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

SECONDARY EDUCATION CERTIFICATE LEVEL

MAY 2017 SESSION

SUBJECT:	**Computing**
PAPER NUMBER:	I
DATE:	15th May 2017
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.

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This paper carries 85 marks of the examination.

Question Number	1	2	3	4	5	6	7	8	9	10	11	12	13	**FOR MARKERS' USE**
For Markers' use only **MARKS**	Total number of Marks or Grade obtained by candidate													

1. The following table contains a number of statements about the CPU. State whether each one is true or false.

The hard disk is part of the CPU	
CPU stands for Control Processing Unit	
The speed of the CPU is measured in GHz	
CPU fetches, decodes and executes instructions	
ALU is not part of the CPU	

(Total: 5 marks)

2. A computer system contains both *ROM* and *RAM*.

   a. What do the acronyms in italics stand for?

   _____

   _____ (2)

   b. Which one of these types of memories:

   i. is Volatile _____

   ii. cannot be changed _____

   iii. is easily upgradable in a computer system _____

   iv. stores currently running programs_____

   v. contains the bootstrap loader_____ (5)

   (Total: 7 marks)

3. A local business has three standalone computers, a printer and an internet connection in an office.

   a. State **TWO** advantages of connecting the computers to create a LAN.

   _____

   _____

   _____ (2)

b. The business will be expanding and opening another office in Gozo. Mention **ONE** other means of communication that could be used by the offices, besides the telephone, to communicate between them?

_____

_____ (2)

c. Identify **ONE** device which is required by computers to communicate over the Internet.

_____ (1)

d. Two managers in different offices need to have a meeting however both do not wish to leave the office. Suggest **ONE** way that this meeting could happen. List **TWO** hardware items required for this meeting to happen.

_____

_____

_____ (3)

(Total: 8 marks)

4. a. Consider the hexadecimal number 7B.

   i. Convert this number into binary.

   _____

   _____

   _____

   _____ (2)

   ii. Convert this number into decimal.

   _____

   _____

   _____

   _____ (2)

This question continues on next page.

b.   Convert the binary number 00111101 to hexadecimal.

_____

_____

_____

_____ (2)

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

_____

_____

_____ (1)

(Total: 7 marks)

5.   a.   Add the following binary numbers

$$\begin{array}{r} 10010111\ + \\ \underline{11011000} \\ \hline \end{array}$$

(2)

b.   State the problem that would occur if the computer had to store the result of the addition of part (a) as a byte.

_____

_____

_____ (1)

c.   What is the effect of a right shift on a binary number?

_____

_____ (1)

(Total: 4 marks)

6. Bytes, kilobytes and megabytes are units used to measure the amount of data stored.

   a. State which of the above units is most appropriate for the following items of data

      i. A one page text document _____

      ii. A person's surname_____

      iii. A ten-minute movie clip _____ (3)

   b. Explain the term multi-programming.

   _____

   _____

   _____ (2)

   c. State **TWO** functions of an Operating System.
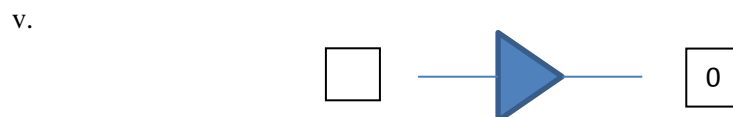
   _____

