L-Università
ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

**ADVANCED MATRICULATION LEVEL
2019 SECOND SESSION**

SUBJECT: **Information Technology**
PAPER NUMBER: I
DATE: 2nd September 2019
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 in this section and any other TWO questions.

Question A1
This question is compulsory. Answer all parts.

a) Prototyping has recently taken over as one of the most popular approaches to software development. In contrast, the waterfall model is one of the most traditional information systems development methodologies.
   i.   Describe **TWO** scenarios in which one would consider making use of prototyping.   (2)
   ii. Under which conditions would the waterfall methodology be more suitable than prototyping?   (2)
   iii. Mention and describe **TWO** other software development methodologies.   (4)

b) What are the conditions that would make data mining a valuable resource?   (3)

c) How is data warehousing related to data mining?   (3)

d) Data being stored in a database needs to be validated. Mention and explain **TWO** data validation checks that can be implemented.   (4)

e) Is it possible for a software product to pass verification tests but fail validation tests? Give an example.   (2)
(Total: 20 marks)

Questions continue on next page

Answer any TWO questions A2, A3 and A4.

Question A2
The year 1959 saw the introduction of the first commercial artificial neural network applied to a real-world problem (*Talking Nets: An Oral History of Neural Networks).* In the past few years, we have experienced a resurgence of interest and research in artificial neural networks.

a)   What developments could have brought about this new interest?   (4)

b)   Expert systems might soon be replaced by machine learning and artificial neural networks. In which scenario would you consider using an expert system rather than an artificial neural network? Give **THREE** valid reasons for your answer.   (4)

c)   In the context of information systems life cycle, list and explain **TWO** issues that would indicate the need for a new system.   (2)

d)   Give an overview of the main stages in the information systems life cycle.   (10)
(Total: 20 marks)

Question A3
The development of HCI made computers more accessible to the masses. For example, the introduction of GUIs has revolutionised the home computing industry.

a)   What is the other main interface style apart from GUI?   (1)

b)   Mention **TWO** disadvantages associated with GUI and **TWO** disadvantages associated with the interface style mentioned in part a) above.   (4)

c)   Mention and outline the basic psychological factors which are taken into consideration when designing good software.   (6)

d)   GUIs have been the standard for quite a number of years.
     i.   Mention and explain **THREE** emerging technologies that are expected to change how people interact with their computers.   (6)
     ii. Explain a limitation for each of the mentioned emerging technologies.   (3)
(Total: 20 marks)

Question A4
A local private school has noticed a sharp increase in the forgeries of its certificates and is being overwhelmed with requests from prospective employers wanting to check if a certificate being presented is genuine or otherwise.

a)   The management of the school is looking into innovative solutions.
     i.   What would be **ONE** advantage of using a decentralised system, such as the blockchain, in order to handle the issuing and the verification of certificates?   (2)
     ii. What would be **ONE** advantage of using a centralised system instead?   (2)

b) The school is considering upgrading its backup methods.
   i. Provide **TWO** reasons why a RAID system is better than a standard back-up procedure.
   (4)
   ii. Explain **TWO** other backup methods. (4)

c) The management is not giving the right importance to data integrity.
   i. Explain the importance of data integrity. (2)
   ii. Explain **THREE** ways how data integrity can be secured. (6)
   (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 are **THREE** benefits of the Government of Malta's e-id system? (3)

b) Mention **THREE** ways in which businesses can increase the productivity of their employees, even when the employees do not physically report at the company's offices. (3)

c) What is the role of a forum within a user support system? (3)

d) Mention and explain **THREE** functional areas within an organisation. (6)
   (Total: 15 marks)

Question B2
With the rise of digital communication services such as Slack, verbal communication has fallen on the wayside.

a) Landlines and mobiles are arguably the most popular technologies related to verbal communication. Mention **TWO** other verbal communication technologies highlighting each technology's features and advantages. (4)

b) A team of software developers working on a common project are currently communicating using non-verbal, digital means. Why is it important for them to engage in verbal communication too? (5)

c) Internal communication within an organisation can be carried out either through the grapevine or else also through lateral communication.
   i. How does grapevine differ from verbal communication? (3)
   ii. Give a brief description of lateral communication. (3)
   (Total: 15 marks)

Questions continue on next page

Question B3

A local independent school wishes to make better use of their resources and maximise their income by offering courses outside their classrooms.

