



L-Università
ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

**ADVANCED MATRICULATION LEVEL
2021 SECOND SESSION**

SUBJECT:	Information Technology
PAPER NUMBER:	I
DATE:	4 th October 2021
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: INFORMATION SYSTEMS

Answer any THREE questions from this section.

Question A1

Various information systems life cycles have been developed throughout the years. Each of them promising to improve upon the weak points of the previous ones or to be particularly adequate for a certain environment.

- a) Identify **THREE** issues that would indicate that the current system being utilised needs to be replaced with a new system? (3)

- b) Prototyping is one of the main information system life cycles.
 - i Explain this lifecycle. (4)
 - ii. Identify **ONE** benefit and **ONE** pitfall of prototyping? (2)

Please turn the page

- c) Identify and describe in detail the software development methodology shown in Figure 1 below. (1, 4)

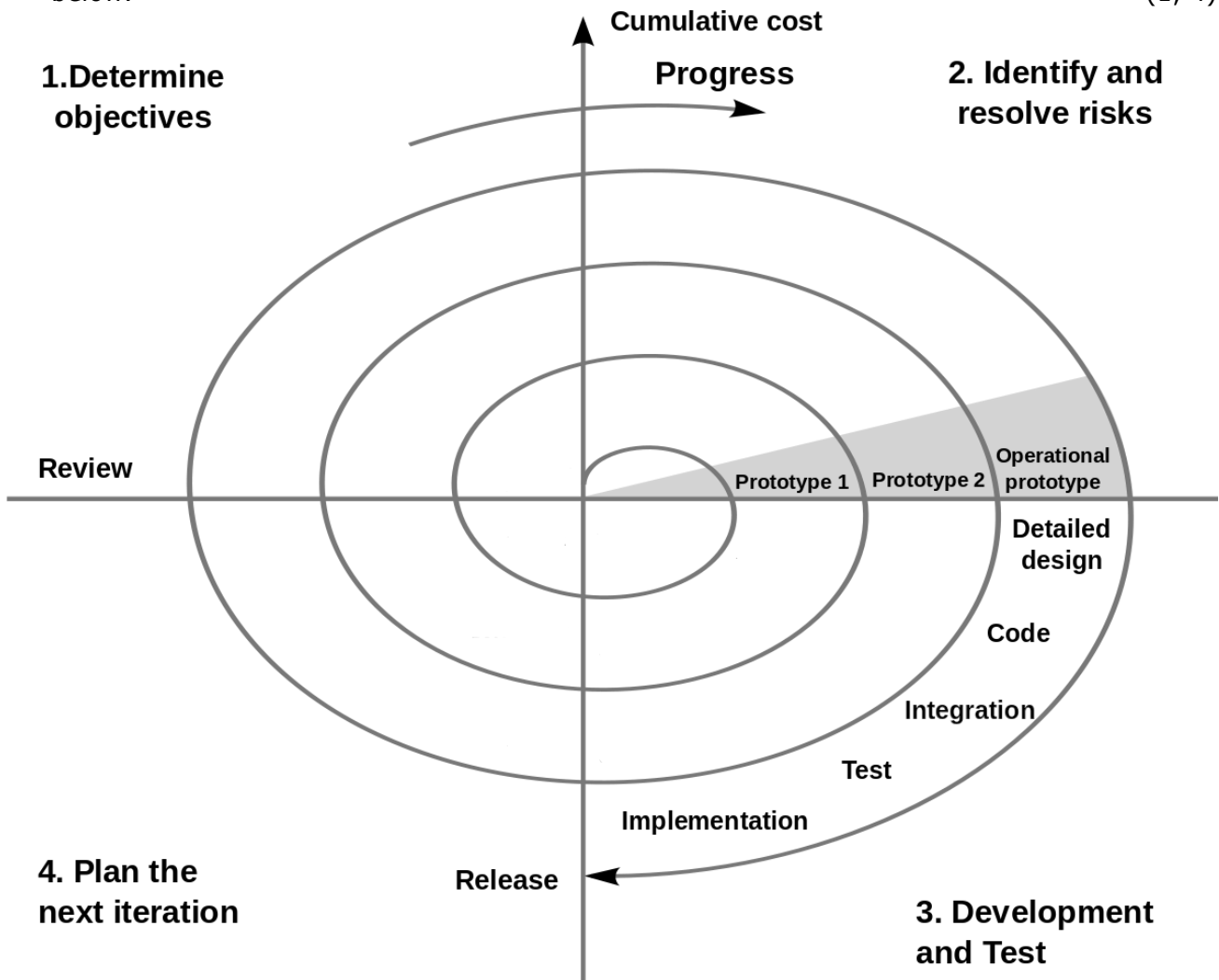


Figure 1 - IS Life Cycle (<https://ultimatesdlc.com>)

- d) How are data mining and Artificial Neural Networks (ANN) correlated? Identify **TWO** benefits of these two technologies for business intelligence software? (1, 2)
- e) A software developer is suggesting that all development going forward should focus on expert systems. Explain **THREE** limitations of expert systems as a counter argument. (3)

(Total: 20 marks)

Question A2

Choosing the right equipment to carry out the data processing required is essential for the standard operation of any enterprise.