   _____

   _____
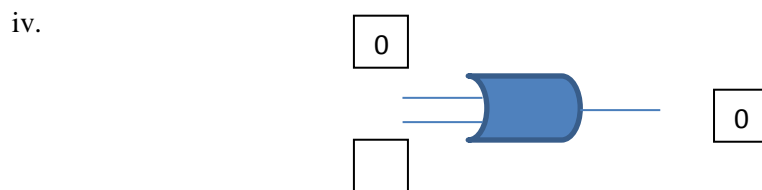
   _____ (2)

   (Total: 7 marks)
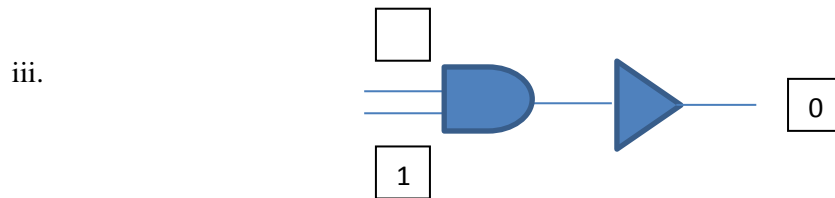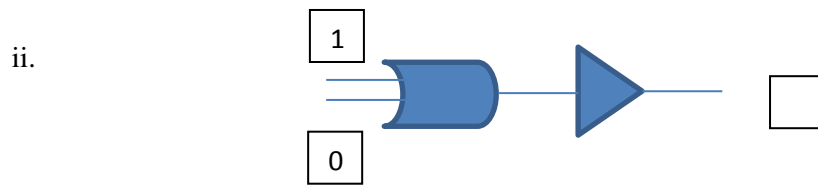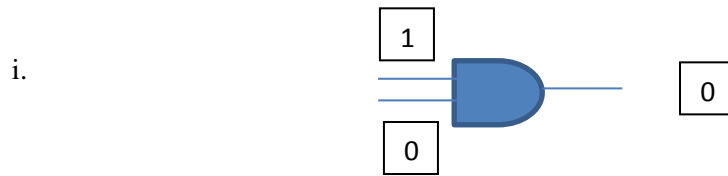
   Please turn the page.

7. The following symbols are used to represent logic circuits.

_____   _____   _____

a. Give the name of the logic gate represented by each of the above symbols. (3)

b. Fill in the missing values in the following logic diagrams. The first one has been done for you.

i.

ii.

iii.

iv.

v.

(4)

(Total: 7 marks)

8. A software house was asked to develop an online game which can be played on games consoles, computers and mobile phones. The program is to be written in a high level language and translated to machine code.

    a. What is the differene between high level languages and machine code?

    _____

    _____

    _____

    _____

    _____ (2)

    b. Highlight the difference between source and executable code.

    _____

    _____

    _____

    _____

    _____ (2)

    c. What is meant by the term online game?

    _____

    _____

    _____ (1)

(Total: 5 marks)

Please turn the page.

9. Compiler, interpreter and assembler are three types of language translators. Combine the appropriate translator to each one of the statements below.

   a. Translates and executes one line at a time._____

   b. The product of translation is saved in a separate file._____

   c. Used to translate a program written in a low level language._____

   d. Translation is done every time a program is run._____

   e. Translates a language which uses mnemonics._____

   f. Program need not be recompiled unless source code has changed._____

   (Total: 6 marks)

10. A typical smartphone is a computer system with input, output and storage.

    a. Identify an input device used on such a phone.

    _____ (1)

    b. Identify an output device which can be attached to the phone.

    _____ (1)

    c. Highlight **ONE** advantage of using a smartphone instead of a desktop computer.
    _____ (1)

    d. What is the difference between a dedicated and a general purpose computer system.

    _____

    _____

    _____

    _____

    _____ (2)

    (Total: 5 marks)

11. Consider the Java programming language.

    a.   Which datatype is used to store:

        i.   a whole number. _____

        ii.   a character. _____

        iii.   TRUE or FALSE._____

        iv.   a number with a decimal point. _____

        v.   a whole sentence. _____ (5)