a) What is the technical term for this kind of learning? (1)

b) What are **TWO** disadvantages associated with this kind of learning? (2)

c) Provide a definition of the main tool that the school can make use of in order to manage such a learning system? (2)

d) ICT has left its mark on various sectors beside education. Discuss how ICT has impacted the leisure industry. (10)

(Total: 15 marks)

Question B4

The HR department of a local software development company noted an increase in the use of sick-leave. Answer the following questions considering that most employees carry out their work using ICT.

a) Mention and explain any **THREE** computer work related disorders that could be causing this problem. (6)

b) What recommendations would you give to the employer in order to reduce the occurrences of such disorders? (4)

c) What are the responsibilities of employers towards the health and safety of their employees? (5)

(Total: 15 marks)

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**ADVANCED MATRICULATION LEVEL
2019 SECOND SESSION**

SUBJECT:	**Information Technology**
PAPER NUMBER:	II
DATE:	3rd September 2019
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: SOFTWARE

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

Question A1
This question is compulsory. Answer all parts.

a) What methods can be used in order to insert data into a database? (2)

b) With reference to Table 1 provide an example of the following:
   i. alphanumeric field;
   ii. possible key field;
   iii. foreign key;
   iv. numeric field. (4)

Table 1

Employee ID	LastName	FirstName	Mobile	Office	Project Assigned	Department ID
AA123	Borg	Mark	12345678	Marsa	Network	1
BB234	Abela	Petra	23456789	Hamrun	Database	2
CC456	Galea	Daniela	34567890	St Julians	Network	1
DD789	Bugeja	Noah	45678901	Sliema	Database	2
EE012	Fsadni	Mariah	56789012	Marsa	Programming	2
FF345	Grech	Kristian	67890123	Sliema	Programming	2
GG456	Camilleri	Andrew	78901234	Hamrun	Network	1

c) In order to reduce costs, a local company wishes to switch to Linux OS. Since Linux is free, cost cannot be used as a criterion for evaluating different Linux distributions. Outline **THREE** criteria which can be used to evaluate different Linux distributions. (3)

d) Explain **THREE** major components of any operating system. (3)

e) Your local hairdresser is still making use of traditional filing systems to keep details of his customers. Explain **THREE** advantages that databases would bring over the hairdresser's current system.

(3)
(Total: 15 marks)

Answer any TWO questions A2, A3 and A4.

Question A2
Linux was originally intended as a competitor in the desktop OS space. Over time it has become very popular in the server and the mobile space. It has yet to make significant inroads into the desktop space.

a) Mention **TWO** competitors of Linux in the desktop space. (4)

b) Linux is very flexible when it comes to its user interface. KDE, GNOME and MATE are examples of various GUIs available. There is also a CLI available through a terminal emulator.
   i. List and explain any **THREE** major features of Linux based operating systems.
   ii. Describe **THREE** scenarios where you would recommend the use of a CLI over a GUI.
   (6)

c) Why do you think that Linux has not become popular on desktop computers? (2)

d) Which type of operating system was developed in order to solve the problem of under-utilisation of CPU and main memory? (3)
   (Total: 15 marks)

Question A3
Applications utilised by millions of people every day have been made possible through extensive use of Database Management Systems (DBMS).

a) Mention **ONE** example of a DBMS application. (1)

b) Mention **TWO** applications (apart from the banking sector) which are made possible through the use of DBMS. (2)

c) WeBank PLC have appointed a DBA to take care of their ever-growing database. Mention **FOUR** benefits that the DBA will bring to the company. (4)

d) The database of WeBank PLC stores all the information related to the bank's operations - employee details, client details, account details as well as suppliers and partners. Which **TWO** DBMS features can the DBA utilise in order to restrict what data can be accessed by different users? (2)

e) Database commands can be broadly divided into four categories; namely DDL, DML, DCL and TCL. DCL handles the data control features whilst the TCL deals with the transactions within a database.
   i. What is the purpose of the DDL? (1)
   ii. What is the purpose of the DML? (1)
   iii. Mention **TWO** commands that are part of the DDL subset. (2)
   iv. Mention **TWO** commands that are part of the DML subset. (2)
   (Total: 15 marks)

Question A4
This question is about Internet Technologies.

a) Write HTML code that would show on the HTML page an image from the following URL:
https://imgur.com/gallery/image.jpg   (2)

b) Modify the HTML in part (a) so that when the image is clicked the user is taken to the following URL:
https://www.um.edu.mt/matsec   (2)

c) Write code that links an HTML page to a CSS file. The CSS file is found at the following URL:
https://maxcdn.bootstrapcdn.com/bootstrap.css   (2)

d) In which section of the HTML document would you include the code produced for part (c)?
(1)

e) How can a protocol be used in order to transfer HTML files?   (2)

f) How can HTML pages be stored in order to be consumed later by visitors?   (2)

g) Apart from an internet connection, what do visitors require in order to be able to process HTML files?   (2)

h) A client wants to add client-side validation to her website. What technology should be used to achieve this validation?   (2)

(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.

