Index No: _____ SEC09/1.13m

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

UNIVERSITY OF MALTA, MSIDA

# SECONDARY EDUCATION CERTIFICATE LEVEL

## MAY 2013 SESSION

| | |
|---|---|
| SUBJECT: | **Computing** |
| PAPER NUMBER: | I |
| DATE: | 26th April 2013 |
| TIME: | 9:00 a.m. to 11:00 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.*
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*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 | **FOR MARKERS' USE** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| For Markers' use only | | | | | | | | | | | | Total number of Marks or Grade obtained by candidate |
| **MARKS** | | | | | | | | | | | | |

1. State which software would one use to perform the following tasks.

   (a) Write a letter_____

   (b) Create a web page_____

   (c) View a web page_____

   (d) Remove malicious programs_____

   (e) Plot a graph from a set of values stored in cells_____ [5]

2. (a) Convert the following unsigned binary number into decimal.

   0101 1100

   _____

   _____

   _____

   _____ [1]

   (b) What is the effect of a *right-shift* on the contents of the register? Justify your answer by using an example.

   _____

   _____

   _____

   _____ [2]

(c) Convert the following hexadecimal number into binary:

ACE5

_____

_____ [2]

_____

(d) If the ASCII code for character A is 1000001, what is the ASCII code for character J?

_____

_____

[2]

_____

3. With regards to the process of analysing a system with the intention of computerisation, what are the steps involved in this process?

_____

_____

_____

_____

_____ [5]

4. What do the following acronyms stand for and identify the area in which they are used?
Example : POS – point of sale used in commercial data processing.

(a) CAD-CAM : _____

_____

(b) EFT : _____

_____

(c) CAL : _____

_____ [6]

5. Consider the following truth table

| A | B | C | X | Y | $\bar{X}.Y$ |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | |
| 0 | 0 | 1 | 0 | 1 | |
| 0 | 1 | 0 | 0 | 1 | |
| 0 | 1 | 1 | 0 | 1 | |
| 1 | 0 | 0 | 0 | 0 | |
| 1 | 0 | 1 | 0 | 1 | |
| 1 | 1 | 0 | 1 | 1 | |
| 1 | 1 | 1 | 1 | 1 | |

(a) Determine X in terms of A and B.

_____ [1]

(b) Determine Y in terms of B and C.

_____ [1]

(c) Fill in the values in the last column corresponding to the output $\overline{X}.Y$ then draw the appropriate circuit representing this truth table.

[4]

6. Number the following statements to obtain the steps, in the correct order, of the fetch execute cycle.

__. CU (Control Unit) activates necessary circuits to execute instructions.

__. CU fetches the required operand.

__. CU fetches the opcode from memory location as indicated by the PC (Program Counter).

__. Go back to step 1.

__. CU places opcode in IR (Instruction Register)

__. CU increments PC to point to the next instruction.

[6]

7. Determine whether the following statements are true or false.

(a) The wider the address bus the larger the addressable space. True / False

(b) The read/write line is found in the data bus. True / False

(c) The accumulator, program counter and instruction register are all registers found in the Control Unit. True / False

(d) The instruction set is the set of all possible instructions used to control the CPU's circuitry. True / False

(e) The processor's speed is measured in GHz. True / False

(f) The wider the data bus the more data can fit into main memory. True / False

[6]

8. Underline ONE correct answer for each of the below.

(a) A sizeable geographical area with digital communication based on the telephone system is called a:

i. LAN
ii. WAN
iii. Modulator – demodulator
iv. All of the above
v. None of the above

(b) A medium for transferring data between two locations is called a:

i. Network
ii. Communications channel
iii. Modem
iv. Bus
v. None of the above

(c) A method for sending data from one place to another by physical or electronic means is:

i. E-mail
ii. Internet
iii. Data transmission
iv. Distributed processing
v. None of the above

(d) A computer uses _____ to convert digital signals from a computer into analogue signals, and vice versa:

i. Multiplexer
ii. Demodulator
iii. Modem
iv. Decoder
v. None of the above

(e) What is meant by an *embedded system*?

i. A system designed for specific control functions within a larger system
ii. A system which is assigned one and only one task
iii. A system which uses one kind of software
iv. A system meant for applications only
v. None of the above

(f) A compiler is:

i. A person who compiles source programs
ii. The same thing as a programmer
iii. A Data input operator
iv. A program which translates source code into object code
v. None of the above

(g) A file containing relatively permanent data is a:

i. Random file
ii. Transaction file
iii. Master file
iv. Sequential file
v. None of the above

(h) An input device which can read characters directly from an ordinary piece of paper is:

i. OCR
ii. OMR
iii. MSI
iv. CRT
v. None of the above

(i) Accessing records from a file without searching from the beginning of the file is:

i. Time sharing
ii. Random
iii. Direct access
iv. Access time
v. None of the above [9]

9. (a) What is an algorithm?

