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

MATRICULATION EXAMINATION
INTERMEDIATE LEVEL
SEPTEMBER 2016

SUBJECT:	COMPUTING
DATE:	31st August 2016
TIME:	9:00 a.m. to 12:05 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.*

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

A1   An instruction cycle is divided in THREE main phases.

    a.   Name the THREE phases.

    b.   Describe the *steps* involved in these THREE phases.   [6]

A2   The Operating System has FOUR main functions, one of which is Process Control. Name and describe the other THREE main functions.   [6]

A3   Given the Boolean expression:

$$Y = A + (\overline{\overline{A.B}} \oplus \bar{C})$$

    a.   Draw the logic circuit for the Boolean expression using the least possible gates.

    b.   Draw the truth table for the Boolean expression.   [6]

A4 $X . (Y + Z) = X.Y + X.Z$ is one of the *Distributive Laws*.

    a.   Give the other Distributive Law.   [1]

    b.   Use truth tables to prove the law given in (a) above.   [3]

    c.   Name and give an example of ONE other Boolean algebra law.   [2]

A5   A Personal Computer (PC) is made up of FOUR main components.

    a.   Name the FOUR main components.   [2]

    b.   Describe these FOUR components.   [4]

A6   a.   What is network *bandwidth*?   [1]

    b.   Give ONE advantage of a *Bus Network* over a *Star Network*.   [1]

    c.   Give TWO advantages of a *Star Network* over a *Bus Network*.   [2]

    d.   Give TWO reasons why military applications are likely to opt for a *Mesh Network*. [2]

A7   a.   What is the *OSI model*?   [2]

    b.   Name TWO layers of the *OSI model*.   [2]

    c.   Suggest TWO advantages of a *full duplex* over a *half-duplex* Ethernet connection. [2]

A8   a.   With reference to the Von Neumann architecture, briefly explain the role of:

        i.   Main Memory;
        ii.   ALU.   [2]

    b.   Why is an Operating System necessary to a Computer System?   [1]

    c.   i.   Suggest ONE possible advantage of storing the Operating System on ROM.
                                                                           [1]
        ii.   Suggest TWO reasons why it would be impractical to store the Operating
               System on ROM, despite the advantage you mentioned in (i).   [2]

A9   a.   Explain why Java is considered an *Object Oriented Language*. [1]

    b.   Explain how the use of an array can improve programme productivity. [1]

    c.   Name and briefly explain TWO sorting algorithms.   [2]

    d.   Assume that an array stores names that are sorted alphabetically, explain why keeping
          the names sorted does NOT improve the efficiency of a linear search. [2]

A10   a.   Explain how inheritance can increase productivity in *Object Oriented* programming.

[2]

   b.   State, giving a reason for your answer, whether the following statements are TRUE or FALSE:

   i.   A *do…while* loop will loop 0 or more times;
   ii.   A *while* loop will loop 1 or more times.   [4]

Section B

(Answer **ONE** question from this section)

B1   a.   i.   A heart rate monitor stores the last ten readings in an array called *readingList*. Show how you would declare and assign the array *readingList*.   [3]

       ii.   Write a line in Java to output the first element of the array *readingList*.   [2]

       iii.   Write a method called findAverage() that finds and returns the average of the last ten readings.   [5]

   b.   What is the difference between a void and a non-void method?   [2]

   c.   i.   Write a method called getVat(), that given the cost of a service 'cost' finds and returns the VAT due on the given amount. (Assume VAT is 18%)

        Note: For a service that costs €2.00, you multiply by 0.18 (18%) to get 0.36 which is the Value Added Tax (VAT).   [5]

       ii.   Show how the above method can be called in an output statement that outputs the VAT due to a given service.   [2]

   d.   Compare the following THREE data types as used in Java: byte, int and double.   [1]

Please turn the page.

B2.   a.   Read the following case study and answer the questions below:

A theatre uses a computerized booking system to keep records of customers, plays and bookings. When a customer makes a booking, the booking clerk first has to check whether there are any seats free for the performance. If there are, the clerk reserves a seat, then checks whether the customer's details are already on file, and if not, types them in. The tickets are then printed out and handed or sent to the customer. Payment is made either in cash or by credit card and a receipt is given.

        i.   Draw the Level 0 Context Data Flow Diagram for this scenario.   [4]

        ii.   Normalising a database implies having the best possible design for a relational database. Mention THREE important rules that must be followed when organizing tables in a database.   [3]

        iii.   Distinguish between 1NF, 2NF and 3NF   [3]

   b.   i.   Differentiate between *databases* and *flat file* systems.   [2]

        ii.   Give and briefly explain THREE advantages of *databases* over *traditional file systems*.   [3]

   c.   Give the terms that best describe the database statements and for each term give ONE practical example.

        i.   This is the dataset representing a single item, sometimes also referred to as a record.

        ii.   This is made on a field to be indexed for faster searches. A table can have more than one of these.

        iii.   This consists of more than one field to uniquely identify an entity occurrence.

        iv.   This uniquely identifies a record.

        v.   This is also known as a field.   [5]