L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

ADVANCED MATRICULATION LEVEL
2025 FIRST SESSION

SUBJECT:	**Information Technology**
PAPER NUMBER:	I
DATE:	20th May 2025
TIME:	9:00 a.m. to 12:05 p.m.

Directions to candidates

A total of **SIX** questions must be attempted; **THREE** from Section A and another **THREE** from Section B.

SECTION A: INFORMATION SYSTEMS

Answer the first question and any other TWO questions in this section.

Question A1

This question is compulsory. Answer all parts.

A data collection system is being developed for a large retail store that has decided to move from manual data entry to more efficient automated data capture methods, aiming to enhance inventory tracking and customer purchase data.

a) Suggest **TWO** reasons why the retail store might choose to switch from manual data entry to using automated data capture devices. (2)

b) Based on the scenario, identify and describe **THREE** automated data capture methods that could be implemented in the store to replace manual data entry. For **each** method, explain why it would be beneficial for the store's operations. (6)

c) For **each** of the data capture methods identified in part b), provide **ONE** example of how it could be applied in the retail store to improve operations. (3)

d) Select **TWO** of the data capture methods mentioned in part b) and compare them with respect to:
   i. function; (1)
   ii. cost; (1)
   iii. accuracy. (1)

e) The store is considering integrating its data capture system with an Electronic Data Interchange (EDI) system. Briefly explain what EDI is and discuss how it can enhance the store's data management and communication with suppliers. (2)

f) The store plans to implement Internet of Things (IoT) devices. Define the term IoT and explain **ONE** potential benefit of implementing these devices in the store. (2)

g) Provide **TWO** examples of how IoT could be applied in the retail store to improve operations. (2)

(Total: 20 marks)

Please turn the page.

Answer TWO questions from Questions A2, A3 and A4.

Question A2

Paula and Jean are working in a technology store that specialises in a wide range of output devices. Their team is tasked with helping customers understand the features and functions of various output devices to assist them in selecting the most suitable products.

a) Two output devices available in the store are printers and monitors. Outline the main function of **each** of these devices. (2)

b) Describe how a printer and a monitor can be used in the following three situations:
   i. presenting visual content during a business meeting; (2)
   ii. printing high-quality photographs; (2)
   iii. displaying promotional content in a retail store window. (2)

c) List **FOUR** additional output devices that might be found in the store. For **each** device, explain its main function. (6)

d) The monitors in the store have different specifications. Define the following properties related to visual output devices:
   i. resolution; (1)
   ii. display size; (1)
   iii. aspect ratio. (1)

e) The store offers various types of printers. Identify **TWO** types of printers that might be available in the store. (1)

f) Define the following terms in relation to printing devices:
   i. resolution; (1)
   ii. print speed. (1)

(Total: 20 marks)

Question A3

This question is related to number base systems.

a) Convert the following numbers from binary to decimal:
   i. 10110101 (2)
   ii. 11100100 (2)

b) Convert the following numbers from decimal to binary:
   i. 187 (2)
   ii. 42 (2)

c) Convert the following numbers from binary to hexadecimal:
   i. 11011011 (2)
   ii. 10101010 (2)

d) Convert the following numbers from hexadecimal to decimal:
   i. A7 (2)
   ii. 3F (2)

e) Convert the following numbers from decimal to hexadecimal:
   i. 255 (2)
   ii. 100 (2)

(Total: 20 marks)

Question A4

TechAdvance Solutions is a growing IT services company that has faced issues with weak passwords, misuse of portable USB devices, and inconsistent remote access policies. Additionally, the company lacks a unified Information Security (IS) strategy.

a) Mention and describe **FOUR** policies that TechAdvance Solutions should implement to address their information security challenges. (8)

b) Define an IS strategy and outline **THREE** key features it includes. (4)

c) Explain **TWO** ways in which an IS strategy can help TechAdvance Solutions address its organisational challenges. (2)

d) Describe **TWO** methods for **each** of the following techniques that can be used to achieve IS:
   i. SWOT analysis; (2)
   ii. resource analysis; (2)
   iii. demand analysis. (2)

(Total: 20 marks)

SECTION B: ICT in Organisations

Answer the first question and any other TWO questions in this section.

Question B1

This question is compulsory. Answer all parts.

