Index Number:_____ SEC09/1.19m

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL
2019 MAIN SESSION

SUBJECT:	**Computing**
PAPER NUMBER:	I
DATE:	13th May 2019
TIME:	9:00 a.m. to 11:05 a.m.

Directions to Candidates

Write your index number where 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 85 marks of the examination.

Question Number	1	2	3	4	5	6	7	8	9	10	11	12	**FOR MARKERS' USE**
For Markers' use only		Total number of Marks or Grade obtained by candidate											
MARKS													

1. a. Convert the hexadecimal number E3 to binary.

_____

_____

_____ (1)

b. Convert the hexadecimal number EA to decimal.

_____

_____

_____ (1)

c. Convert the unsigned binary number 11001011 to decimal.

_____

_____

_____ (1)

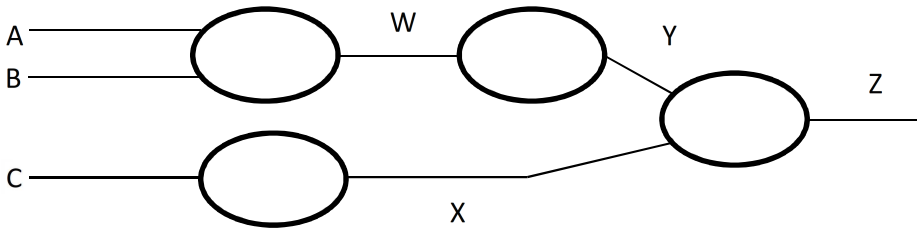
d. Explain why hexadecimal numbers are often used to represent binary numbers.

_____

_____ (1)

(Total: 4 marks)

2. The following shows a partly drawn circuit and a partly completed truth table. Write AND, OR or NOT in each of the logic gates and complete the truth table so that the circuit and truth table match.



(4)

A	B	C	W	X	Y	Z
0	0	0		1	1	
0	0	1	0			
0	1	0				0
0	1	1				
1	0	0				
1	0	1	1			
1	1	0				0
1	1	1		0		

(4)

(Total: 8 marks)

3. Many computer systems now use speech recognition as an input method.

   a. With respect to speech recognition, define the term analogue data.

   _____ (1)

   b. Describe **TWO** benefits and **TWO** possible problems of speech recognition over a traditional keyboard and mouse input method.

   Benefits: _____

   _____

   _____

   _____

   Problems: _____

   _____

   _____

   _____ (4)

   c. Describe the process of storing voice data in digital form on a computer.

   _____

   _____ (2)

(Total: 7 marks)

4. A laptop is supplied with a 1.9 GHz dual-core Central Processing Unit (CPU), 4 GB of RAM and an inbuilt HD graphics card. The user can expand the RAM capacity up to 8 GB.

   a. How does the laptop make use of RAM?

   _____

   _____

   _____ (1)

   b. Give a reason why a computer with 8 GB of RAM could run several large programs faster than a computer with 4 GB of RAM.

   _____

   _____ (1)

   c. What is a dual-core CPU? Give a possible benefit of its use.

   _____

   _____ (2)

   d. Give the meaning of the term 1.9 GHz.

   _____

   _____ (1)

(Total: 5 marks)

5. A student table in a school database contains the following fields:
   idnumber, dateOfBirth, name, surname, age, classID

   a. Give the data type for each field mentioned above.

   _____

   _____

   _____ (3)

   b. State which of these would you choose as the primary key.

   _____ (1)

   c. Name which of these fields is unnecessary. Explain.

   _____ (1)

d. Which of these fields is likely to be a foreign key?

_____ (1)

e. The database of student records can be accessed either serially (serial access) or directly (direct access). Which of these two:

i. is generally quicker for retrieving a student's record? Give a reason for your choice.

_____

_____ (2)

ii. would require the database to be sorted or indexed?

_____ (1)

iii. would be used to mail merge a newsletter for the entire school? Give a reason for your choice.