- a) Mention **ONE** purpose of having various types of RAM within one computer system? (1)
- b) Identify **TWO** typical applications of SRAM within a computer system. (2)
- c) Explain **FOUR** comparisons of SRAM and DDR SDRAM. (4)
- d) Explain a typical application of DDR SDRAM within a computer system. (1)

- e) What type of memory do graphic cards make use of? Why do video cards require their own specific type of memory? (1, 2)
- f) Mention **ONE** type of non-volatile storage. What is the purpose of this storage within a computer system? (1, 1)
- g) The use of optical media as a storage device has fallen sharply in recent years. Explain how a solid-state drive compares to a magnetic-based one in terms of; access time, cost, longevity and typical use. (4)
- h) Identify **ONE** typical use for **each** of the following: mainframe, servers and netbooks. (3)

(Total: 20 marks)

Question A3

This question is about computers and number representation.

- a) How is the range of numbers that can be represented in computer systems limited by the number of bits available? (1)
- b) What happens when a number that needs to be represented is too large for the number of bits available? Explain **TWO** mitigations to avoid such occurrences. (1, 2)
- c) Convert the hexadecimal number 8FF to binary. (2)
- d) Add the binary number 1110011 to the binary number 1010111 (2)
- e) Convert the fraction 0.375 to binary. (2)
- f) Define the process of normalisation. What is the benefit of this process? (2)
- g) What is the difference between signed and unsigned fixed point integer representation? (2)
- h) Using the number -44 and a storage of 8 bits, illustrate the steps required to get the two's complement of a negative number from its one's complement. (3)
- i) A junior software developer is surprised to learn that when adding 0.1 and 0.2 in his favourite programming language, the answer being given is 0.30000000000000004. Explain in detail why the answer is not exactly 0.3 as expected. (3)

(Total: 20 marks)

Question A4

Due to COVID-19 restrictions, a local company is looking at replacing some of its security procedures.

- a) The company is currently using a fingerprint scanner in order to recognise when people arrive at their place of work. Identify and explain an authentication technology that could be used which would reduce the chance of COVID-19 transmission. (2)
- b) Security is not based only on authentication but also on authorisation. Explain **FOUR** methods of authorisation that can be used. (4)

Question continues on next page.

- c) Malicious attacks can be either physical or electronic. Discuss **TWO** physical and **TWO** electronic methods which could help in securing the company from such attacks. (4)
- d) An important aspect of disaster planning is backing up the company's data. What is the difference between full and incremental backups? As part of your explanation, provide a scenario where it would be best to use a full backup and another scenario where it would be advisable to use incremental backups. (4)
- e) All of the above measures are related to data integrity. What is data integrity, and how does this differ from data security? (2)
- f) Why is it that when designing security policies, it is counter-intuitive to set a password policy which is very complex? (3)
- g) How can the company protect data during transmission? (1)

(Total: 20 marks)

SECTION B: Human Communication and Business Organisations

Answer any THREE questions from this section.

Question B1

- a) Define the terms data and information whilst highlighting their main differences. (2)
- b) Information processing occurs through a basic cycle.
- What is this process called? (1)
 - By drawing a data flow diagram, show this process through the inclusion of all required components and sub-components. (4)
- c) Explain why more focus is being placed on health considerations in view of the current age we are living in, whereby computers are being utilised on a day-to-day basis. (2)
- d) Mention **THREE** health problems associated with computer systems. (3)
- e) What does the term ergonomic environment refer to? (1)
- f) Mention **TWO** health and safety measurements that might be implemented by companies to safeguard their employees. (2)

(Total: 15 marks)

Question B2

- a) What does the term e-government mean? (1)
- b) What is the term utilised to describe governmental services being offered to clients via the Internet? (1)
- c) i. Explain the following three types of services:
- Admin to Admin;
 - Admin to Business;
 - Admin to Citizen. (3)
- ii. Give **ONE** example for each of the three services mentioned in part c(i) (3)

- d) i. Define the term electronic identity. (1)
- ii. Provide **TWO** examples of usage for an electronic identity (2)
- e) When browsing services online, the search intent (i.e., the results which one expects) might vary. Mention and explain **TWO** main types of search intents. (4)

(Total: 15 marks)

Question B3

The health authorities would like to produce an awareness campaign in relation to the current Covid situation.