TechEase Solutions, a retail technology provider, is enhancing its user support systems to assist both its internal staff and customers. The company aims to improve technical assistance, streamline its help desk operations, and ensure users can easily access support through various tools and resources.

a) Define user support systems. (1)

b) Explain why TechEase Solutions needs user support systems. Give **TWO** reasons. (2)

c) List **TWO** technical aspects of user support that are important for TechEase Solutions. (2)

d) Define a help desk and explain its importance to TechEase Solutions. (2)

e) Mention and describe **FOUR** types of user support systems that TechEase Solutions might implement. (6)

f) Provide **ONE** example for **each** user support system mentioned in part e). (4)

g) TechEase Solutions has also developed manuals to assist users. Mention and describe **THREE** types of manuals that could be useful. (3)

(Total: 20 marks)

Please turn the page.

Answer any TWO questions from B2, B3 and B4.

Question B2

The local government is modernising its services by implementing e-Government solutions to improve efficiency and accessibility for its departments, businesses, and citizens. As part of this initiative, it plans to educate its employees about key e-Government concepts and services.

a) Define e-government. (1)

b) Outline the following types of e-Services:
   i. admin to admin; (1)
   ii. admin to business; (1)
   iii. admin to citizen. (1)

c) Provide **ONE** example for each e-Service mentioned in part b). (3)

d) Define the term Electronic Identity and list **TWO** of its uses in the context of e-Government. (3)

(Total: 10 marks)

Question B3

Sphere Solutions is a technology startup exploring the potential of Distributed Ledger Technology (DLT) to enhance its operations. The company aims to understand its significance and practical applications.

a) What is DLT, and why is it important to Sphere Solutions? Provide **TWO** reasons. (3)

b) Mention and outline **TWO** key uses of DLT that could benefit Sphere Solutions. (3)

c) For **each** use mentioned in part b), provide **TWO** examples of how they can be used by Sphere Solutions. (4)

(Total: 10 marks)

Question B4

An automotive company is exploring ICT tools to improve its design, manufacturing, and data analysis processes. The company is also investigating how these tools can enhance navigation systems and enable simulations for testing safety and efficiency.

a) Define the following concepts:
   i. Computer-Aided Design (CAD); (1)
   ii. Computer-Aided Manufacturing (CAM). (1)

b) Explain the role of experimentation and simulation in testing vehicle performance and analysing traffic patterns. (2)

c) Explain how navigation and data tracking systems can improve vehicle efficiency and safety. (2)

d) Provide **TWO** examples of how statistical packages like SPSS could be used by the automotive company to analyse traffic data. (2)

e) Discuss **TWO** benefits of using simulations in vehicle design and testing. (2)

(Total: 10 marks)

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MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

ADVANCED MATRICULATION LEVEL
2025 FIRST SESSION

SUBJECT:	**Information Technology**
PAPER NUMBER:	II
DATE:	20th May 2025
TIME:	4:00 p.m. to 7:05 p.m.

Directions to candidates

A total of **SIX** questions must be attempted; **THREE** from Section A and another **THREE** from Section B.

SECTION A: SOFTWARE

Answer the first question and any other TWO questions in this section.

Question A1

This is a compulsory question. Answer all parts.

The following is a basic portfolio website HTML structure designed to showcase projects and contact information.

```
1.  <!DOCTYPE html>
2.  <html lang="en">
3.  <head>
4.      <meta charset="UTF-8">
5.      <meta name="viewport" content="width=device-width, initial-scale=1.0">
6.      <title>My Portfolio</title>
7.      <link rel="stylesheet" href="styles.css">
8.  </head>
9.  <body>
10.     <header>
11.         <h1>Welcome to My Portfolio</h1>
12.     </header>
13.     <main>
14.         <p>Explore my projects and get to know more about my work.</p>
15.     </main>
16.     <footer>
17.         <p>Contact: info@mywork.mt</p>
18.     </footer>
19. </body>
20. </html>
```

styles.css

```
1. body {
2.     font-family: Arial, sans-serif;
3.     background-color: #f0f0f0;
4.     margin: 20px;
5. }
6.
7. h1 {
8.     color: #333;
9. }
10.
11. p {
12.     color: #666;
13. }
```

Question continues on the next page.

a) Explain the purpose of the following HTML elements in the code:
   i. <html>; (1)
   ii. <head>; (1)
   iii. <main>; (1)

b) Describe **TWO** benefits of using an external CSS file over inline styling within the HTML document. (2)

c) Modify the HTML code to add an unordered list within the <main> section, with three items: "*Project 1*," "*Project 2*," and "*Project 3*". (3)

d) Add an <img> tag within the <header> section that displays a profile picture with an alternative text of "Profile Picture." Ensure the image has a width of 150 pixels. (4)

e) Explain the function of the <meta charset="UTF-8"> tag and why it is essential for modern web pages. (2)

f) Write an HTML comment that describes the purpose of the <footer> section. (1)

(Total: 15 marks)

Answer any TWO questions from Questions A2, A3 and A4.