_____

_____

_____

_____

_____ [1]

(b) Mention TWO ways of representing an algorithm and highlight the main difference between them.

_____

_____

_____ [4]

_____

(c) When is it more suitable to use an interpreter instead of a compiler to translate a program? Why?

_____

_____

_____

_____ [1]

10. Explain the purpose of the following components within a computer system.

(a) CPU:

_____

_____

_____

_____

(b) Main Store:

_____

_____

_____

_____

***Please turn the page.***

(c) Backing Store:

_____

_____

_____

_____

(d) OS:

_____

_____

_____

_____ [8]

11. Consider the following class written in Java :

```
1.     class Test {
2.           public static void main (String args[]){
3.              //declaration
4.              int z=0;
5.              int a [] = new int [5];
6.              for (int i=0; i<=4; i++)
7.                 a[i] = i * 5;
8.              //calculation
9.              int j=0;
10.             do{
11.                 z = z + a[j];
12.                 j++;
13.             } while (j<=4);
14.             System.out.println("The answer is " + z);
15.          }
16.     }
```

(a) From the program above give an example of a variable initialisation, a reserved word and a condition.

_____

_____

_____ [3]

(b) Which data structure is variable ***a*** representing?

_____ [1]

(c) What is the purpose of variable ***j*** in this program, and what happens to its value in line 12?

_____

_____

_____

_____ [2]

(d) What is happening in lines 6 and 7?

_____

_____

_____

_____

_____

_____ [3]

(e) Name the TWO loops which are used in this program?

_____

_____ [2]

(f) What will the user see on screen when this program is run? Show how you arrived to your conclusion.

[3]

(g) What does the symbol // represent in Java?

[1]

(h) Mention THREE types of errors one might encounter while writing programs, and give a description for each.

[6]

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# SECONDARY EDUCATION CERTIFICATE LEVEL

## MAY 2013 SESSION

| | |
|---|---|
| SUBJECT: | **Computing** |
| PAPER NUMBER: | IIA |
| DATE: | 27th April 2013 |
| TIME: | 9:00 a.m. to 11:00 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.*
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| Question Number | 1 | 2 | 3 | 4 | 5 | **FOR MARKERS' USE** |
|---|---|---|---|---|---|---|
| For Markers' use only | | | | | | Total number of Marks or Grade obtained by candidate |
| **MARKS** | | | | | | |

1. (a) A logic circuit with TWO inputs A and B is based on the following expression:

$$F = \overline{A}.B + A.\overline{B}$$

i) Draw the logic circuit for the above expression.

[2]

ii) Complete the truth table below for the expression given above.

| A | B | $\overline{A}.B$ | $A.\overline{B}$ | $\overline{A}.B + A.\overline{B}$ |
|---|---|---|---|---|
| 0 | 0 | | | |
| 0 | 1 | | | |
| 1 | 0 | | | |
| 1 | 1 | | | |

[4]

iii) By analyzing the inputs and the resultant output in the above truth table, what is the *mathematical function* of this circuit in terms of A and B?

_____

[2]

(b) Assuming an 8-bit *two's complement* binary representation:

i) represent $\mathbf{-60_{10}}$ in binary;

_____

_____

_____

[1]

ii) add $\mathbf{-50_{10}}$ to $\mathbf{20_{10}}$. Show your working and represent your answer in binary.

_____

_____

_____

_____

[3]

iii) If the value obtained in (i) is interpreted as an *unsigned* 8-bit, obtain its hexadecimal equivalent.

_____

_____

_____

_____ [2]

(c) i) What is the *advantage* of having an 8-bit unsigned binary register over an 8-bit *two's complement* register?

_____

_____

_____ [1]

ii) What is the *maximum positive value* which can be represented in an 8-bit *two's complement* register? Represent your result in both binary and decimal number representations.

_____

_____

_____ [1, 1]

2. (a) Network systems are used to share and exchange data between computers connected together via communication links.

i) Identify TWO types of wireless communication links which are used over large geographical distances.

_____ [2]

ii) Which device is used to connect a computer to a network infrastructure such as the telephone network?

_____ [1]

iii) Briefly explain how the device identified in (ii) allows the computer to *send* and *receive* data over the network.

[2]

(b) When files are stored on a direct-access storage device, an appropriate disk filing system is used.

i) Explain the meaning of a *direct-access* storage device and identify TWO examples of direct-access storage devices.

