MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD
UNIVERSITY OF MALTA, MSIDA

SECONDARY EDUCATION CERTIFICATE LEVEL

MAY 2016 SESSION

SUBJECT:	**Computing**
PAPER NUMBER:	I
DATE:	28th April 2016
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	6	7	8	9	10	**FOR MARKERS' USE**
For Markers' use only **MARKS**										Total number of Marks or Grade obtained by candidate	

1. Consider the process of analysing and designing a system to develop a new computerised system.

   a. State whether the following statements are **True** or **False**.

		TRUE	FALSE
i.	System analysis and design is a technique used to reduce the chance of creating an ineffective information system.		
ii.	In a large organisation, the person who performs or co-ordinates most of the tasks involved is the database administrator.		
iii.	Analysing the problem is a task performed after the system is designed.		
iv.	Software is developed in the programming phase.		
v.	Once the new system is operational, control and review is performed to compare the original design specifications to the actual system.		

   [5 marks]

   a. Identify **THREE** types of documentation produced by the end of this process.

   _____

   _____

   _____

   [3 marks]

   b. Describe **TWO** changeover methods.

   _____

   _____

   _____

   _____

   _____

   _____

   [4 marks]

2. A database is an organised collection of data.

   a. Choose the correct term (from the ones given below) for the following definitions.

   Master file, keyfield, record, sorting, transaction file, query

   i. A collection of related fields:_____

   ii. A temporary file containing recent changes to records:_____

   iii. Selecting records by giving certain conditions:_____

   iv. Ordering of records according to some criteria:_____

   v. Contains data which is kept up to date at all times:_____

   vi. Uniquely identifies each record:_____

   [6 marks]

DO NOT WRITE ABOVE THIS LINE

b. Consider a school database in which each student has one teacher but one teacher can teach more than one class. State the relationship between:

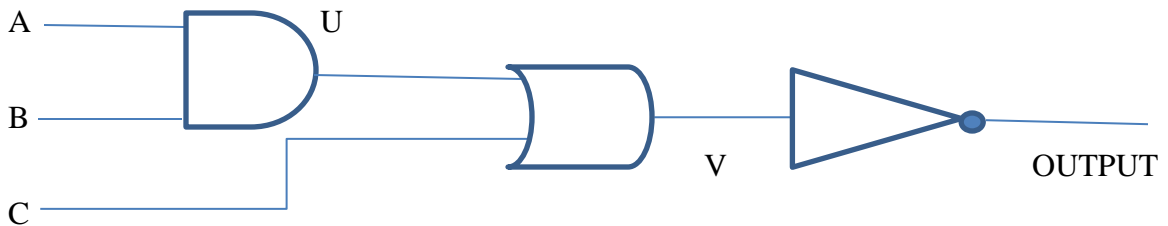   i.   student and teacher:_____

    ii.   teacher and class._____

[2 marks]

c. Identify a suitable keyfield for the entity student.

_____

[1 mark]

3. A logic gate is the elementary building block of a given circuit.

a. Given the following circuit, identify the gates used by writing the names inside the corresponding symbol.

[3 marks]

b. Complete the following truth table to obtain the outputs for this circuit for each possible combination of inputs.

A	B	C	U	V	OUTPUT
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			

[6 marks]

4. Data representation refers to methods used internally to represent information stored in a computer.

a. Assume an 8-bit register in which the most significant bit (MSB or leftmost bit) is used for error checking and the remaining 7 bits are used to represent a character.

i. How many different characters can be represented using this coding system? Show how you arrived to your answer.

_____

_____

[2 marks]

ii. Assume this register contains the following bit pattern,

11000011

Given that 'A' = 65, which character is this register holding?

_____

_____

_____

[3 marks]

5. Represent the following decimal integer as an 8-bit number.

a. 56

_____

_____

_____

[1 mark]

b. Can 365 be represented using this system? Give a reason for your answer.

_____

_____

_____

[3 marks]

c. Represent the binary number 1101001110101110 as a hexadecimal number.

_____

_____

_____

[2 marks]

6. Java is an object oriented programming language.

   a. Match the following definitions to the correct term by writing the definition number in the column next to the matching term.