_____

_____ (2)

(Total: 11 marks)

6. Match these terms with their definition:

URL, bookmark, HTML, web server, attachment, web client

a. A computer on which a website is hosted:_____ (1)

b. A language used to design web pages:_____ (1)

c. Software used to browse a website:_____ (1)

d. The address of a web page:_____ (1)

e. A document sent with an email:_____ (1)

f. A saved link to a favourite web page:_____ (1)

(Total: 6 marks)

Please turn the page.

7. Identify the environment where the following software packages are used.

   a. IDE (Integrated Development Environment):

   _____ (1)

   b. Media Player:

   _____ (1)

   c. Digital Audio Workstation:

   _____ (1)

   d. CD Ripper:

   _____ (1)

   (Total: 4 marks)

8. A computer system inputs data, processes it, and then outputs information.

   a. List **ONE** device that could be used for both input and output.

   _____ (1)

   b. For the device mentioned in part (a), describe:

      i. an application for which it is appropriate;

      _____ (1)

      ii. how the required data is inputted;

      _____ (1)

      iii. what processing is required for the application mentioned in part b (i) using this device;

      _____

      _____ (2)

      iv. how the relevant data is outputted.

      _____ (1)

   (Total: 6 marks)

9. One example of a dedicated computer system commonly found in the home is a TV box, which connects to a television set and can stream Internet media and TV programs.

   a. What is a dedicated computer system?

   _____ (1)

   b. What type of long-term storage would a TV box typically have?

   _____ (1)

   c. What is this long-term storage mostly used for?

   _____ (1)

   d. What sort of input device would the TV box have?

   _____ (1)

   (Total: 4 marks)

10. a. What is the role of a device driver in an operating system?

   _____ (1)

   b. Differentiate between shareable and non-shareable resources. Give an example of each.

   _____

   _____ (2)

   c. Provide **ONE** advantage of a networked system and **ONE** advantage of a standalone system.

   _____

   _____ (2)

   d. What is a distributed database?

   _____ (1)

   (Total: 6 marks)

Please turn the page.

11. An auto dealer has 8 shop assistants who serve customers, 3 office staff who handle the administration and a manager. A specialised company is asked to design and implement a new computer system for the auto dealer.

    a. Why is system analysis required in this case?

    _____

    _____ (1)

    b. One type of the documentation that needs to be produced is a detailed user manual.
       i. Name **TWO** things one would expect to find explained in such a manual for the auto dealer.

       _____

       _____

       _____ (2)

       ii. Nowadays, most user manuals are only available for download in digital form. Mention **TWO** advantages a digital version has over a printed version.

       _____

       _____

       _____ (2)

    c. The other two types of documentation are technical and program documentation. Differentiate between the two.

    _____

    _____ (2)

    d. The new system is implemented using parallel running. Outline what is meant by parallel running.

    _____

    _____ (2)

    e. Outline **TWO** reasons for choosing parallel running as opposed to a direct changeover.

    _____

    _____ (2)

(Total: 11 marks)

12. a. Give an example of a Java construct used for:

i. branching: _____ (1)

ii. iteration: _____ (1)

b. What is output in each of the following:

i. `System.out.println("(10+2*5)");` _____ (1)

ii. `System.out.println((10+2*5));` _____ (1)

iii. `System.out.println("((10+2)*5)");` _____ (1)

iv. `System.out.println(((10+2)*5));` _____ (1)

c. The following program is supposed to convert a month in digit format to its textual equivalent. The expected output of the following snippet is "The equivalent of 3 is March". However, the actual output is "The equivalent of 3 is April".

```
public static void main(String[] args)
{
    int month = 3;
    String monthText = "";
    switch (month)
    {
        case 1:
            monthText = "January";
        case 2:
            monthText = "February";
        case 3:
            monthText = "March";
        case 4:
            monthText = "April";
    }
    System.out.println("The equivalent of " + month + " is " + monthText);
}
```

i. Identify the bug causing the unexpected result.