- a) Mention **THREE** different types of communication mechanisms which can be utilised for such a campaign. (3)
- b) For **each** of the communication mechanisms mentioned in part (a), specify **ONE** advantage and **ONE** disadvantage. (6)
- c) For **each** of the three types of communication mentioned in part (a), name and explain **TWO** related technologies. (6)

(Total: 15 marks)

Question B4

'There is nothing wrong with change if it is in the right direction' – Winston Churchill.

- a) Mention **THREE** reasons as to why companies might opt for a change in their current systems. (3)
- b) Change is something which should be managed since it might impact various individuals and functions of a company. Explain why this is required. (2)
- c) Mention **FOUR** factors which might need to be revisited following a change of system. (4)
- d) Employees might be resistant to change due to multiple reasons.
 - i. Explain **THREE** reasons as to why employees might be resistant to change. (3)
 - ii. Explain **THREE** ideas which can be implemented by companies to overcome this resistance to change. (3)

(Total: 15 marks)



SUBJECT:	Information Technology
PAPER NUMBER:	II
DATE:	5 th October 2021
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 any THREE questions from this section.

Question A1

A local souvenir shop has recently acquired the funds to invest into a software which can be used to allow the shop to sell their products online to a wider audience.

- Discuss **SIX** evaluation criteria that this souvenir shop should take into consideration when making the choice between the possible alternative software. (6)
- One of the software being considered is labelled as integrated software. What is the meaning of integrated software? Highlight **ONE** advantage and **ONE** disadvantage of integrated software. (3)
- Mention **TWO** other types of software which this shop can make use of. (2)
- Apart from the computer hardware and the software which allows online sales, the shop is being asked to purchase an operating system and utility programs. Provide a recommendation for **ONE** operating system and **ONE** utility programs that the shop can make use of. (2)
- Apart from multitasking operating systems, describe **TWO** other types of operating systems. (2)

(Total: 15 marks)

Please turn the page.

Question A2

A startup has seen an increased demand for its services and is implementing a database in order to have better control of its data. The following table is a sample of the data they currently hold in a Microsoft Word document.

StaffNo	Staff Name	PatientNo	PatientName	Appointment Details	Reason for Visit
S1001	Peter Borg	P589	Maria Camilleri	01/02/2021 @ 08:00	Cleaning
S1001	Peter Borg	P254	Jesmond Pace	02/02/2021 @ 08:50	Checkup
S1154	Daniela Farrugia	P554	Ellie Scerri	06/03/2021 @ 17:00	Removal
S1001	Peter Borg	P999	Noah Abela	10/04/2021 @ 10:00	Cleaning
S1154	Daniela Farrugia	P254	Jesmond Pace	02/05/2021 @ 11:00	Removal

- a) Provide **ONE** example of **THREE** different anomalies that can be encountered in this situation. (3)
- b) Carry out a normalisation exercise to present the data above in the third normal form. State any assumptions that you make about the data. (8)
- c) Given the relation below, provide SQL statements that provide the data indicated.

SalesPerson (PersonID, Name, City, Commission)

- i. Shows all the data in ascending order by Name. (1)
- ii. Shows only the names and city of the salespersons who have a commission higher or equal to 0.2. (3)

(Total: 15 marks)

Question A3

A company has an HTML based website which they would like to update.

- a) Provide HTML code that:
- i. Adds a heading with the text "Welcome". (1)
- ii. Adds a paragraph with the text "Our shop in Valletta is open all day between 9am and 9pm. In our shop you can find" (1)
- iii. Adds the following text as a bulleted list: (3)
- Clothes
 - Toys
 - Food
 - Drink
- iv. Adds an image with the name "logo.jpg" (1)

- v. Adds a link to the website "https://www.facebook.com/ourshop". The text for the link should read "Follow us on Facebook" (1)
- b) What are **TWO** benefits of using CSS in a website? (2)
- c) Provide CSS code in order to format the paragraphs as follows: (3)
- Red text
 - Font size 18px
- d) Mention **TWO** kinds of form validation that can be carried out using JavaScript. (2)
- e) Which protocol is required to be used in order to be able to send emails? (1)