Question A2

An Operating System (OS) is system software that manages computer hardware, software resources, and provides various services for computer programs.

a) Describe the purpose of the resource allocation *and* process scheduler in an OS. (2)

b) Outline **TWO** advantages of a multi-user operating system over a single-user system. (2)

c) Explain the role of the following utility applications.
   i. Defragmenters. (1)
   ii. Compression. (1)
   iii. File Managers. (1)

d) Give **ONE** example of a situation where the following types of OS may be used.
   i. Real-Time. (1)
   ii. Network. (1)
   iii. Mobile. (1)

e) A company is considering switching from its proprietary OS, Windows, to the open-source OS, Linux. Discuss **TWO** advantages and **ONE** disadvantage that Linux has compared to Windows. (3)

f) Part a) refers to one of the components of an OS. Name **TWO** other components that are part of an OS. (2)

(Total: 15 marks)

Question A3

TechCo Solutions registered a domain name and IP addresses for their new platform and partnered with an Internet Service Provider (ISP) for connectivity. They discussed using an Intranet and Extranet for communication and chose IPv6 over IPv4 for scalability, emphasizing the role of the DNS in making their website accessible.

a) Define a **Domain Name** and explain its relationship with an IP address in the context of TechCo Solutions' new platform. (2)

b) What is an ISP, and why is it critical for TechCo's operations? (2)

c) TechCo is considering setting up an Intranet and an Extranet. Compare these two networks, and explain which would be more suitable for internal communication. (2)

d) List **TWO** reasons why TechCo might choose IPv6 over IPv4 for its future projects. (2)

e) Describe what would be the impact on TechCo's platform's accessibility if the DNS server fails. (2)

f) Define the following in relation to TechCo Solutions:
   i. The role of Internet registries in registering TechCo's domain name and IP addresses;(1)
   ii. The importance for TechCo to register their domain name and IP addresses globally. (1)

g) Explain how DNS redundancy can help TechCo ensure uninterrupted access to their platform, even during server failures or high traffic. (3)

(Total: 15 marks)

Question A4

SmartShop is a small retail company that uses a database to manage its inventory, suppliers, and customer orders. The current database has issues such as duplicate data, inconsistent entries, and redundant information. For example, supplier details are repeated for every order, and product categories are stored inconsistently. The manager has asked the IT team to normalise the database to improve its efficiency, accuracy, and performance.

a) Define normalisation in the context of database design. (1)

b) Identify whether the following table is in 1NF, and justify your answer. (3)

Table 1: Orders Table

OrderID	Product	SupplierDetails
101	Apples	FreshFarms, 99123456
102	Oranges, Grapes	FreshFarms, 99123456

Question continues on the next page.

c) Identify whether the following table is in 3NF, and justify your answer. (3)

Table 2: Transaction Table

CustomerID	CustomerName	OrderID	OrderDate	OrderTotal
001	Thuram	101	2025-04-28	€120
002	Martinez	102	2025-04-30	€270

d) List **TWO** ways in which redundancy in SmartShop's database affects data integrity and efficiency. (2)

e) List **ONE** issue that can happen if SmartShop's database is over-normalised. (1)

f) Explain the relationship between primary keys and foreign keys in the context of a normalised database for SmartShop. (2)

g) Provide **ONE** example for each of the following types of cardinalities in the context of SmartShop's database:
   i. One-to-One; (1)
   ii. One-to-Many; (1)
   iii. Many-to-Many. (1)

(Total: 15 marks)

SECTION B: PROGRAMMING TECHNIQUES AND SYSTEM DEVELOPMENT

Answer the first question and any other TWO questions in this section.

Question B1

This is a compulsory question. Answer all parts.

a) The following are code snippets from the Python programming language.