_____

_____ (2)

ii. What type of error is this?

_____ (1)

iii. How can program tracing help a programmer in the debugging process?

_____

_____ (2)

This question continues on next page.

iv. Explain the other **TWO** types of errors that can occur whilst programming apart from that mentioned in part (ii).

_____

_____

_____

_____ (2)

(Total: 13 marks)

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Index Number:_____ SEC09/2A.19m

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL
2019 MAIN SESSION

SUBJECT:	**Computing**
PAPER NUMBER:	IIA
DATE:	14th May 2019
TIME:	4:00 p.m. to 6:05 p.m.

Directions to Candidates

Write your index number where 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 85 marks of the examination.

Question Number	1	2	3	4	5	**FOR MARKERS' USE**
For Markers' use only **MARKS**	Total number of Marks or Grade obtained by candidate					

1. a. What are binary numbers?

_____

_____ (1)

b. The binary pattern 1011 0111 can represent different numbers.

i. State its value in decimal if it represents an unsigned binary number.

_____

_____

_____

_____ (1)

ii. State its value in decimal if it represents a 2's complement binary number.

_____

_____

_____ (1)

iii. Hence add the value in part (ii) to 33 in 8-bit two's complement.

_____

_____

_____ (1)

iv. Name **TWO** other items a binary bit pattern can represent.

_____

_____ (2)

c. By using a truth table prove the following result:
A.B + $\bar{A}$.B = B

_____

_____

_____

_____

_____

_____

_____ (2)

d. **W**, **X**, and **Y** are three binary signals, where **WX** is a two-bit binary number and **Y** is a control signal. The output **Z** is related to these 3 signals in the following way:
- when **WX** > 1 and is prime and **Y**=1, then **Z**=1;
- otherwise **Z**=0.

i. What is the largest decimal number that can be stored in WX?

_____ (1)

ii. Draw a truth table for **Z.**

_____

_____

_____

_____

_____

_____

_____

_____

_____ (3)

iii. Hence or otherwise, find a Boolean expression for **Z.**

_____

_____

_____ (2)

iv. Draw a logic diagram for **Z**.

(3)

(Total: 17 marks)

Please turn the page.

2. A company called PICAcard allows customers to pay for their goods electronically by using a debit/credit card.

   a. Give **ONE** method of capturing data from the debit/credit card.

   _____ (1)

   b. The integrity of the data collected and recorded by PICAcard is critical to ensuring secure transactions to its customers.

      i. What is data integrity?

      _____

      _____ (1)

      ii. Give **TWO** reasons why it is important.

      _____

      _____ (2)

      iii. Describe **TWO** methods, how data integrity is maintained.

      _____

      _____

      _____ (2)

   c. i. What is data security?

      _____

      _____ (1)

      ii. Outline **ONE** method used to maintain the security of the data being sent over a network.

      _____ (1)

   d. PICAcard is required by law to register with the Data Information Commissioner before they store any personal data.

      i. Name **TWO** other responsibilities required of PICAcard by the Data Protection Law.

      _____

      _____ (2)

      ii. What term is used in the Data Protection Law to describe PICAcard?

      _____ (1)

e. PICAcard is required to implement a security strategy. Describe **TWO** reasons why PICAcard requires a security strategy.

_____

_____

_____

_____ (2)

f. Electronic payment is commonly used when buying goods on the Internet. Describe **TWO** advantages and **TWO** disadvantages for customers who shop online.