(Total: 15 marks)

Question A4

- a) Describe **FOUR** components of operating systems. (4)
- b) Describe the user interface presented to the user when making use of a CLI (Command Line Interface). (1)
- c) Storing data efficiently, especially in databases, is one of the main research areas in computing. What are **TWO** characteristics associated with the object-oriented data model? (2)
- d) Working remotely has seen a marked increase during 2021. Describe the purpose of **THREE** Internet client application utilities that make remote work possible. (3)
- e) Describe **THREE** kinds of malware that can be encountered when using the Internet. (3)
- f) Explain **TWO** solutions that can be implemented in order to counteract such malware. (2)

(Total: 15 marks)

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SECTION B: PROGRAMMING TECHNIQUES AND SYSTEM DEVELOPMENT

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

Question B1

This question is compulsory. Answer all parts.

a) The following is a code snippet in the Java programming language.

```

1  class ExampleJava
2  {
3      public static void main(String args[])
4      {
5          int num;
6          System.out.println("Enter an integer number:");
7
8          Scanner input = new Scanner(System.in);
9          num = input.nextInt();
10         if (num % 2 == 0)
11             System.out.println("_____");
12         else
13             System.out.println("_____");
14     }
15 }
```

- i. Explain briefly what the above algorithm is doing. (1)
- ii. Based on the answer to part (a i), insert the appropriate text in lines 11 and 13 (within the inverted comments). (2)
- iii. Identify the line number whereby a method is being declared. (1)
- iv. Create and instantiate a new object of the class 'ExampleJava' and name it 'exjava'. (1)
- v. Identify **ONE** mistake in the above code snippet and write down the appropriate code required to correct the identified mistake. (2)
- vi. Provided that erroneous inputs by the user such as the inputting of a letter instead of an integer need to be handled, which statements should be included to the above code snippet for such exception handling? (1)
- vii. Arrange the code in lines 11 and 13 so that the number is outputted on screen. (2)

b) The following is a relational table named 'Employees' together with its corresponding fields.

Employees
empID
empName
empSalary
deptNum

- i. It is required that all employees whose salary is greater than 1500 are retrieved. The output should be the name of the employee together with their respective department. Write down the correct SQL code required to perform such a query. (4)
- ii. Which SQL construct should be utilised if the salaries displayed as output to the previous question are to be grouped according to department? (1)
- c) i. Define the term HTML. (2)
- ii. Mention **TWO** HTML tags which are usually associated with lists. (2)
- iii. Write down the correct HTML line of code required to create a link to Google's website (i.e. www.google.com) with the text 'Visit Google's website'. (1)

(Total: 20 marks)

Answer any TWO questions from B2, B3 and B4.

Question B2

An array, A, stores some numbers in random order.

- a) It is required that the numbers in A are sorted in ascending order. In pseudocode, write down a bubble sorting algorithm which is able to sort this array. (10)
- b) Suppose that a particular number is to be retrieved from A. Describe **TWO** search algorithms which can be utilised in such a scenario. (2)
- c) By choosing any **ONE** of the search algorithms mentioned in part(b), write down in pseudocode its implementation. (8)

(Total: 20 marks)

Question B3

- a) i. Explain the difference between top-down and bottom-up *approaches* in system design. (2)
- ii. Mention **TWO** advantages and **TWO** disadvantages for **each** of the approaches mentioned in Question (ai). (4)
- b) Mention **FOUR** criteria which should be considered when selecting a solution during the system life cycle (4)
- c) A new take-away restaurant would like to keep track of the Orders being received. The Order process is conducted as follows:
- A customer places an order by providing his/her name, mobile number and address together with the type of order.
 - The type of order may be a normal one or express delivery. A normal order would take between 30 minutes to 1 hour whilst an express order would be delivered in 20 minutes or less.
 - Once an order is confirmed (i.e. the required information received) and the order is finalised, it is delivered or picked up by the customer and the order record is closed.
- Draw a UML class diagram to represent the classes used in this scenario. (10)

(Total: 20 marks)

Question B4

The main part of the system life cycle process is system implementation where the actual system is put into operation.

- a) Mention and explain **THREE** different types of system implementation methods. (6)
- b) Mention and explain **ONE** advantage for each of the system implementation methods specified in part (a). (6)
- c) Mention and explain **TWO** challenges which might be encountered when implementing a new system. (4)
- d) Every implemented system should be accompanied by a 'user's guide' and 'technical documentations'. Explain **TWO** differences between both terms. (4)

(Total: 20 marks)