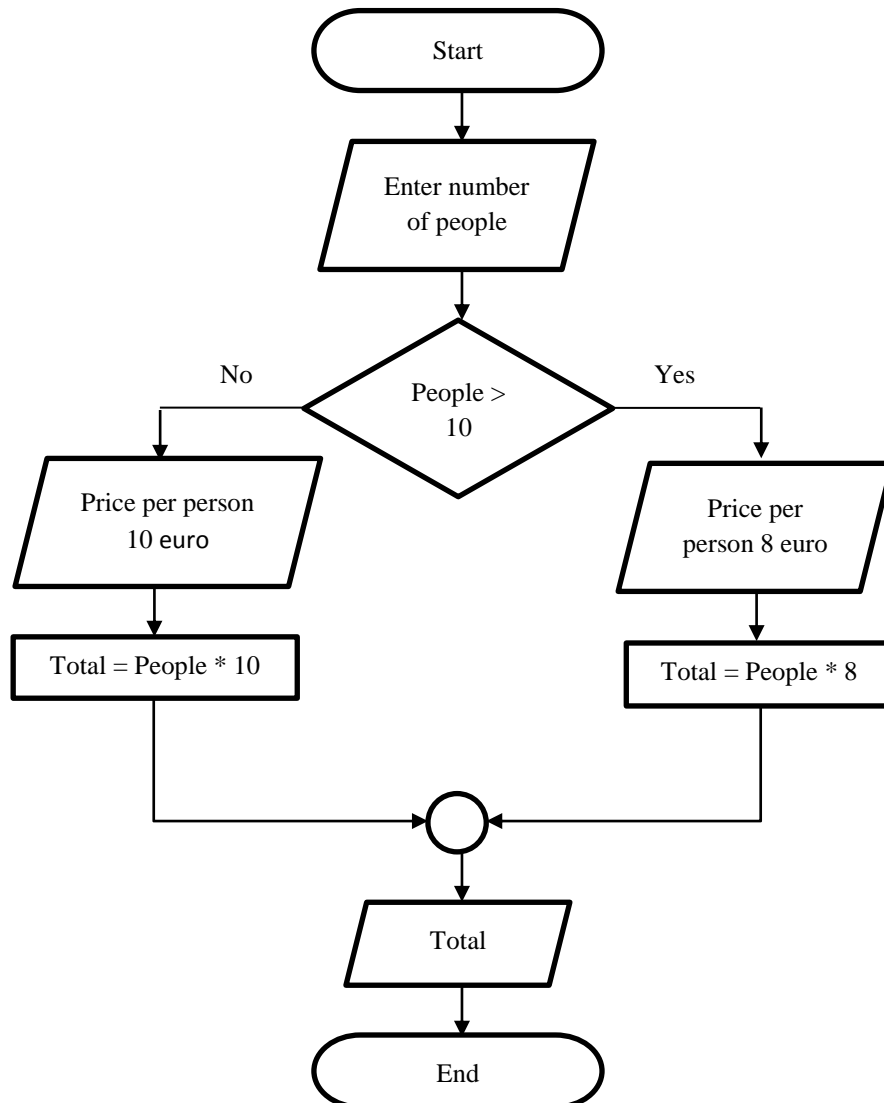   b.   Show how the numbers 1 to 10 can be displayed on screen using one of the loops available in JAVA.

_____

_____

_____

_____

_____

_____ (3)

    c.   Name another **TWO** loops available besides the one used in part (b).

_____ (2)

(Total: 10 marks)

Please turn the page.

12. Given the following flowchart.

```
                          ┌──────────────┐
                          │    Start     │
                          └──────┬───────┘
                                 │
                          ┌──────▼───────┐
                         /  Enter number /
                        /   of people   /
                       └───────┬───────┘
                               │
         No            ┌───────▼───────┐           Yes
     ┌─────────────────┤   People >    ├─────────────────┐
     │                 │      10       │                 │
     │                 └───────────────┘                 │
     │                                                   │
 ┌───▼──────────┐                              ┌─────────▼────┐
/ Price per     /                             /  Price per    /
/ person        /                            /  person 8 euro /
/ 10 euro      /                            └────────┬───────┘
└───┬──────────┘                                     │
    │                                                │
┌───▼──────────────┐                        ┌────────▼─────────┐
│ Total = People * 10│                      │ Total = People * 8│
└───┬──────────────┘                        └────────┬─────────┘
    │                                                │
    └─────────────────────►( )◄─────────────────────┘
                            │
                     ┌──────▼───────┐
                    /    Total      /
                   └───────┬───────┘
                           │
                    ┌──────▼───────┐
                    │     End      │
                    └──────────────┘
```

a. Which symbol is used to represent:

i. a decision;

ii. start/end;

iii. input/output;

iv. a process. (4)

b.   What input is required by the algorithm represented by this flowchart?