_____

_____

_____

_____ (4)

(Total: 17 marks)

3. a. The Operating System (OS) is responsible for the management of computer hardware. Which management role is involved in the execution of each of the following instructions? Explain your answer.

i. `int x = 0;`

_____

_____ (2)

ii. `x = 5 + 2;`

_____

_____ (2)

iii. `System.out.println("Hello!");`

_____

_____ (2)

This question continues on next page.

b. Melita Car Rentals has been recording car rental bookings using spreadsheets and email communication for several years. It has now decided to adopt new tailor-made software for the recording of car rentals to ensure rental data is kept up to date.

i. Outline **TWO** reasons why it is important that the system requirements are clearly stated and different personnel is involved during the design stage.

_____

_____ (2)

ii. Outline **TWO** reasons why testing is important for the new system.

_____

_____ (2)

iii. Outline **TWO** different types of maintenance that are likely to be needed following implementation.

_____

_____ (2)

c. Melita Car Rentals would like to start sending newsletters and promotions to their prospective customers. What computer processing mode is used to mail the newsletter? How does it work?

_____

_____ (2)

d. As part of their marketing, Melita Car Rentals upload several high definition videos on their website to promote their car rental company. However, website visitors trying to view these videos have complained of long buffering periods.

i. Explain the term bandwidth in this context.

_____

_____ (1)

ii. Give **TWO** suggestions to help reduce buffering periods.

_____

_____ (2)

(Total: 17 marks)

4. An accumulator holds the unsigned 8-bit number 00001100.

   a. What is the value of the number in the accumulator in decimal?

   _____

   _____

   _____ (1)

   b. Show the binary contents of the accumulator after a logical left shift operation.

   _____ (1)

   c. What is the value of the accumulator in decimal now?

   _____ (1)

   d. What is the effect of a logical left shift on the value in the accumulator?

   _____ (1)

   e. After how many left shifts will the value 00001100 become 00000000?

   _____

   _____ (1)

   A CPU has an 8-bit unsigned accumulator. The instruction `SHL` performs a logical left shift operation. Consider the following assembly code:

```
LDA num  ; load the value at location num into the accumulator
SHL      ; shift the bits in the accumulator left
ADD num  ; add the value at location num to the accumulator
STA num  ; store the accumulator in location num
```

   f. Assuming location `num` initially holds the number 6, what value is left in `num` after this code executes?

   _____

   _____ (3)

   g. What is the effect of this code on the value in location `num`?

   _____

   _____ (1)

This question continues on next page.

The following assembly code is written for a CPU with an 8-bit unsigned accumulator:

```
      LDA #255    ; load the 8-bit number 255 into the accumulator
rep:  STA counter ; store the accumulator in location counter
      LDA num1    ; load the accumulator from location num1
      ADD num2    ; add the contents of location num2 to the accumulator
      STA num1    ; store the accumulator in location num1
      LDA counter ; load the accumulator from location counter
      SHL         ; shift the bits in the accumulator left by one bit
      JNZ rep     ; if the accumulator is not 0 jump to label rep
      HLT         ; stop execution of this program
```

h. From the code snippet above, identify:

i. a label: _____ (1)

ii. an immediate operand: _____ (1)

iii. a symbolic address: _____ (1)

iv. a conditional branch instruction: _____ (1)

v. an opcode: _____ (1)

i. Assuming 5 is initially stored in location `num1`, and 10 is stored in location `num2`, trace the values of `num1`, `num2` and `counter` as they change during the execution of the above code:

num1	num2	counter
5	10	

(3)

(Total: 17 marks)

5. a. A car radio has five buttons so that a user can select one of the five preferred stations. The table below is an example of the radio frequencies stored in the radio.

1	2	3	4	5
104.9	105.8	97.7	88.91	102.3

Construct an algorithm, in pseudocode, that calculates the range of frequencies (i.e. finds the highest and lowest frequencies and then calculates the difference between them) of any set of five selected radio stations.

(5)

b. The following search algorithm is supposed to search for a name (nameToSearch) in a list of names (namesArray). The algorithm should be case insensitive and should provide one line of feedback indicating whether the name is found or not

```
String[] namesArray = { "John", "Peter", "Jane", "Maria" };
String nameToSearch = "john";

for (int i = 1; i < namesArray.length; i++)
{
    if (namesArray[i].equals(nameToSearch))
        System.out.println(nameToSearch + " found at position " + i);
    else
        System.out.println(nameToSearch + " not found!");
}
```

i. Write the exact output produced by this code.