A school is developing a program to calculate students' average scores and assign grades based on their performance. The program should take a list of scores as input, calculate the average, and determine the grade based on predefined ranges:

- A: 90 and above
- B: 75–89
- C: 50–74
- F: Below 50

Below is the code implementation.

```
1.  def calculate_average(scores):
2.      total = sum(scores)
3.      count = len(scores)
4.      return total / _______
5.
6.  def grade_student(average):
7.      if average >= 90:
8.          return 'A'
9.      elif average >= 75:
10.         return 'B'
11.     elif average >= 50:
12.         return 'C'
13.     else:
14.         return 'F'
15.
16. scores = [85, 90, 78, 92, 88]
17.
18. avg = calculate_average(scores)
19. grade = grade_student(avg)
20.
21. print(f"Average score: {avg}")
22. print(f"Final grade: {grade}")
```

i. Describe the algorithm between lines 6 and 14. (3)
ii. List the line numbers where functions are declared. (2)
iii. Identify any errors between lines 11 to 14. (2)
iv. Fill in the missing part of Line 4: *return total /* ___. (1)
v. What does the **len()** function in the *calculate_average* function do? (1)
vi. Modify the program to display the message "Excellent performance!" if the grade is 'A'. Clearly specify the line number where this addition should be made. (3)
vii. What function can be used to add an item to the list after line 16? (1)
viii. Write the code snippet on line 17 to remove the value 78 from the scores list. (1)
ix. What would happen if the scores list on line 16 is left empty? (1)

Questions continues on the next page.

b) A webpage for an online bookstore is being designed. Below is the CSS code applied to a paragraph introducing the bookstore. Analyse the code and answer the questions.

```
1. <!DOCTYPE html>
2. <html>
3. <head>
4.     <style>
5.         h1 {
6.             color: red;
7.             text-align: center;
8.             font-family: Verdana, sans-serif;
9.             font-size: 24px;
10.        }
11.        p {
12.            color: green;
13.            text-align: justify;
14.            font-style: italic;
15.            font-weight: normal;
16.            text-decoration: overline;
17.        }
18.    </style>
19.</head>
20.<body>
21.    <h1>Book Store</h1>
22.    <p> Welcome to the best online bookstore for all your literary
   needs!</p>
23.</body>
24.</html>
```

i. The text in *<h1>* is not aligned properly, which property should be modified to fix it? (1)

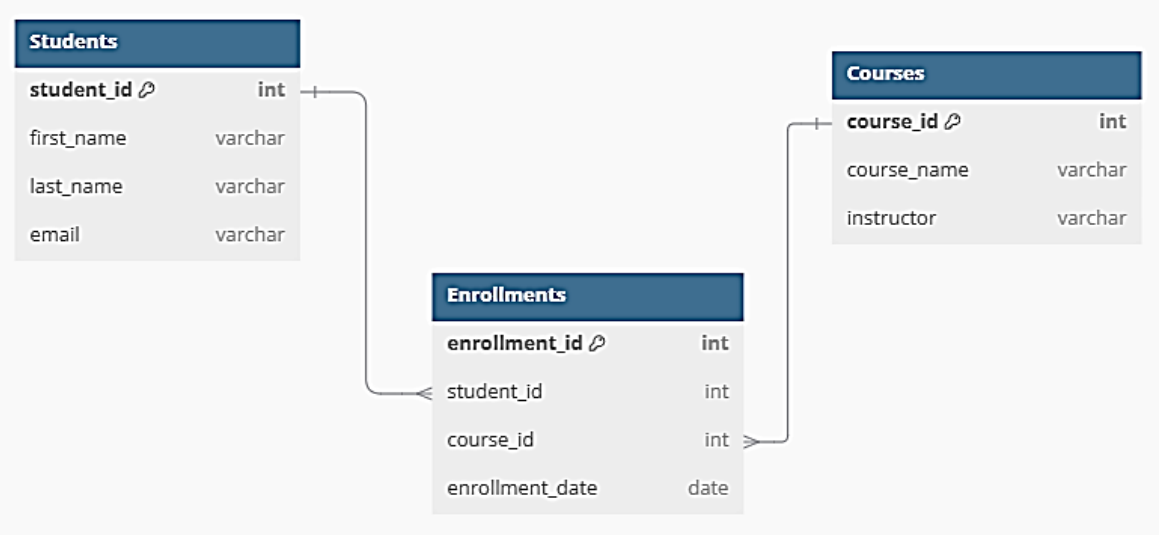
ii. The *<p>* text uses *text-decoration: overline;*. Describe what visual effect this creates. (1)