[1, 1]

ii) Demonstrate ONE advantage of *direct-access* over another mode of access.

[1]

iii) What is a *disk filing system*? What information does a *disk filing system* contain?

[1, 1]

iv) A telephone directory database is distributed to local councils once every year. Suggest a suitable *storage medium* whereby operators can access the information required about a resident in their locality. Justify your answer.

[1, 1]

(c) Input and output data transfer sent to/by the I/O subsystem can be carried out either in serial or in parallel.

i) Compare and contrast *serial* and *parallel* data transfer.

_____

_____

_____ [2]

ii) How can *buffering* resolve the problems associated with speed difference within the I/O subsystem?

_____

_____

_____ [1]

iii) Identify TWO devices which employ the *buffering* technique. Briefly explain how buffering can help with the overall performance of the computer system when using these two devices.

_____

_____

_____

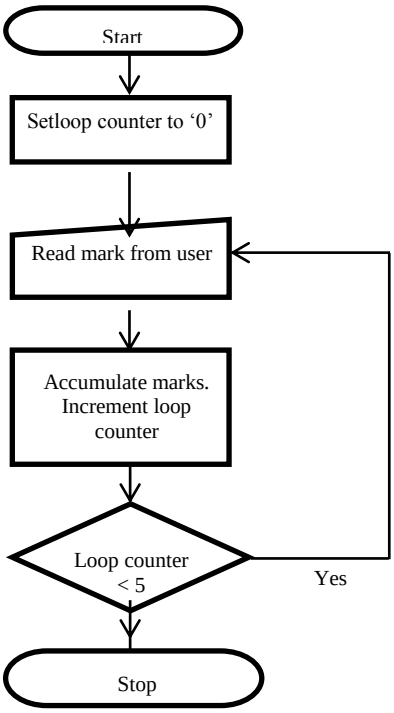
_____ [1, 1]

3. (a) With reference to the JAVA programming language, list the TWO main selection statements (conditional transfers).

_____

_____ [2]

(b) i) Analyse the flowchart below and produce the necessary code so that the total marks can be found.




```
class Total{
  public static void main (String[] args){
```

_____

_____

_____

_____

_____

_____

_____ [4]

```
    }
}
```

ii) Show how the average mark can be obtained and displayed by the program by adding ONE line of code. Write this code.

_____ [2]

(c) i) Explain the main differences between a *compiler* and an *interpreter*.

_____

_____

_____ [2]

ii) List TWO advantages of 4th generation programming languages over 3rd generation programming languages.

_____

_____

_____

_____ [2]

iii) List TWO disadvantages of 4th generation programming languages over 3rd generation programming languages.

_____

_____

_____

_____ [2]

(d) Software maintenance is an integral part of the software lifecycle.

i) Give TWO examples of software maintenance techniques.

_____

_____ [2]

ii) How can *comments* or *in-line documentation* help in facilitating maintenance?

_____

_____ [1]

4. (a) There are a number of operating systems, one of which is *real-time*.

i) List TWO characteristics of a *real-time* operating system.

_____

_____

_____

_____ [2]

ii) Choose TWO real life situations and explain how *real-time* operating systems are effectively used in these situations.

_____

_____

_____

_____ [2]

(b) An operating system manages the computer's resources in an efficient way.

i) Give TWO examples of resources which are managed by the operating system and briefly explain how the operating system manages such resources.

_____

_____

_____

_____ [2]

ii) Suggest a suitable type of operating system for each of the following applications:

- airline booking system; _____
- utility bills at the end of the month; _____
- internet banking services; _____
- home computer system. _____

[2]

(c) i) Illustrate how the width of the *address bus* has a direct effect on the size of the main memory.

_____

_____

_____

_____ [2]

ii) Define the following terms:

- opcode; _____

_____

- operand; _____

_____

- machine code. _____ [3]

_____

iii) Data found in the accumulator needs to be stored back in memory. Explain how the system instructs the memory unit so that it receives data from the accumulator register.

_____

_____

_____

_____ [2]

iv) Identify a *technique* used to improve the performance of a frequently accessed slow device. Briefly explain how this helps in the overall performance of the computer.

_____

_____

_____

_____ [2]

5. (a) i) Explain how *resolution* and *speed* are related when printing an image on a hard-copy.

_____

_____

_____

_____ [1]

ii) Explain how the use of multimedia can improve communication with people who:

- are found in other countries;
- have special needs.

_____

_____

_____

_____ [2]

iii) While the use of multimedia has brought more usability and accessibility, spending more time on a computer has also brought a number of health hazards.

