iii. Tick the correct option to complete statement:

If Line 11 is executed

☐	The statement at Line 4 is true and the statement at Line 10 is true.
☐	The statement at Line 4 is true and the statement at Line 10 is false.
☐	The statement at Line 4 is false and the statement at Line 10 is true.
☐	The statement at Line 4 is false and the statement at Line 10 is false.

(1)

This question continues on the next page.

iv. Determine the output obtained when line 16 is executed.

(1)

v. Distinguish between a function and a module.

(1)

f. The goal difference is the difference between goals scored and goals conceded by a team in a tournament. The function `show_goal_difference` is shown below. This function is being passed two list variables.

Line 1:	<code>def show_goal_difference(goals_scored, goals_conceded):</code>
Line 2:	<code> total_scored = 0</code>
Line 3:	<code> total_conceded = 0</code>
Line 4:	<code> for scored in goals_scored:</code>
Line 5:	<code> total_scored += scored</code>
Line 6:	<code> for conceded in goals_conceded:</code>
Line 7:	<code> total_conceded += conceded</code>
Line 8:	
Line 9:	<code> print('Goal Difference: ', goal_difference)</code>
Line 10:	<code> goal_difference = total_scored - total_conceded</code>

i. Name the lists that are being passed to this function.

(1)

ii. Identify a line of code that initialises a variable.

(1)

iii. What determines how many times the for loop at line 6 loops?

(1)

iv. Explain the function of line 7.

(1)

v. This code does not run because of a syntax error. Identify the line that contains this error. Suggest a solution to fix this error.

(2)

vi. When the error mentioned in part f(v) above is fixed, this code still gives the wrong result. Identify the type of error. Suggest a solution to fix this error.

(2)

(Total: 20 marks)