FORM 3 (Option)  COMPUTING  TIME: 1h 30min

Name: ____________________________________________                Class: ________________

Directions to Candidates:

Answer **ALL** questions in **Section A** and **Section B** on this paper;  
The use of flow chart template is permitted;  
Calculators are **NOT** allowed;  
Good English and orderly presentation are important.

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For office use only:

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
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<th>10</th>
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<th>12</th>
<th>13</th>
<th>Paper Total</th>
<th>Course Work</th>
<th>Final Mark</th>
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</table>
Section A

1. This question is about Computer Systems.
   a. Answer with True or False.

<table>
<thead>
<tr>
<th>Statement</th>
<th>True/False</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Keyboard, mouse, hard disk and RAM are all examples of hardware.</td>
<td>[3]</td>
</tr>
<tr>
<td>ii. Computers deal with information and not with data.</td>
<td></td>
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<tr>
<td>iii. All computers, including computerized devices like automatic washing machines etc., have a processor.</td>
<td></td>
</tr>
</tbody>
</table>

   b. In which of the following type/s of jobs would you expect computers to be better suited than humans? (Tick as appropriate.)
   The first one has been done for you.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Jobs requiring complex calculations</td>
<td>✓</td>
</tr>
<tr>
<td>ii. Jobs requiring creativity</td>
<td></td>
</tr>
<tr>
<td>iii. High precision repetitive jobs</td>
<td></td>
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</tbody>
</table>

2. Most modern operating systems use a GUI (Graphics User Interface).
   a. What is a graphics interface? [1]

   b. Give ONE reason to show why non-computer experts prefer a graphics interface. [1]

   c. Modern Operating Systems allow us to organise files and folders in a tree structure. Suggest ONE reason why users may prefer to use a tree structure of folders for their documents. [1]

   d. How does the clipboard facility help users share data between different applications? [2]

3. Wordprocessors, Spreadsheets and Graphics Package are application software.
   a. Which of the above application software is most suitable for the following jobs? [3]

   i. Keeping a family budget.
   ii. Writing personalized letters to everyone on a mailing list.
   iii. Producing a picture for a poster to advertise a school activity.
b. Mention a feature in a modern word processor to help the user:
   i. Improve the presentation of his work
   ii. In language skills

4. An antivirus helps us clear our system of viruses and is an example of utility software.
   a. What is utility software?

   b. Give TWO characteristics of a virus:
      i.  
      ii.  

c. Mention ONE other type of utility software, besides an antivirus, and briefly describe its use.
   Utility Software
   Use

5. a. What specialized input device would the following people use for the mentioned tasks?

   Person  | Task                             | Device
   ---      | ---                              | ---
   i. Cashier at Supermarket | Obtaining item price for bill production |
   ii. Designer | Sketching a new logo | |

   b. Insurance companies often use OCR for the input of the clients’ details on forms.
   i. What does OCR stand for?
   ii. Suggest ONE advantage of using OCR rather than manually inputting data.
   iii. Suggest ONE possible shortcoming (fault) of OCR.
6. Printers often have a buffer area.
   a. Would you expect a buffer area to be volatile or non-volatile memory? [1]

   b. Why is buffering important when input and output devices are in use? [2]

   c. Suggest TWO ways in which inkjet printers and laser printers are different. [2]

<table>
<thead>
<tr>
<th>Inkjet Printers</th>
<th>Laser Printers</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td></td>
</tr>
<tr>
<td>ii.</td>
<td></td>
</tr>
</tbody>
</table>

7. This question is about accessing data from a storage device.
   a. Magnetic Tape allows serial access only.
      i. What is serial access? [2]

      ii. Suggest ONE application where serial access is suitable. [1]

      iii. Explain why serial access would not be suitable for use in a book lending library’s computer system. [1]

   b. A solid state hard disk is different from a traditional magnetic hard disk because it is electronic and has no moving parts. In fact it works similar to a pen drive rather than to a traditional hard disk.

Suggest ONE reason why some laptops today have their operating system installed on a solid state hard disk (even if the application software and user data is then stored on a traditional hard disk).

8. This question is about Internet use.
   Fill in the blanks with a suitable word or phrase.

   a. A ________________ is an application software we use to find and display web pages.

   b. When one wants to use the World Wide Web to look up information on a particular subject one uses a ________________.
c. If one finds a webpage that s/he needs to access often, one should add it to her/his ________________.

d. One normally needs to enter her/his username and password before one can ________________ to her/his web-based e-mail account.

e. Some text on a website can be clicked on to take you to another page; this type of text is called ________________.