(1)

ii. Identify **THREE** mistakes in the code snippet.

(3)

iii. Rewrite the code fixing the mistakes identified in part b (ii).

(4)

c. Differentiate between 3rd Generation and 4th Generation languages.

(2)

d. Explain the term software portability.

(2)

(Total: 17 marks)

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Index Number:_____ SEC09/2B.19m

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MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL
2019 MAIN SESSION

SUBJECT:	**Computing**
PAPER NUMBER:	IIB
DATE:	14th May 2019
TIME:	4:00 p.m. to 6:05 p.m.

Directions to Candidates

Write your index number where 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.
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Question Number	1	2	3	4	5	**FOR MARKERS' USE**
For Markers' use only **MARKS**	Total number of Marks or Grade obtained by candidate					

1. a. What are binary numbers?

_____ (1)

b. The binary bit pattern $0011\ 0111_2$ can represent different numbers.

i. Convert the binary number $0011\ 0111_2$ into hexadecimal.

_____

_____ (1)

ii. Convert the binary number $0011\ 0111_2$ into decimal.

_____

_____ (1)

iii. Name **TWO** other items a binary bit pattern can represent.

_____ (2)

iv. Perform a binary shift left on the binary pattern given in part (b). What is actually happening when the binary bits are shifted one place to the left?

_____

_____ (2)

c. Convert the decimal number 87_{10} into binary.

_____

_____ (1)

d. Name the two-input logic gates. Draw the truth table for each of the logic gates.

_____

_____

_____

_____

_____

_____

_____

_____ (2)

e. By using the truth table below prove the following Boolean identity:

A + (Ā.B) = A + B

A	B	Ā	Ā.B	A + (Ā.B)	A + B
0	0				
0	1				
1	0				
1	1				

(2)

f. Using a truth table similar to the one in part (e), prove the following Boolean identity:

(A.B) + (Ā.B) = B

(3)

(Total: 15 marks)

2. Mica bought a personal computer to help him out with his small business. The computer is supplied with a hard disk drive (HDD), an optical drive, some application software packages and an Internet connection.

a. Mica is not sure which application is most suitable for the different tasks he needs. For the tasks listed below, help Mica choose the most suitable type of application software package.

Task	Application Software Package
Creating a formal letter	
Recording the monthly expenditure for his business	
Keeping his customer records	
Promoting the company's products to a large audience	
Creating a company logo	

(5)

This question continues on next page.

b. Compare the functional characteristics of Hard Disk Drives (HDD) and Optical Drives and give a typical use and storage capacity for each.

HDD: _____

_____

_____

_____

Use:_____

Storage Capacity: _____

Optical Drives: _____

_____

_____

_____

Use:_____

Storage Capacity: _____ (6)

c. Mica stores data about his customers in his new computer.

i. What is data integrity?

_____

_____ (1)

ii. Give **TWO** reasons why it is important.

_____

_____ (2)

d. Mica's customers are allowed to pay for their goods electronically by using a debit/credit card.

i. How is the data captured from the debit/credit card?

_____ (1)

ii. The business encrypts their data so it cannot be used by hackers even if they gain access to the network. Explain the term encryption.

_____

_____ (1)

iii. Mention and explain another method how the business can make sure that data is safe.

_____

_____ (2)

(Total: 18 marks)

3. With reference to a CPU:

a. What is the function of the ALU?

_____

_____ (1)

b. In a computer system, what is the purpose of the system bus?

_____

_____ (1)

c. Name and explain the function of the **THREE** buses which together make up the system bus.

