

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

MATRICULATION CERTIFICATE EXAMINATION
INTERMEDIATE LEVEL
MAY 2012

SUBJECT:	COMPUTING
DATE:	28 th May 2012
TIME:	4.00 p.m. to 7.00 p.m.

Directions to Candidates

- Answer **ALL** questions in Section A and **ONE** question from Section B.
 - Good **English** and orderly **presentation** are important.
 - All answers are to be written on the **booklet** provided.
 - The use of **flowchart templates** is permitted but calculators may **NOT** be used.
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Section A

(Answer **ALL** questions in this section)

- A1 (a) Computer systems divide software into two major classes.
- (i) Name the **TWO** classes of software.
 - (ii) Briefly explain the difference between the **TWO** classes and give **ONE** example of software in each class.
 - (iii) What is *authoring software* used for? [4]
- (b) (i) What is *process control*? [2]
- (ii) Name and briefly describe a system which uses *process control*.
- A2 (a) (i) What does the acronym *EFT* stand for?
- (ii) Define *EFT* and give a suitable use to justify your definition. [3]
- (b) (i) Briefly describe what *remote access* is.
- (ii) What method is usually used to provide *remote access*?
 - (iii) What is usually required to optimise safety and traceability to the source? [3]

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- A3 (a) *Two's complement* and *Sign and Magnitude* are TWO representations for binary numbers. Using an 8-bit register, what is the range in decimal of each representation? [2]
- (b) Using 1 byte and with an imaginary binary point fixed after the fourth bit convert the decimal number 14.1875 to binary. [2]
- (c) Give TWO main differences between a *compiler* and an *interpreter*. [2]
- A4 (a) Draw the logic circuit for the following boolean expression:
$$F = A.B + B.C.(B + C)$$
 [2]
- (b) Simplify the expression of part (a) and redraw the optimised logic circuit. [4]
- A5 (a) What is the *System Bus*? [1]
- (b) The *Data Bus* is part of the system bus. Identify the TWO other buses. [2]
- (c) Give an example that demonstrates a typical use of each of the TWO buses you identified in part (b). [2]
- (d) Briefly explain how the width (size) of the data bus may affect the performance of the computer system. [1]
- A6 (a) *Batch processing*, *Online processing* and *Networking* may require different types of operating systems.
Differentiate between the THREE types of operating systems and for each type give a typical application. [3]
- (b) *Real time* computer systems require yet another type of operating system.
(i) Mention TWO main characteristics of a real time system.
(ii) Give ONE typical example of where such a system is implemented. [3]
- A7 (a) What is an *Assembler*? [1]
- (b) List THREE assembly language instructions and state the type of operation that each instruction performs. [3]
- (c) Differentiate between *Immediate* and *Direct* addressing modes as used in assembly language. [2]

- A8 (a) Identify THREE *programming language paradigms* and for each paradigm name ONE high level language. [3]
- (b) *Looping constructs* are integral sections of most programs.
- (i) What is a *looping construct*? [3]
- (ii) Differentiate between a *pre-tested* and a nested looping construct. [3]
- A9 (a) The ‘memory’ of a computer system typically consists of various types.
- (i) Mention ONE main characteristic of *cache memory*.
- (ii) Explain briefly how *cache memory* may improve the performance of the currently running program.
- (iii) Main memory *store protection* is an important memory management task. Why is this task necessary? [4]
- (b) Explain the function of TWO important registers that are directly involved during the *fetch-decode-execute* cycle. [2]
- A10 Data over a communication medium may be transmitted in different modes.
- (a) Name and briefly explain the THREE modes of *data transmission*. [3]
- (b) For each mode listed in part (a), mention ONE typical example of such type of data transmission. [3]

Section B

(Answer ONE question from this section)

- B1 (a) (i) What is a *Data Structure*? [2]
- (ii) What is the purpose of storing data in a *data structure*? [2]
- (b) *Data Structures* may either be built-in a programming language or developed by the programmer.
- (i) Name THREE different data structures.
- (ii) Explain briefly the specific characteristics of each of the data structures you mentioned in part (b)(i).

(iii) Mention ONE practical application/use of each of the *data structures* you mentioned in part (b)(i). [9]

(c) Assume that you have a very large group of different numbers and you need to search for a particular number 'X'. Using either flowcharts or pseudocode, design the algorithm for the *linear search* of 'X'. Your algorithm must end by showing whether 'X' has been found or not, since you must take into account that 'X' may not be part of the group of numbers. [9]

B2 (a) *Databases* are at the heart of most information storage and retrieval systems.

(i) Mention TWO advantages of *databases* over the *traditional* file systems. [2]

(ii) Give THREE duties of a *Database Administrator* (DBA). [3]

(b) Study the scenario below and then answer the questions on it.

ABC is a Real Estate Agency and has a number of employees. It operates as follows:

- The agency keeps track of each home by keeping its identification code, address, number of bedrooms, number of bathrooms, garage, area of site (square metres) and price. The agency also keeps information about owners of a home; it keeps their ID number, name, surname and mobile number. An owner can possess one or more homes, while each home has only one owner.
- When a buyer contacts the agency to view a home s/he is allocated to a particular employee that represents the owner. An employee can list many homes and ONLY an employee can list one or more homes.
- An employee has a unique identification code, name, surname and mobile number.
- The agency keeps information on prospective buyers. It keeps their ID number, name, surname, mobile number, preferences of bedroom and bathrooms and price range. An employee can work with many buyers, but a buyer works with only one employee.

(i) What is a *relational database model*?

(ii) Name the THREE main components used in a *relational database model*.

(iii) Briefly describe the three components named in part (ii).

(iv) Convert the scenario above to tables (relations) and include the *fieldnames* and their *data type* while clearly highlighting the *relationships*. [15]