9. The diagram shows a simple NXT robotic device.

   ![Image of NXT robotic device]

   a. Which of the sensors A, B, C would you use to:

      i. Allow the device to realize when it’s approaching a wall ________________

      ii. Make the device start moving only when someone claps ________________

      iii. Differentiate between a white wall and a black wall ________________

   b. Explain the function of the NXT instructions shown below:

      ![Image of NXT instructions]

      ________________

      ________________

      ________________

      ________________

      ________________
10. This question is about character sets.
   a. ASCII is a 7 bit character set. Therefore how many characters can it represent?  
   
   b. What does the acronym ASCII stand for?  
   
   c. In ASCII the letter ‘a’ is represented by the binary pattern 1000001. What is the decimal equivalent of this binary pattern?  
   
   d. Suggest ONE reason why Unicode is preferred to ASCII.  
   
11. NAND gates are gates which give the opposite (inverse) output of an AND gate. This means that a NAND gate gives 0 only when both inputs are 1, else it outputs 1.
   a. Give the truth table of a NAND gate.  
      
      | Input A | Input B | Output |
      |--------|--------|--------|
      |  0     |   0    |   1    |
      |  0     |   1    |   0    |
      |  1     |   0    |   1    |
      |  1     |   1    |   0    |

   b. The following logic circuit involves a series of NAND gates connected such that collectively they function as a single OR gate. Prove that the circuit in fact functions as an OR gate. 
      Hint: Complete the truth table below to help you.  
      Note: When A is 0 A₁ and A₂ are also 0 etc.  

      | A | B | C | D | E |
      |---|---|---|---|---|
      | 0 | 0 |   |   |   |
      | 0 | 1 |   |   |   |
      | 1 | 0 |   |   |   |
      | 1 | 1 |   |   |   |

      Proof
Section B

12. Programs like the one shown below can be created to make robotic devices perform specific tasks.

![Diagram of robotic device](image)

a. A **sequence** is one of the basic algorithm constructs and involves a number of instructions that will be executed in succession.

i. List and briefly explain the other two algorithm constructs. [4]

<table>
<thead>
<tr>
<th>Construct</th>
<th>Explanation</th>
</tr>
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<tbody>
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</table>

ii. Look again at the picture above and identify the two constructs labelled A and B. [2]
A
B

b. Look carefully at the properties of the move block shown below and then answer the questions that follow by placing the numbers ‘i’ to ‘iv’ in the correct boxes. *The first one has been done for you.*

![Move block properties](image)

i. Mark (i) the section responsible for making the robotic car **move forward**.

ii. Mark (ii) the section responsible for the **speed** with which the robotic car moves.

iii. Mark (iii) the section responsible for determining **which motors** are being controlled by this move block.

iv. Mark (iv) the section responsible for how much the motor turns.
c. Flowcharts are used to design solutions to problems.

i. What is a **flowchart**?  

ii. **Underline** the correct terms:

In a flowchart
- A move block is represented by (a process, an output, a decision) symbol.
- A sound block is represented by (a process, an output, a decision) symbol.

iii. The following pictures show part of a looping block. The image on the right shows the properties of the block.

The incomplete flowchart below represents the looping block above. Complete the flowchart.

```
C = 0
```

Yes

No
13. A new computerised system is going to be developed for a school library.

a. The System will involve 3 main files:

<table>
<thead>
<tr>
<th>Student File</th>
<th>Including the fields: StudentID, Name, Surname, Date of birth, Class, Address, Telephone number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book File</td>
<td>Including the fields: BookID, Name, Author, Year of publication, Shelf mark, Available</td>
</tr>
<tr>
<td>Loans File</td>
<td></td>
</tr>
</tbody>
</table>

i. Identify the field you would use as keyfield in the Student File and justify your answer.
   **Field:**
   **Reason:**

ii. Suggest a suitable data type for the fields in Book File. (Some have been done for you)

<table>
<thead>
<tr>
<th>Field</th>
<th>Data Type</th>
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<tbody>
<tr>
<td>BookID</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Text</td>
</tr>
<tr>
<td>Author</td>
<td></td>
</tr>
<tr>
<td>Year of publication</td>
<td></td>
</tr>
<tr>
<td>Shelf mark</td>
<td>Text</td>
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<tr>
<td>Available</td>
<td></td>
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</table>

b. The new system will be a relational database.

i. What is a relational database?

ii. Suggest ONE advantage of a relational database when compared to a system of separate files.
c. At the end of every month the librarian needs to run a query for students who have overdue books that should have been returned that month and were not. The system needs to issue these students a fine.

i. What is a query? [1]

ii. Suggest a suitable record structure for the Loans File. [4]

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
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iii. Use the following information to draw a flowchart for the part of the database program that will calculate and output the fine or overdue books.
- The student will be charged 10c for every day since the due date.
- Assume that the due date is stored in a variable called dateIn and that the last day of the month is stored in a variable called lastDay.