_____

_____ (1)

c.   What output is produced?

_____

_____ (1)

(Total: 6 marks)

13. The management of a shop wish to computerise their system however they are undecided whether to purchase *off-the-shelf* or *customised (tailor-made)*software.

a.   Highlight the differences between the terms in italics.

_____

_____

_____

_____ (2)

b.   Systems Analysis is the process of analysing a system with a view to computerisation. State the stages required to develop a new computerised system.

_____

_____

_____

_____

_____

_____

_____ (3)

This question continues on next page.

c. At which stage:

  i. are interviews and questionnaires carried out?_____

  ii. is the new system put in place?_____

  iii. it is decided whether the new system can or cannot be implemented?

_____ (3)

(Total: 8 marks)

SECONDARY EDUCATION CERTIFICATE LEVEL

MAY 2017 SESSION

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MARKS						

1. This question is about operating systems and storage.
   a. One of the main purposes of operating systems is to manage resources. Name **TWO** such resources and briefly explain how the operating system manages each resource mentioned.

   _____

   _____

   _____

   _____

   _____

   _____

   _____ (4)

   b. List **THREE** features of a networked operating system.

   _____

   _____

   _____

   _____

   _____

   _____ (3)

   c. What is an embedded system? Distinguish between a general-purpose computer system and an embedded system.

   _____

   _____

   _____

   _____ (2)

d. RAM is volatile. Explain the benefit of this property.

_____

_____ (1)

e. A new CPU is being advertised as having a large quantity of cache memory. The CPU developers are stressing that this cache memory will improve the overall speed of the computer system. Do you agree? Give **TWO** reasons to support your answer.

_____

_____

_____

_____

_____ (3)

f. What is the main difference that exists between ROM and cache memory?

_____

_____

_____

_____ (2)

g. To solve the problem of file organisation on high-capacity media, files are usually stored in a hierarchical system. By using a diagram explain how a hierarchical directory structure works.

(3)

(Total: 18 marks)

_____

2. This question is about logic.

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

     i.   Show how the number +47 would be stored in this register.

_____

_____

_____

_____ (2)

     ii.   Show how the number -15 would be stored in this register.

_____

_____

_____

_____ (2)

     iii.   Work out 47 + (-15) using 8-bit Two's Complement Binary Representation.

_____

_____

_____

_____

_____

_____ (2)

     iv.   Can the number +140 be represented in this Two's Complement 8-bit register? Explain why.

_____

_____

_____

_____

_____ (3)

b. Consider the following logic circuit diagram.
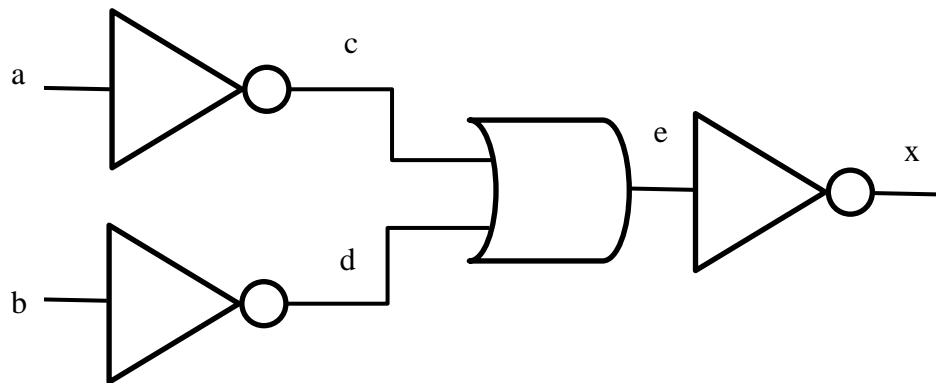
    i.   What is the Boolean expression for the above Logic Circuit?

_____ (1)

    ii.   Complete the Truth Table for the above Logic Circuit.

a	b				x
0	0				
0	1				
1	0				
1	1				

(1)

    iii. What is the name of the logic gate that will behave as the above logic circuit? Draw the corresponding logic gate with same inputs and output.

Name: _____

(2)

(Total: 13 marks)

Please turn the page.

3. This question is about Algorithms and Programming.

   a. Complete the following Java class which given three marks, will calculate and output the largest mark.

```
class largest {
    public static void main(String[ ] args){
    int mark1 = 10;
    int mark2 = 7;
    int mark3 = 12;
```

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ (4)

   b. Observe the following pseudo-code:

```
Bill := 0
for C = 1 to 5 do
     print 'Enter Price:'
     input Price
     Bill := Bill + Price
end for
print Bill
END
```

    i.   What is the function of the above pseudo-code?

_____

_____ (2)

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

(4)

This question continues on next page.

c. Explain branching and iteration in the context of problem solving.

_____

_____

_____

_____ (2)

d. Define the following types of errors and give an example of each:

   i. syntax error

   _____

   _____ (1)

   ii. logical error

   _____

   _____ (1)

   iii. run-time error

   _____

   _____ (1)

e. What type of error is detected during the translation of source code?

   _____

   _____ (1)

f. What is executable code? What is it used for?

   _____

   _____

   _____ (2)

(Total: 18 marks)

4. This question is about the Central Processing Unit

   a. Explain the term register in relation to a Central Processing Unit.

   _____

   _____ (1)

   b. What is the function of the Arithmetic Logic Unit (ALU)?

   _____

   _____ (1)

   c. Identify and briefly describe the role of the two registers found within the Control Unit.

   _____

   _____ (2)

   d. List the steps of the Fetch-Execute cycle.

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____ (4)

   e. Explain how a computer's processor speed is measured.

   _____

   _____

   _____

   _____ (2)

f. What is the use of a parity check when data is transmitted between two devices?

_____

_____

_____

_____ (2)

g. Consider the following section of assembly language code:

        LDA   x   ; Load the value of memory location x into the accumulator
        OR   acc, 10000000 ; OR the contents of the accumulator with 10000000_2
        JMP   Lbl1   ; jump to label Lbl1 if the result is zero
        STA   acc, x   ; Store contents of accumulator to memory location x
    Lbl1:   HLT   ; End of program.

    From the above assembly language code above:

    i.   Identify **ONE** opcode.

_____ (1)

    ii.   Identify **ONE** operand.

_____ (1)

    iii. Identify **ONE** label.

_____ (1)

    iv.   Assuming that 00010000_2 is the value to be loaded in memory location x which is a Two's Complement 8 bit register, find the resulting value of memory location x by dry running the above assembly language code.

_____

_____ (2)

    v.   Considering the value of the accumulator identified in part (iv), state the scope (what will happen to the value of memory location x) of the OR instruction?

_____

_____ (2)

(Total: 19 marks)

5. This question is about I/O devices & data security.

    a. i.   Name **FOUR** input devices.

_____

_____ (2)

       ii.   Name **FOUR** output devices.

_____

_____ (2)

       iii.   Name another **TWO** devices which are both input and output.

_____

_____ (2)

    b. The following words are related to printing. What do they mean?
       i.   Dots per inch;
       ii. Resolution;
       iii. Page layout.

_____

_____

_____

_____

_____

_____

_____

_____

_____ (3)

This question continues on next page.

c. What does the process of spooling involve?

_____

_____ (2)

d. Explain the term I/O Buffering. Why is I/O Buffering necessary?

_____

_____ (2)

e. In the case of data corruption, measures must be taken to prevent data loss. Describe **TWO** security measures for protecting confidential data.

_____

_____

_____

_____

_____

_____ (4)

(Total: 17 marks)

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1. a. Choose the correct term from the list of terms given below which defines the descriptions given.

Programmer	*Web Master*	*Computer Engineer*	*Data Entry Clerk*
Systems Analyst	*IT Trainer*	*Computer Technician*	

    i.   Uses computers and related systems to design new IT solutions, modify, enhance or adapt existing systems and integrate new features or improvements, all with the aim of improving business efficiency and productivity. _____(1)

    ii.   Uses instructions from high or low level languages to write software. _____ (1)

    iii.   A computer expert who excels in explaining, teaching and passing on his/her IT skills and knowledge. _____ (1)

    iv.   Uses keyboard skills to enter information into databases and systems, and create letters, reports and other documents. _____ (1)

    v.   Responsible for creating, managing, and maintaining one or more web-servers or websites. _____ (1)

    vi.   Identifies, troubleshoots and resolves computer problems. _____ (1)

    vii.   Embeds computers in other machines and systems, build networks to transfer data, and make computers, faster, smaller, and more capable. _____ (1)

  b. Identify a suitable input device for the following situations:

    i.   When using a word processor. _____(1)

    ii.   When playing computer games. _____(1)

    iii.   For correcting multiple choice exam papers. _____(1)

    iv.   For obtaining a softcopy of printed material. _____ (1)

c. Highlight the difference between vector and raster devices and give **ONE** example of each.

_____

_____

_____

_____

_____

_____ (4)

(Total: 15 marks)

Please turn the page.

2. The fetch execute cycle, consists of the following steps:

    Step 1: CU fetches the opcode from memory location indicated by PC
    Step 2: CU places opcode in IR
    Step 3: CU fetches any required operand
    Step 4: CU increments PC to point to next instruction
    Step 5: CU activates necessary circuits to execute instruction
    Step 6: Go back to step 1

  a. What is the purpose of the fetch execute cycle?

_____

_____

_____ (2)

  b. Which component of the computer system performs this cycle?

_____ (1)

  c. What is meant by the term operand?

_____ (1)

  d. What do the acronyms below stand for:

    i. CU:_____

    ii. PC:_____

    iii. IR:_____(3)

  e. Which of the acronyms in part (d) above are registers and what does the data stored in each one of them represent?

_____

_____

_____

_____

_____

_____ (4)

f. The System bus is used to connect all the components of a computer system together and is made up of three buses.

   i.   Identify the names of these three buses.

_____

_____

_____ (3)

   ii.   Which one of these buses is related to the size of the address space?

_____ (1)

   iii.   Which one of these buses is related to the word length?

_____ (1)

   iv.   Which one of these buses contains the R/W line?

_____ (1)

(Total: 17 marks)

Please turn the page.

3. A football nursery uses a database to store information of all the children training within the nursery. PLAYER and CATEGORY are two tables used in the database. The data for the first three players in the table PLAYER is shown below

PLAYERID	SURNAME	NAME	CATEGORY CODE
123456L	Agius	Alan	Under 13
654321L	Brincat	Brian	Under 15
246810L	Calleja	Carla	Under 15

a. State a primary key for the PLAYER table and explain your choice.

_____

_____ (2)

b. The database also contains a CATEGORY table and the primary key for this table is CATEGORY CODE. Explain why CATEGORY CODE has been included in the PLAYER table.

_____

_____

_____ (2)

c. Identify the type of relationship between CATEGORY and PLAYER if a player can play in one category only but a category can have many players.

_____ (1)

d. Data verification and data validation are two important checks done during data entry. Choose which one of these types of checks applies to the following statements.
   i. Checking that the CATEGORY CODE entered actually exists.

_____ (1)

   ii. Checking that the PLAYERID consists of 6 digits followed by an L.

_____ (1)

e. The nursery needs to prepare the following tasks before the start of the new season. Identify the software which needs to be used for every task.
   i.   A website giving all the necessary information regarding the nursery.

_____ (1)

   ii. A letter to be emailed to every person.

_____ (1)

   iii. A slideshow to present to the parents during the introduction meeting.

_____ (1)

   iv. A list of email addresses to which a letter is to be sent.

_____ (1)

   v.   A small booklet including text and pictures to be handed out to the parents.

_____ (1)

f. The club is prohibited from sharing information about its members. State which important law stops them from doing so.

_____ (2)

g. A file can be accessed either in serial mode or direct mode. Explain the difference between these two modes of access.

_____

_____

_____

_____

_____ (2)

h. Which mode of file access is best suited to:
   i.   Search for a particular person in a database._____

   ii. List all people in a database._____ (2)

(Total: 18 marks)

Please turn the page.

4. a. Computer technology has changed the ways in which people interact with each other.

   i.   Identify **ONE** other form of communication, besides the use of the telephone, which involves the use of an Internet connection.

   _____ (2)

   ii. Describe what hardware and software is needed for the type of communication described in part (i).

   _____

   _____ (2)

   iii. Mention **ONE** advantage and **ONE** disadvantage of communicating in this way.

   _____

   _____

   _____

   _____ (2)

   b. With reference to a complete computer system state what is meant by the following terms:

   i.   Storage device;

   _____

   _____

   _____ (1)

   ii. Input device;

   _____

   _____

   _____ (1)

iii. Output device.

_____

_____

_____ (1)

c. Input and output devices are available for people with special needs. Identify **ONE** input and **ONE** output device which can be used by a person with needs. Explain your answer.

_____

_____

_____

_____

_____ (4)

d. Most communication done over the Internet involves the sending and receiving of files. Sometimes it may happen that malicious code becomes attached to these files and is downloaded without the users' knowledge. What is this malicious code called and what can the user do to protect him/herself from it.

_____

_____

_____

_____ (2)

e. Describe using **ONE** sentence the following terms:
   i. E-commerce;

_____

_____

_____ (1)

This question continues on next page.

    ii. E-learning;

_____

_____

_____ (1)

    iii. E-government.

_____

_____

_____ (1)

(Total: 18 marks)

5. Janet is writing a program which simulates a dice game. It is played using two ordinary six sided dice. After rolling each dice, if the value obtained on both dice is the same then the total points is equal to double the value of both dice, otherwise the total points is equal to the sum of the dice. Below is a code snippet of this program.

```
Line 1          if (dice1==dice2)
Line 2              total = (dice1+dice2)*2;
Line 3          else total = dice1 + dice2;
Line 4          System.out.println(" Total point = "+ total);
```

a. Which datatype is most suitable for variables *dice1* and *dice2*?

_____ (2)

b. Why is Boolean not a suitable datatype for total?

_____ (1)

c. What would be the output when:

    i. dice1 = 3 and dice2 = 5 _____

    ii. dice1 = 6 and dice2 = 6 _____ (2)

d. Logical and syntax are 2 types of errors. Which one of these errors occur if:

    i.   a semicolon is omitted from **Line2**; _____

    ii.   the programmer by mistake uses a – instead of a + in **Line 3**. _____ (2)

e. Besides the errors mentioned in part (d) above, which other error can occur while a program is running? Describe by using an example.

_____

_____

_____

_____ (3)

f. Which error best describes the statements that follow?

    i.   Detected by the compiler. _____ (1)

    ii.   Detected by performing a dry run of the program. _____ (1)

    iii. Will stop the program from executing. _____ (1)

g. Write an appropriate statement which will output the larger values obtained between dice1 and dice2.

_____

_____

_____

_____

_____

_____

_____ (4)

(Total: 17 marks)

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