The following is a program snippet:

```
1    public class QuestionB1 {
2        public static void main(String args[]) {
3         int sentinel = 25;
4         int[] numbers = {10,20,30,40,50};
5         boolean success = false;
6
7         for (int i = 0; i < 5; i++)
8         {
9            if (numbers[i] == sentinel) {
10                System.out.println("Operation is a success.");
11                success = true;
12              }
13         }
14
15            if (success==false) System.out.println("Operation was a failure.");
16          }
17   }
```

a) Answer the following questions in regard to the code shown above.
   i.   Write down the exact output of this application.   (1)
   ii. What is the purpose of the code from lines 7 to 13?   (2)
   iii. What would the value of the variable success be if the value of the variable sentinel is changed to 20?   (2)
   iv. Modify the code so that the sentinel and numbers variables are inputted from the keyboard rather than being fixed values.   (5)

b) Explain the following SQL statement

   SELECT * FROM Employees WHERE Office='Marsa';   (3)

c) Explain how you can modify the statement in part (b) to retrieve only employees whose surname is "Borg" and are part of the Office in "Sliema". Assume that the Surname attribute exists in the relation.   (2)

d) Write CSS code to change the text of an HTML heading with ID "MyHeading" so that it has the following attributes:
   i.   Color: Red
   ii. Font: Verdana
   iii. Text is centrally aligned   (5)
                                                                              (Total: 20 marks)

Question B2

a) Declarative programming is one of the main programming paradigms. What are the main aspects of this paradigm that set it apart from other programming paradigms? (4)

b) A JAVA class called *Calculation* has two methods called *Addition* and *Subtraction*. It also contains an attribute called Answer. Write a class called *MyCalculation* that inherits from the *Calculation* class in order to add a *Multiplication* method.

The *Multiplication* method should accept two integer parameters (x and y) and set the attribute *Answer* to be the multiplication of x and y. Finally the method should output the value of the variable *Answer*. (8)

c) Write JAVA code that creates an object of type *MyCalculation* called *Demo*. Your code should subsequently call the *Multiplication* method. (4)

d) From your code list **FOUR** reserved words. (4)
(Total: 20 marks)

Question B3

You have been employed at a software development house for a number of months and you have noticed that their software development process consists of just the design, implementation and maintenance stages. This has led to a number of projects being out of spec or else cancelled entirely.
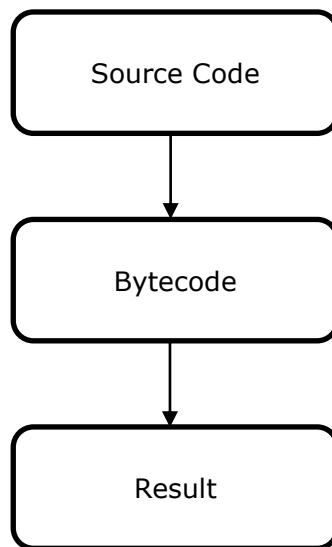
Write a report to the management detailing the steps that you would follow in order to establish a more comprehensive software development model. For each step you are required to thoroughly explain the aims, objectives and outcomes.
(Total: 20 marks)

Questions continue on next page

Question B4

a) Programmers write instructions in various programming languages; which can be divided into three general types: Machine language, Assembly language and High-level languages. Highlight the difference between these generations of programming languages. (6)

b) Any JAVA code developed needs to be converted into a machine understandable language. The diagram below represents a simplified overview of such a procedure.

```
┌─────────────────┐
│   Source Code   │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│    Bytecode     │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│     Result      │
└─────────────────┘
```

   i. Which tool is used in order to develop the source code? What are the main features of this tool? (3)

   ii. Which tool is responsible for converting the bytecode into actual code that can be run on the computer? Explain how this tool helps in achieving JAVA's aim of portability. (4)

   iii. Where does the JAVA compiler fit in the diagram above? What are the main characteristics of the JAVA compiler? (3)

   iv. What type of errors can occur between the Source Code and the Bytecode stage? How are these different from the kind of errors that can occur during the execution of the application being developed? (4)

(Total: 20 marks)