Definitions	Terms	
1. Sets the value stored in the storage location(s) denoted by a variable name.	variable	
2. A symbolic name given to a storage location containing some value.	loop	
3. Is an instance of a class.	datatype	
4. A data structure which can store a fixed number of elements of the same type.	Assignment statement	
5. Used to execute one or more statements repeatedly.	class	
6. A sequence of characters.	object	
7. Program-code template for creating objects.	Array	
8. Type of data that a variable or object can hold.	String	

[8 marks]

   b. Consider the following JAVA program snippet.

```
if (years == 10)
    Time = "decade";
else if (years == 100)
    Time = "century";
else if (years == 1000)
    Time = "millennium";
System.out.println (Time);
```

   i. Identify a conditional statement from the code snippet above.

_____

[1 mark]

Please turn the page.

ii.   Rewrite the above code using a different conditional statement.

_____

_____

_____

_____

_____

_____

_____

_____

[5 marks]

7. The fetch execute cycle describes the steps required for one instruction to be executed.

a.   Rearrange the following steps in the correct order as performed in the fetch execute cycle.

	CU activates necessary circuits to execute instruction
	Go back to step 1
	CU fetches the opcode from memory location indicated by PC
	CU increments PC to point to next instruction
	CU fetches required operand
	CU places opcode in IR

[3 marks]

b.   What do the following acronyms stand for?

   i.   CU: _____

  ii.   PC: _____

 iii.   IR: _____

  iv.   ALU: _____

[4 marks]

c.   In which step of the cycle presented in 7(a) might the CU require the services of the ALU and why?

_____

_____

_____

_____

[3 marks]

8. The system bus is a way by which various components of a computer system can communicate with each other.

    a. One of the buses found in the system bus is the data bus. The wider the data bus the faster the system. Why?

    _____

    _____

    _____

    _____

    _____

    [2 marks]

    b. How many memory locations can be accessed using a 10-bit wide address bus?

    _____

    _____

    [2 marks]

    c. Besides the address bus and data bus, the system bus contains another bus.

        i.   Identify this third bus found in the system bus?

    _____

    [1 mark]

        ii. Mention one line found in this bus.

    _____

    [1 mark]

Please turn the page.

9. Choose the correct term from the ones given below to complete the following paragraphs.

Webcams, WAN, network, satellites, share, electronic, LAN, microphones, wireless, small, telephone lines, large.

A _____ consists of two or more computers that are linked together in order to _____ resources, exchange files or allow _____ communication. The computers on a network may be linked together through cables, _____, radio waves or _____.

A _____ is a network that is confined to a relatively _____ area such as a school or offices. On the other hand, a _____ connects networks over _____ geographical areas. Two users half a world apart with workstations equipped with _____ and _____ might teleconference in real time. Another type of network is the WLAN which allows a user to connect using a _____connection.

[6 marks]

10. RAM and ROM are two types of memory considered to be part of main memory.
    a. For each of the following statements choose whether it is referring to either RAM or ROM.
        i.   It is non-volatile.   _____
        ii. It allows read and write operations.   _____
        iii. It contains the bootstrap loader.   _____
        iv. Stores currently running programs.   _____
        v.   Looses all contents once the computer is switched off.   _____

[5 marks]

    b. In what way is secondary memory different from main memory?

    _____
    _____
    _____

[2 marks]

    c. Give **ONE** example of a device considered to be secondary memory.

    _____

[1 mark]

SECONDARY EDUCATION CERTIFICATE LEVEL

MAY 2016 SESSION

SUBJECT:	**Computing**
PAPER NUMBER:	IIA
DATE:	29th April 2016
TIME:	4:00 p.m. to 6:05 p.m.

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1. This question is about logic.

    a. A register in a particular computer stores integers in 8-bit, Two's Complement Binary Representation.

    i. Work out 60 + (-25) using 8-bit Two's Complement Binary Representation.

    _____

    _____

    _____

    _____

    _____

    _____

    [2 marks]

    ii. Work out (-40) + (-63) using 8- bit Two's Complement Binary Representation.

    _____

    _____

    _____

    _____

    _____

    _____

    [3 marks]

    b. The transfer of text involves a large amount of data to be transmitted. The text is sent as ASCII characters. Explain what is meant by an ASCII character.

    _____

    _____

    _____

    [2 marks]

    c. A system (S) is ON if:

    - Alarm B (B) is ON and alarm C (C) is ON

      or

    - Alarm A (A) is ON and alarm B (B) is ON

i.   Complete the Truth Table for the above system.

A	B	C			
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			

[4 marks]

ii. Draw the logic circuit that corresponds to the above system.

[4 marks]

iii. Derive the Boolean Expression for the above system.

_____

_____

[2 marks]

2. With reference to operating systems and storage:

a. List **THREE** features of a single user operating system.

_____

_____

_____

[3 marks]

b. A supermarket employs a large amount of workers. The arrival and departure time for each worker are noted and stored on a hard disk. Every month, a computer system calculates the monthly pay for each worker and a pay slip is produced for each worker.

i. What type of Operating System should be used to produce the pay slips? Give **TWO** reasons why this type of Operating System is ideal for this scenario.

_____

_____

_____

_____

[3 marks]

ii. The workers' files are accessed sequentially. Explain this statement.

_____

_____

_____

[2 marks]

iii. Workers can ask about their payment by going to the office. Their request should be handled immediately. Explain how data is retrieved from the hard disk.

_____

_____

_____

[2 marks]

iv. Explain why sequential access is not suitable for this scenario.

_____

_____

[2 marks]

v. What type of access mode should be used? Justify your answer.

_____

_____

[2 marks]

vi. What type of structure is used to solve the problem of file organisation on high-capacity media? Explain how it works.

_____

_____

_____

_____

[3 marks]

3. This question is about Java.

a. Write one line Java statements that perform the following tasks.

i. Create a **class** with the name *Computing*.

_____

ii. Print the **sentence** *This is a Matsec exam* in the command window.

_____

iii. Declare a **variable** of type **char** with the name of *char1*.

_____

iv. Assign the addition of variables *num1* and *num2* to the variable *total*. (Assume that *num1* and *num2* have already been declared.)

_____

v. Write a single line comment *This is Paper 2A*.

_____

[5 marks]

b. Consider the following program:

```java
class Results {
    public static void main (String args[]) {
        String student1 = "Albert";
        String student2= "Maria";

        int mark1 = 88;
        int mark2 = 90
        int result = (mark1+mark2)/2;

        System.outprintln("The  average  mark  of  "+student1+"
and "+student2+" is "+result);
    }
}
```

i.   There are **TWO** mistakes in this program. Identify the mistakes and correct them.

_____

_____

_____

_____

[4 marks]

ii. What is the output of this program?

_____

_____

[1 mark]

c. Study the following pseudo-code:

```
INPUT A, B
IF B <= 10 THEN C = A
     ELSE C = A + B
ENDIF
PRINT A, B
PRINT C
END
```

i. Write down the outputs produced by the algorithm if A=12 and B=3.

_____

_____

_____

_____

[2 marks]

ii. Write down the outputs produced by the algorithm if A=18 and B=25.

_____

_____

_____

_____

[2 marks]

iii. Draw the flowchart corresponding to the above pseudo-code.

[3 marks]

4. This question is about software and programming languages.

a. A compiled program is better than an interpreted program.
   i. Write **TWO** reasons to show that the above statement is true.

   _____

   _____

   _____

   [2 marks]

   ii. Write **ONE** reason against the statement above.

   _____

   _____

   [1 mark]

b. Logical errors are considered to be harder to trace and debug than syntax error.
   i. Give **ONE** example of a logical error.

   _____

   [1 mark]

   ii. Give **ONE** example of a syntax error.

   _____

   [1 mark]

   iii. Why are logical errors the hardest to trace and debug?

   _____

   _____

   [1 mark]

   iv. State **ONE** tool that is used by programmers to help them identify logical errors.

   _____

   [1 mark]

c. i. Explain the term *program testing*.

   _____

   _____

   [1 mark]

   ii. Why is the testing stage an important stage during program development?

   _____

   _____

   [1 mark]

d. For each application below, state whether it should be written in a 3GL or 4GL programming language. Give **ONE** reason for each answer.

   i. Operating System

      _____

      _____

   ii. Computerised Library System

      _____

      _____

   iii. A printer driver

      _____

      _____

   iv. Flight Reservation System

      _____

      _____

[8 marks]

5. This question is about I/O devices and the CPU.

  a. It is known that different devices have different access speeds.

    i. Distinguish between *serial* and *parallel* data transfer.

      _____

      _____

      _____

      _____

[2 marks]

    ii. Describe, by giving an example, the technique used to reduce the speed difference between these devices.

      _____

      _____

      _____

[3 marks]

    iii. Explain the terms *pixel* and *resolution* of a picture and how they are related.

      _____

      _____

      _____

[2 marks]

b. With reference to the assembly code program below:

1		LDA #3	; Load accumulator A with 3
2		STA C	; Store contents of accumulator A in memory location C
3	LAB1	LDA Y	; Load accumulator A with contents of memory location Y
4		MUL Z	; Multiply contents of the accumulator A by the contents of memory location Z
5		STA Y	; Store contents of accumulator A in memory location Y
6		LDA C	; Load accumulator A with contents of memory location C
7		SUB #1	; Subtract 1 from accumulator A
8		STA C	; Store contents of accumulator A in memory location C
9		JNZ LAB1	; Jump to LAB1 if contents of accumulator is not 0
10		HLT	; End of program

Referring to the above code snippet:

i. Identify **ONE** opcode.

_____

[1 mark]

ii. Identify **ONE** operand.

_____

[1 mark]

iii. Identify the line number where a label is declared.

_____

[1 mark]

iv. Suppose that initially 3 is stored in location Z and 1 in location Y, write down the contents of all memory locations when this code is being executed. What are the contents of Y at the end?

_____

_____

_____

_____

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_____
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_____

[5 marks]

v. What is the function of the above assembly program?

_____
_____

[2 marks]

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UNIVERSITY OF MALTA, MSIDA

SECONDARY EDUCATION CERTIFICATE LEVEL

MAY 2016 SESSION

SUBJECT:	**Computing**
PAPER NUMBER:	IIB
DATE:	29th April 2016
TIME:	4:00 p.m. to 6:05 p.m.

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MARKS						

1. The OS acts as an interface between the user/applications and the hardware.

   a. What is meant by the term GUI?

   _____

   _____

   [1 mark]

   b. One of the main functions of the OS is to manage the computer's resources. Identify **THREE** of the said resources.

   _____

   _____

   _____

   [3 marks]

   c. What is the relationship between the bootstrap loader and the OS?

   _____

   _____

   _____

   [1 mark]

   d. Can the bootstrap loader be stored in RAM?

   _____

   _____

   _____

   [1 mark]

   e. General purpose and dedicated are two types of operating systems.

      i.   Outline the difference between these two systems.

   _____

   _____

   _____

   _____

   [2 marks]

      ii.   List the following items under the correct heading of the table below.

   Desktop, GPS, electric oven, laptop, digital thermometer, PC

Dedicated System	General Purpose System

   [3 marks]

f. The OS forms part of a category of software called System Software.

   i. Identify the other major software category.

_____

[1 mark]

   ii. The OS uses file extensions to associate a file with the corresponding software. Identify the software associated with the following file extension. The first one has been done for you.

.xls	**spreadsheet**
.ppt	
.docx	
.html	

[3 marks]

g. Identify **TWO** hardware devices which can be upgraded or replaced to help make a computer system run faster.

_____

_____

[2 marks]

2. Consider the following JAVA class.

```java
class Vote {
  public static void main (String [] args){
        int age;
        do {
             System.out.println("Enter age.");
             age = Keyboard.readInt();
             if (age>18)
                  System.out.println ("You can vote");
             else
                  System.out.println (''You cannot vote");
        } while (age !=0);
    }
}
```

a. What is the purpose of the program?

_____

_____

_____

_____

[2 marks]

b. What happens when the user enters 0?

_____

_____

[1 mark]

c. From the code above identify

    i.   The name of the class _____

    ii.   A variable _____

    iii.   An output statement _____

    iv.   A condition _____

    v.   A loop _____

[5 marks]

d. Name **TWO** other types of loops which are not used in the program above.

_____

_____

_____

[2 marks]

e. Fill the following table by putting the following datatypes under the correct heading.

String, int, char, double, Boolean, float

Numeric data type	Non-numeric data type

[3 marks]

f. An array is a collection of data elements all of the same type.

    i.   Show how an array of 10 integers is declared.

_____

_____

[2 marks]

ii.   Use a loop to initialise all the elements of the array declared in part (i) to 0.

_____

_____

_____

[2 marks]

3. *Source code* needs to be translated to produce *executable code*.

a. Outline the difference between the terms in italic.

_____

_____

_____

_____

_____

[2 marks]

b. Why is translation required?

_____

_____

_____

[2 marks]

c. Assemblers, compilers and interpreters are three different types of translators. Choose the translator which best suits the following statements.

i.   Translated code is saved in a separate file. _____

ii.   Code is translated AND executed one line at a time. _____

iii.   Is used to translate instructions written in mnemonics. _____

iv.   Translation is not needed each time the program is run when using this translator._____

v.   No translated code is saved. _____

[5 marks]

d. i.   Identify **ONE** instance where it is more beneficial to use an interpreter rather than a compiler.

_____

ii.   Identify **ONE** instance where it is more beneficial to use a compiler rather than an interpreter.

_____

[2 marks]

e. Three types of errors can be generated by a computer program.

    i.   Name these errors.

_____

_____

_____

[3 marks]

    ii.   Which **ONE** of these errors is generated during translation?

_____

[1 mark]

    iii.   Choose **ONE** of the errors mentioned above which can be identified by performing a dry run of the program.

_____

[1 mark]

    iv.   Which **ONE** of these errors will always force the program to stop working?

_____

[1 mark]

4. Consider the different types of storage devices.

a. Such devices can allow either *serial access*, *direct access* or both.

    i.   Distinguish between serial and direct access.

_____

_____

_____

_____

[2 marks]

    ii.   Identify **ONE** device which allows serial access only, and **ONE** which allows both.

_____

_____

[2 marks]

b. A storage device can either be *magnetic* or *optical*. State whether the following statements refer to an optical or magnetic storage device.

    i.   It is not affected by a magnetic field: _____

    ii.   It does not use laser to read/write data: _____

    iii.   No delicate moving heads are involved to read/write data: _____

    iv.   Data is stored as pits and lands: _____

[4 marks]

c. Which input device would you suggest to:

    i.   Correct a multiple choice exam: _____

    ii.   Play a videogame: _____

    iii.   Register a sale of a product at a supermarket cashpoint: _____

    iv.   Type in a letter using a word processor on a PC: _____

    v.   Store a printed photograph into digital format: _____

[5 marks]

d. Outline the difference between:

    i.   Hardcopy and softcopy.

_____

_____

_____

_____

_____

    ii.   Vector and raster devices.

_____

_____

_____

_____

_____

[4 marks]

5. The Internet is not just about finding information but also about connecting with friends and family.

a. Choose from the words/phrases given below to complete the following paragraphs.

Internet, social networking, webcam, online, telephone, chat, instant messaging, microphone, Skype, Facebook, written

Today there are many different ways to communicate _____. These include social networking, _____ and VoIP.

_____ has become one of the main ways to stay in touch. It is easy to keep up with your friends' lives by seeing their posts and pictures. A very common social networking site is _____.

Please turn the page.

Instant messaging is also known as _____. It includes programs which allow you to have _____ conversations with your friends.

On the other hand VoIP (voice on internet protocol) allows you to have a _____ service through your _____ connection. Some programs such as _____ allow you to do video conferencing. For this one would need also a _____ and a _____.

[11 marks]

b. State whether the following statements are **True** or **False**.

		TRUE	FALSE
i.	A word processor allows one to create and edit documents.		
ii.	New applications must be formatted by the user before they can be used.		
iii.	A browser is required to write webpages.		
iv.	A clipboard is used to copy text or images from one application to another.		
v.	A spreadsheet is composed of fields, records and files.		
vi.	Database management systems are used to manage large amounts of data.		

[6 marks]