_____

_____

_____

_____

_____

_____ (6)

d. Complete the following sentences with some of these words:
program pointer, fetch-execute cycle, operand, program counter, main memory, instruction register, opcode, address.

i. While it is being executed, a program is held in:

_____ (1)

ii. This CPU register points to the next instruction to be executed:

_____ (1)

This question continues on next page.

iii. This CPU register holds a copy of the instruction being executed:

_____ (1)

iv. The process of executing one instruction after another is called the:

_____ (1)

v. The data on which an instruction is to operate is called the:

_____ (1)

e. Indicate whether each of these statements about the CPU is TRUE or FALSE.

	Statement	True/False	
i.	A CPU can only execute programs written in assembly language		(1)
ii.	The CPU clock speed is measured in microseconds		(1)
iii.	The control unit is a register within the CPU		(1)
iv.	Cache memory speeds up program execution		(1)

(Total: 17 marks)

4. a. Melita Car Rentals has offices in five different countries. In each office, there are customer care agents, office staff and a manager. Staff between different offices communicates either through email or video conferencing.

i. What is video conferencing?

_____ (1)

ii. Compare the use of email with video conferencing for communication between the staff.

_____

_____ (2)

The company has been recording car rental bookings using a spreadsheet. It has now decided to contact a specialised company to design and implement a tailor-made software for the recording of car rentals. The specialised company will carry out a process called system analysis.

b. Outline the purpose of the system analysis.

_____

_____ (2)

c. Give **TWO** reasons why different users should be involved in the process of developing a new computer system.

_____

_____ (2)

d. Outline **ONE** advantage of using:

i. interviews rather than questionnaires in this scenario;

_____ (1)

ii. questionnaires rather than interviews in this scenario.

_____ (1)

e. The system analysis has been carried out and a feasibility report was presented to Melita Car Rentals. Name **TWO** pieces of information that the report may contain.

_____

_____ (2)

f. Give **ONE** reason why testing is important.

_____ (1)

The specialised company can give Melita Car Rentals either the source code or the executable code.

g. Outline the difference between the two kinds of code.

_____

_____ (2)

h. State **ONE** advantage and **ONE** disadvantage for the customer to have only executable code.

_____

_____ (2)

(Total: 16 marks)

Please turn the page.

5. a. A company uses computer controlled equipment to monitor and control a heating system. The system has an on/off switch and two buttons to set the maximum and the minimum temperature.

- If temperature is less than the minimum, the heater is switched on
- If temperature is greater than the maximum, the fan is switched on
- If temperature is within the minimum and maximum temperature, the fan and the heater should be switched off.

i. Construct a flowchart to represent this algorithm.

(7)

ii. With reference to the scenario in part a, explain the term process control system.

_____

_____ (2)

iii. What is the role of the operating system in this scenario?

_____

_____ (2)

b. The following search algorithm is supposed to search for a name (nameToSearch) in a list of names (namesArray). The algorithm should be case insensitive and should provide one line of feedback indicating whether the name is found or not

```
String[] namesArray = { "John", "Peter", "Jane", "Maria" };
String nameToSearch = "john";

for (int i = 1; i < namesArray.length; i++)
{
    if (namesArray[i].equals(nameToSearch))
        System.out.println(nameToSearch + " found at position " + i);
    else
        System.out.println(nameToSearch + " not found!");
}
```

The expected output of the algorithm is:

```
john found at position 0
```

The actual output of the algorithm is:

```
john not found!
john not found!
john not found!
```

i. Why does the code produce several lines of output instead of just one?

_____

_____ (2)

ii. Why does the output indicate that `john` was not found when that name is in the list?

_____

_____ (2)

iii. Indicate what needs to be changed to fix the problem in part b (ii).

_____

_____ (1)

This question continues on next page.

iv. Explain why the loop does **not** iterate for every element in the list.

_____

_____ (2)

v. Indicate what needs to be changed to fix the problem in part b (iv).

_____

_____ (1)

(Total: 19 marks)

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