Explain this statement and give examples of health hazards when using a computer.

_____

_____

_____

_____ [2]

(b) An accumulator which is able to hold an 8-bit *unsigned* binary number is used for the following assembly language program:

```
005: LDA 100  ;load accumulator with 100 decimal
006: SHL      ;logical shift contents of accumulator
              ;to the left by 1
007: ADD 56   ;add 56 decimal to the contents of the accumulator
```

i) How is the value inside the accumulator changed after executing line (006)?

_____

_____

_____

[2]

_____

ii) Explain why the resultant value cannot be represented in memory after executing line (007).

_____

_____

_____ [2]

iii) Modify ONE operand from the above snippet so that the final value will be represented in memory.

_____ [1]

iv) Identify ONE advantage of using *symbolic addressing* over fixed/static addressing.

_____

_____ [1]

(c) The reliability of software is determined by the tests it was subjected to.

i) Explain how the performance of the program is tested using suitable test data.

_____

_____

_____ [2]

ii) Show how the following errors can be detected when testing a program:

- logical error;
- run-time error.

_____

_____

_____

_____ [2]

iii) Distinguish between *user documentation* and *technical documentation*.

_____

_____

_____

_____ [2]

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MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

UNIVERSITY OF MALTA, MSIDA

# SECONDARY EDUCATION CERTIFICATE LEVEL

## MAY 2013 SESSION

| | |
|---|---|
| SUBJECT: | **Computing** |
| PAPER NUMBER: | IIB |
| DATE: | 27th April 2013 |
| TIME: | 9:00 a.m. to 11:00 a.m. |

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|---|---|---|---|---|---|---|
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| **MARKS** | | | | | | |

1. (a) A computer system consists of both *software* and *hardware*. Give examples of:

Computer Software;

1. _____

2. _____

3. _____

Computer Hardware.

1. _____

2. _____

3. _____ [2]

(b) Software may be designed to accomplish different functions. Give ONE example and ONE function of:

an Operating System;

Example: _____

Function: _____ [2]

an Application Package.

Example:_____

Function:_____ [2]

(c) Computer Software may need specific hardware for its operation. Give ONE example of an input device you would associate with:

a Word Processor; _____

point of Sales Software Package; _____

a Gaming Application. _____ [3]

(d) The design of a *software solution* depends highly on the problem to be solved and the context within which it needs to be deployed. For the situations provided below provide the best solution from **GUI, CLI, Direct Access to Data, Serial Access to Data.**

1. Payroll - _____
2. e-Gaming Solution - _____
3. Database Application - _____
4. An OS to run with limited RAM - _____ [2]

(e) A computer network has been installed in an office to increase efficiency. Describe how efficiency can be increased when a computer network is installed in an office.

_____

_____

_____

_____ [1]

(f) i) Computer systems may be general purpose or dedicated. Outline the difference between these two systems.

_____

_____

_____

_____ [1]

ii) List ONE example of:

a) a general purpose computer; _____ [1]

b) a dedicated computer. _____ [1]

iii) Computer Systems require RAM for their operation. Considering general purpose and dedicated computers identify:

a) Which of the two requires more RAM in its design?

_____

_____ [1]

b)What is the function of ROM in their Architecture?

_____

_____ [1]

2. (a) **CD-ROM**, **Pen-Drive**, **External HDD**, **DVD-ROM** are examples of *storage media*. Point out which of these storage media would be most suitable to:

i) store a word processed document that needs to be updated from time to time;

_____

ii) store 12 photos each requiring 15MB of space;

_____

iii) back-up the HDD of a PC;

_____

iv) store a 55 minute video.

_____ [4]

(b) Today's world is highly dependent on data communication.

i) Explain how a coding system such as ASCII could be helpful.

_____

_____

ii) State one limitation of the ASCII coding system.

_____

_____

iii) Describe how ASCII code distinguishes between 'a' and 'A'.

_____

_____

[3]

(c) By showing your working,

i) Calculate the sum of 64 + 20 using 8-bit binary representation.

Ans_____

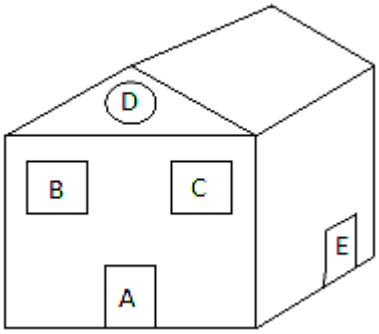
ii) What is the maximum number that can be represented using an unsigned 8-bit binary register?

Ans_____

iii) What would happen if you tried to store the number 300 using an unsigned 8-bit binary register?

Ans_____ [3]

iv) The house pictured below has an alarm system.




A binary digit of '1' represents that a door/window is closed while a binary digit of '0' represents that a door/window is open. Fill in the table as appropriate.

| Door/Window | E | D | C | B | A |
|---|---|---|---|---|---|
| All windows open/Doors closed | | | | | |
| All windows closed/Doors open | | | | | |
| Doors closed/ Windows closed | | | | | |

[3]

v) The circuitry of the alarm system was based on an 8-bit system. Show how the Doors closed/Windows closed would be represented using this system.

Ans_____ [2]

vi) The designer is considering using a Hexadecimal display. Show how your answer to the Doors closed/Windows closed would be displayed in Hexadecimal form.

Ans_____ [2]

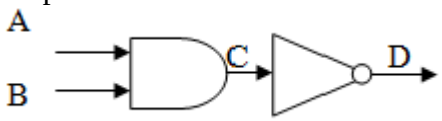
3. (a) Write the statement or symbol represented by each of the following expressions.

i) A+B = _____

ii) A.B = _____

iii) $\bar{A}$ = _____ [3]

(b) Observe the logic circuit presented below.




i) Complete the Truth Table that corresponds to the circuit.

| A | B | C | D |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

[4]

(c) Associate the **CU**, **MU** and **ALU** with the functions presented below.

i) _____ Stores Programs and Data.

ii) _____ Executes Instructions.

iii) _____ Performs Arithmetic and Logic Operations. [3]

(d) Suggest whether the following are *input* or *output* devices:

i) Microphone _____

ii) Plotter _____

iii) Projector _____

iv) Scanner _____ [2]

(e) Today the need to back-up files is considered extremely important. Explain why this is so.

_____

_____

_____

_____ [2]

(f) The need to store data brings about the need for security and integrity. Place **Audit Trail**, **Passwords**, **Validation**, **User Id**, **Verification**, **Encryption** and **Restricted Access** under the correct heading.

| Security | Integrity |
|---|---|
| | |
| | |
| | |
| | |

[3]

4. (a) A teacher provided his students with a number of acronyms. Write down what each one stands for.

| Acronym | What it stands for. |
|---|---|
| OMR | |
| MICR | |
| OCR | |
| WWW | |
| LAN | |
| CBT | |

[3]

(b) The teacher went on to explain that computers can have positive and negative effects on our lives. List 2 positive and 2 negative effects the teacher could have mentioned.

Positive:

i) _____

ii) _____

Negative:

i) _____

ii) _____ [2]

(c) On another occasion the teacher delivered a lesson related to CPU speeds being measured in MHz, KHz, GHz and Hz. Re-order these *frequency units* from slowest to the fastest.

| | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |

[2]

(d) List any TWO provisions found within the Data Protection Act of 2001.

i) _____

_____

ii) _____

_____ [2]

(e) A student would like to upgrade her computer system for a Multimedia course she will be following. Identify THREE hardware components she should upgrade.

i) _____

ii) _____

iii) _____ [3]

(f) Distinguish between:

i) a compiler and an interpreter;

ii) a pen drive and a hard disk drive (HDD);

iii) software activation and software piracy;

iv) executable code and source code;

v) primary and secondary storage. [5]

5. (a) The Java Programming language is said to be Object Oriented. Observe the simple code provided and answer the questions that follow.

```
//This is simple code
class Numbers {
   public static void main(String args[]) {
      int x=30;
      int y=40;
      float z;

      System.out.println("Processing...");
      z = x + y;
      System.out.println("Sum of integers = " + z);
   }
}
```

i) Outline in your own words the use of *int* in this code.

_____

_____

_____

_____ [1]

ii) Show the output obtained when running this code.

_____

_____

_____

_____ [2]

iii) Use this code to identify:

a data type _____

a remark _____

an assignment statement _____

an output statement _____ [4]

iv) Suggest a suitable primitive data type which will NOT be suitable for x and y.

_____ [2]

v) Modify the code so that it works out the average of the two numbers.

_____

_____

_____

_____

_____

_____

_____

_____ [3]

(b) Complete the paragraph using these terms: **Instruction**, **Assembly Code**, **ADD**, **Mnemonics**, **CPU**, **Machine Code**, **JMP**, **Readable.**

_____ is binary (1's and 0's) code that can be executed directly by the _____, with each _____ performing a very specific task. _____ is plain-text and (somewhat) human _____. Examples of such instructions include _____ and _____ which are also known as _____. [4]

(c) Explain the use of HTML.

_____

_____

_____

_____ [1]