FORM 4 COMPUTER STUDIES 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.

For office use only:

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Section A – Answer ALL Questions

1. Errors may arise from mistakes during data entry or mistakes in the program itself. Name the following errors.

a. A data entry error made when two data items are swapped. E.g. Typing 132 instead of 123. ______________________ [1]

b. A data entry error made when a data item is left out. E.g. Typing ‘scool’ instead of ‘school’. ______________________ [1]

c. A program error resulting when a running program meets a situation it was not designed to handle. ______________________ [1]

d. An error in the grammar of the programming language that does not allow the program to run. ______________________ [1]

e. An error in the design of a program that may lead it to hang or give wrong results. ______________________ [1]

2. Data verification and validation checks are often employed during the entry of data.

a. Name two types of data validation checks.
   i. ____________________________________________________________ [1]
   ii. ____________________________________________________________ [1]

b. Can these checks on the data ensure that all data entered is correct? Why?
   ____________________________________________________________ [1]
   ____________________________________________________________ [1]

c. Explain briefly one type of data verification.
   ____________________________________________________________ [1]

3. Computers represent values in binary.

a. Why is the above statement true?
   ____________________________________________________________ [2]

b. Convert the following binary number to decimal: 10001101

   Answer ______________________ [1]

c. Convert the following binary number to hexadecimal: 10001101

   Answer ______________________ [1]

d. Convert the following decimal number to hexadecimal: 45

   Answer ______________________ [1]
4. Binary Arithmetic
   a. i. Represent the decimal number 20 in an 8-bit register.

      Answer [1]

   ii. Represent the number 5 in two’s complement in 8 bits.

      Answer [2]

   b. Subtract 5 from 20 using two’s complement arithmetic.

      Answer [2]

5. Consider the following logic circuit and its incomplete truth table below. Note that the circle in the logic circuit is representing an unknown type of gate.

   a. Use the incomplete truth table to help you find the unknown gate. Then label the unknown gate in the logic circuit above.

   b. Complete the truth table for the above logic circuit.

   c. Give the Boolean expression for this circuit.

      [2]
6. Software may be tailor-made or purchased off-the-shelf.
   a. Give three **differences** between tailor-made and off-the-shelf packages.
      
      | Tailor-made packages | Off-the shelf packages |
      |----------------------|------------------------|
      |                      |                        |
      |                      |                        |
      |                      |                        |

   b. Mention two **reasons** when a company might decide to go for a tailor-made package and not off-the-shelf.
      
      i. ___________________________ [1]
      ii. __________________________ [1]

7. The System Life Cycle is associated with the computerization of an organization.
   a. **Number** the following seven tasks of the System Life Cycle to put them in the correct order. *The first one has been numbered for you.*
      
      | System maintenance | Control and Review | Present system study and analysis | Programming, Testing and Documentation | 1 Problem Definition and Feasibility Study | