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SUBJECT:	<b>Information Technology</b>
PAPER NUMBER:	I
DATE:	25 <sup>th</sup> September 2020
TIME:	9:00 a.m. to 12:05 p.m.

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**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 in this section and any other TWO questions.**

Question A1

**This question is compulsory. Answer all parts.**

- a) Over the past 3 years, there has been a substantial increase in the number of financial institutions adopting data warehousing.
- What is data warehousing? (2)
  - What are **TWO** benefits of data mining for financial institutions? (2)
- b) Project management is concerned with meeting the success criteria of a project.
- Why do project reviews take place in project management? (2)
  - Why is project management important for modern organisations? (2)
- c) Investment by companies in security has also increased over the past years.
- Mention **TWO** ways how a company can protect itself against malicious attacks. (2)
  - What is disaster planning? (2)
  - How can data be protected whilst in electronic transit? (2)
- d) A computer is made up of various subsystems.
- How do the ROM and RAM complement each other in a computer system? (1)
  - What input device would you recommend to a digital graphics artist? (1)
  - Using a diagram if necessary, provide an overview of a typical microprocessor. (4)

**(Total: 20 marks)**

**Questions continue on next page**

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

Question A2

Elinio Ltd are the largest and oldest software development house on the island and they have been entrusted to develop a new software system for the local international airport. Due to the sheer size of the software to be developed, this will, in reality, be a suite of integrated software applications. The aims are to support the airport in all areas such as passenger communication, baggage handling, airplane operations management, resource management and billing.

Whilst Elinio Ltd have vast experience in software development, they have never developed a software system similar to the requirements set by the airport. Also, the airport's final aims and technical details for the software are not finalised. However, both parties would like to start developing the system as soon as possible.

- a) Give a recommendation to Elinio Ltd on whether to develop the new system using the waterfall or the prototyping system lifecycle. Substantiate your choice with **TWO** valid reasons. (5)
  - b) List **FIVE** disadvantages of the lifecycle chosen in part (a). (5)
  - c) List **FIVE** indicators that can be used by Elinio Ltd to ascertain that the airport is really in need of a new system. (5)
  - d) The spiral model is a risk-driven development methodology.
    - i. Describe the activities carried out during the **FOUR** phases of the spiral model. (4)
    - ii. Give **ONE** scenario where you would suggest that this methodology is implemented. (1)
- (Total: 20 marks)**

Question A3

Recently a new airline called MaltaLink started their operations. At the moment, tickets can only be sold at their head-office in Mellieħa. The senior management are keen to start selling tickets via their own website and also the numerous online channels such as KAYAK, Expedia and Skyscanner.

- a) Which processing mode should MaltaLink use for their multipoint online ticket sales application? Explain **TWO** criteria upon which you have reached your conclusion. (6)
  - b) MaltaLink have taken a look at what their competitors are offering through their websites, and they have immediately noticed that a few competitors have opted for a graphics intensive approach, whilst others have designed an interface which is more based on text. Explain to MaltaLink **TWO** advantages and **TWO** disadvantages of each approach. (8)
  - c) It is crucial that the data entered by the customers during checkout is correct. Explain **THREE** validation checks that you would recommend that MaltaLink implement on their section of the website where users are inputting their data. (6)
- (Total: 20 marks)**

Question A4

PrintLocal is an established company specialising in large format printing as well as the manufacturing of shop signage. They have been looking to expand their operations and finally had the opportunity to rent an additional office space in order to support their expansion.

- a) Due to their technical specifications, the manufacturing machines are networked using a ring topology. Explain, with the use of diagrams, how ring topologies work. Your explanation should include **ONE** advantage and **ONE** disadvantage associated with the ring topology. (5)
- b) The computers being installed in the new premises also need to be networked. Which network topology would you recommend that is used? Provide **TWO** valid reasons for your answer. (5)
- c) Provide an overview of **TWO** communication media that can be used with the topology chosen for part (b) above. (5)
- d) The CEO of PrintLocal is intrigued by computer communication. The manufacturing machines which were purchased 10 years ago make use of parallel communication. However newer models are all serial based. The CEO understands that parallel communication makes use of multiple wires to transmit data whilst serial uses only one. Explain how serial communication methods, such as SATA and USB, are much faster than their parallel equivalents. (5)

**(Total: 20 marks)**

**SECTION B: Human Communication and Business Organisations**

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

Question B1

**This question is compulsory. Answer all parts.**

- a) What is meant by the term e-Government? (1)
- b) What is a non-profit organisation? (1)
- c) Provide a definition for Downward Communication. (2)
- d) Give **TWO** examples showing how an employees-only forum can increase morale within an organisation. (2)
- e) Mention **THREE** aims that a company might have when embarking on spreading information to the outside world. (3)
- f) Briefly describe the concepts of authority, responsibility and delegation as a characteristic of organisations. (6)

**(Total: 15 marks)**

***Questions continue on next page***

Question B2

During a recent company meeting at Play2Win Ltd, the idea was floated that the company should have a dedicated Purchasing department. Since their inception in 2011, Play2Win Ltd have provided each functional area within the company a quarterly budget which could be used for any purchasing required.

- a) Mention **THREE** key personnel who should be employed to run the Purchasing department. Explain the duties and responsibilities of these personnel. (6)
- b) Write a detailed report explaining how the Purchasing department can assist Play2Win Ltd in reaching targets for higher profits. (9)

**(Total: 15 marks)**

Question B3

“Your most unhappy customers are your greatest source of learning.” – Bill Gates. Unhappy customers usually reach out to the support offered by the company for assistance.

- a) Give **FOUR** reasons why it is still advisable to provide user manuals even though research shows that customers do not refer to such material. (4)
- b) Explain **THREE** types of support that a company can provide for its customers. (6)
- c) A recent study by ZenDesk has revealed that companies struggle to provide adequate internal support. Write a report detailing how companies can provide the best internal support. (5)

**(Total: 15 marks)**

Question B4

The amount of data being generated and stored by today’s organisations is staggering.

- a) Explain **TWO** benefits for organisations who choose to invest in storing data. (4)
- b) Explain **TWO** difficulties that organisations might encounter when storing large amounts of data. (4)
- c) Networking has made the sharing of data much easier and organisations have taken steps in order to avoid the misuse and sharing of such data.
  - i. Define the terms data protection and information security. (2)
  - ii. List **TWO** factors that compel organisations to implement an information security policy. (2)
  - iii. Highlight **THREE** differences between data protection and information security. (3)

**(Total: 15 marks)**



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SUBJECT:	<b>Information Technology</b>
PAPER NUMBER:	II
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TIME:	9:00 a.m. to 12:05 p.m.

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**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 in this section and any other TWO questions.**

Question A1

**This question is compulsory. Answer all parts.**

- a) Although the Internet, extranets and intranets all rely on the same TCP/IP technologies, they all differ in terms of the levels of access.
- i. What is the difference between intranets, extranets and Internet? (3)
  - ii. What is the purpose of TCP/IP in this case? (1)
- b) The three levels present in a database architecture are the Physical level, Conceptual level and External level. Briefly describe these **THREE** levels. (3)
- c) Name **TWO** advantages that a distributed database system has over a centralised database system. (2)
- d) What is the correct HTML element for:
- i. representing a paragraph? (1)
  - ii. creating a hyperlink? (1)
  - iii. creating an unordered list? (1)

***Question continues on next page***

e) Refer to Table 1 called Suppliers with the following data:

Table 1: Suppliers

<u>SupplierID</u>	SupplierName	City
100	Microsoft	Washington
200	Google	California
300	Oracle	California
400	Apple	Noah
500	Amazon	Frankfurt
600	Rakuten	London
700	Samsung	London

Write an SQL statement to produce the following output:

<u>SupplierID</u>	SupplierName	City
200	Google	California

(3)

**(Total: 15 marks)**

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

Question A2

This question is about Internet-related software.

- a) Whilst the Internet makes much of our lives easy by making it possible for us to connect to anyone no matter where we are on the globe, it also allows Internet fraud to reach into our daily lives. Define Internet fraud. (2)
  
- b) Mobile phone communication has made calling, messaging, chatting, and video calling a real-time event as it is convenient and cost-effective. However, its disadvantages cannot be overlooked. Discuss **TWO** such disadvantages. (2)

- c) The following email message was sent by a cyber-criminal. Efforts were made by the cyber-criminal to make this email message appear to be legitimate. The sender email address was faked to appear to come from a university's HR department and the document link led to a fake login page.

From: HR@university.edu  
Subject: Message from human resources  
Date: April 13, 2019 at 9:29:54 PM PDT  
To: XXXXX@university.edu

Dear XXXXX@university.edu

An information document has been sent to you by the Human Resources Department.

Click [here](#) to Login to view the document. Thank you!

University HR Department  
© 2019 The Regents of the University. All rights reserved.

- i. What is this type of internet scam called? (1)
- ii. What is the purpose of this internet scam? (2)
- iii. Discuss **TWO** possible solutions to the above scam. (4)
- d) Jack has built an HTML website and wants his users to be able to access it from the Internet.
- i. Which protocol is used by the World Wide Web to define the actions taken by web services and browsers? (1)
- ii. He wants to push his files to a remote server from his local computer and would also like to transfer some files. Which protocol should be used in order to achieve this? (1)
- iii. To make use of the email, Jack makes use of the Simple Mail Transfer Protocol (SMTP), Post Office Protocol (POP3) and Internet Message Access Protocol (IMAP). Identify **ONE** difference between the SMTP and POP3 protocols and **ONE** difference between the POP3 and IMAP protocols. (2)

**(Total: 15 marks)**

**Questions continue on next page**

Question A3

This question is on categories of software

- a) Evaluation reports include essential parts and processes of an evaluation. Name **THREE** key components usually found in an evaluation report. (3)
- b) i. What is a utility program? (1)
  - ii. How does it differ from an application program? (2)
  - iii. Name, and describe, **TWO** utility programs normally provided with an Operating System. (4)
- c) Different types of operating systems exist. One such operating system operates in environments where tasks involve managing network resources and users.
  - i. Identify this type of operating system. (1)
  - ii. Describe the main purpose of this type of operating system. (2)
  - iii. Give **TWO** examples of such an operating system. (2)

**(Total: 15 marks)**

Question A4

This question is about Database Systems

- a) A library uses the following table to store details of students, the books they have borrowed and when they borrowed them. The Primary Key is (StudentID, BookID).

Table: LOAN

<u>StudentID</u>	StudentName	<u>BookID</u>	BookTitle	Date
S1	White	B1	Python	12-Apr-2019
S2	Smith	B2	Databases	17-Jan-2019
S3	Borg	B1	Python	25-Feb-2019

- i. Which normal form does the above table violate and why? (3)
- ii. Normalise the table to achieve 3rd normal form. (3)
- b) BestArt is a gallery that sells paintings by well-known artists. The gallery wants to store its information about its artists and customers in a database.
  - Information on customers include the customer’s unique ID, name, address, the total amount of Euro spent in the gallery and the artists and groups of arts that that customer tends to like.
  - The information on artists include their names, age and style of work.
  - For each piece of artwork, the artist, the year it was painted, its unique title and its price must also be stored.
  - Pieces of artwork are also classified into groups of portraits, still life etc. One given piece may belong to more than one group.

Draw the Entity Relationship diagram for the database. (6)
- c) A relational database is one example of a data model. Name **THREE** other data models. (3)

**(Total: 15 marks)**



**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 Java code snippet.

```

1  public class QuestionB1
2      {
3      public void Method1(int [] array)
4          {
5              int m = 0;
6              for(int i=0; i<array.length; i++ )
7                  {
8                      if(array[i]>m)
9                          {
10                             m = array[i];
11                         }
12                     }
13                 System.out.println("_____"+ m);
14             }
15         }

```

- i. Include text in line 13 (within the inverted commas) to display what the algorithm is doing. (2)
  - ii. Create and instantiate an object of QuestionB1 called B1. (1)
  - iii. Assuming an array called MyArray, produce code which will call the method Method1 for B1. (2)
  - iv. Is the above method a function? Justify your answer. (5)
  - v. From the above code snippet, give an example of a:
    - a. declaration;
    - b. initialisation;
    - c. assignment statement;
    - d. increment;
    - e. condition. (5)
- b) i. Make the element below into a link that goes to "https://www.um.edu.mt". (3)

**<a \_\_\_\_\_ "https://www.um.edu.mt">This is a link</a>**

- ii. For the HTML code below, add the correct HTML tag to add a heading with the text "HTML". (2)

**<p>Hypertext Markup Language is the standard markup language for documents designed to be displayed in a web browser. </p>**

**(Total: 20 marks)**

Question B2

- a) Identify **TWO** advantages of Unified Modeling Language (UML) diagrams. (2)
- b) How does a use-case diagram differ from a DFD (Data Flow Diagram)? (2)
- c) Good Choice Pizza is a company who would like to install a system to record orders for pizza. When a customer phones to order, his telephone number is stored in the system. Once the order is taken, the total, including tax and delivery is calculated. The order is then given to the cook and a receipt is printed. Drivers who make the deliveries give customers a copy of the receipt. Weekly totals are kept by management for comparison with the previous year's performance.
- i. From the above scenario identify the:
- a. external entities;
  - b. processes; and
  - c. data stores. (10)
- ii. Draw a context diagram (level 0) DFD diagram for the scenario in part (c). (6)
- (Total: 20 marks)**

Question B3

- a) To perform software testing, there are software testing strategies that can be followed, such as unit testing and integration testing.
- i. What are the purposes of using unit testing and integration testing? (2)
- ii. Who performs unit testing and who performs integration testing? (2)
- iii. Name **TWO** advantages of unit testing. (2)
- b) Distinguish between white-box testing and black-box testing. (2)
- c) Alpha testing is one type of user acceptance testing.
- i. When is Alpha Testing usually performed? (1)
- ii. Give **ONE** reason why alpha testing is important. (1)
- d) Distinguish between top-down and bottom-up approaches in the design stage of the waterfall model. (2)
- e) As technologies are continuously changing, many businesses find themselves needing to change over their computer information systems.
- i. Explain **ONE** situation where a phased transition would be advisable. (1)
- ii. Suggest **ONE** advantage and **ONE** disadvantage of:
- a. parallel changeover; (2)
  - b. direct changeover. (2)
- f) Give **THREE** reasons why a system may require maintenance. (3)
- (Total: 20 marks)**

Question B4

- a) Assume that the number X needs to be searched in an unsorted list (array) of numbers. Using either a flowchart or pseudocode, design the algorithm for the linear search of X. The algorithm must display whether X has been found or not, since the case may be that the number X is not on the list. (9)
- b) Describe **TWO** characteristics of the Object-Oriented Programming (OOP) paradigm. (4)
- c) In programming:
- i. Define the loop construct. (1)
  - ii. Name the **THREE** types of loop constructs and explain the difference between them. (6)
- (Total: 20 marks)**