iii. The *<p>* uses the *font-style: italic;* property. Suggest a situation where using *font-style: normal;* might be more appropriate for the same paragraph. (1)

iv. If the *<p>* tag's color is removed from the CSS, what would be the default color of the text? (1)

v. The *text-decoration* property is set to *line-through*. Suggest a practical use case for this styling in the context of an online bookstore. (1)

c) The following is an ERD representing a University Course Management System. It includes three tables: *Students* for storing student details, *Courses* for course information, and *Enrollments* to track which students are enrolled in which courses.



i. Write an SQL query to retrieve all the *course_name* values from the *Courses* table. (1)
ii. Write an SQL query to list the *first_name* and *last_name* of students who have an email ending with *@teched.edu*. (1)
iii. Write an SQL query to retrieve all records from the *Enrollments* table for students enrolled in the course with *course_id = 101*, ordered by *enrollment_date* in descending order. (2)
iv. Write an SQL query to find the *course_name* and *instructor* of courses taught by an instructor named *"Dr. Smith"*. (1)

(Total: 25 marks)

Answer any TWO questions from Questions B2, B3 and B4.

Question B2

TechBooks Library is upgrading its manual system to a modern Library Management System (LMS). The LMS will handle book loans, member records, and inventory tracking. The system will follow the stages of system development to ensure successful implementation.

a) Define a computer-based system and explain how the LMS fits this definition. (2)

b) Identify which type of system the LMS is and justify your answer. (2)

c) List the **EIGHT** main stages of system development. (4)

d) The library's current manual system is being replaced. List **TWO** reasons why the library might make this decision. (2)

e) Give **TWO** possible reasons why this organisation decided to develop a new system. (2)

f) List **FOUR** factors that should be evaluated during the feasibility study to ensure the new system's success. (2)

g) The library needs to implement automated notifications. Which stage of system development would address this? (1)

(Total: 15 marks)

Question B3

TechEd University is developing a Student Management System (SMS) to automate student data handling, class schedules, and report generation. The system will use various programming languages and paradigms for efficient implementation.

a) Define natural languages and programming languages, and explain how each is relevant to the development of the SMS. (2)

b) Compare and contrast natural languages with programming languages in the context of SMS development. (2)

c) Identify whether a low-level or high-level programming language is better suited for SMS development and justify your choice. (2)

d) Outline the purpose of language translators in SMS development. (2)

Question continues on the next page.

e) List **ONE** reason why a compiler, an interpreter, and an assembler might be chosen by programmers for SMS development. (3)

f) Suggest one real-world process for each programming paradigm in the context of SMS development:
   i. Imperative; (1)
   ii. Functional; (1)
   iii. Declarative; (1)
   iv. Object-Oriented. (1)

(Total: 15 marks)

Question B4

A grocery store program calculates the total cost of up to 5 items. The cashier inputs each item's price, and the program sums them to display the final total.

```
1. counter = 1
2. total = 0
3.
4. while counter < 6:
5.     price = int(input(f"Enter price {counter}: "))
6.     counter += 1
7.     total += price
8.
9. print(f"The sum of all numbers is: {total}")
```

a) Draw a flowchart to represent the program's logic. (5)

b) Suggest **ONE** improvement that could make the system more user-friendly for the cashier.(1)

c) The store wants to track frequent customer purchases. How could the current system be enhanced to store customer details and their transaction history? (1)

A grocery store needs a simple algorithm to determine whether a customer is eligible for a discount. The system should prompt the user to enter the total amount spent. If the amount is €50 or more, the customer gets a 10% discount; otherwise, no discount is applied. The pseudocode should outline the steps required to complete this task.

d) Write a simple algorithm in pseudocode to solve the above problem. (5)

e) Suggest **ONE** method to validate user input if the total amount is entered incorrectly. (1)

f) The first part of the question focuses on flowcharts, while the second part focuses on pseudocode. Choose either pseudocode or flowchart as your preferred method for defining an algorithm, and list **TWO** reasons to justify your choice. (2)

(Total: 15 marks)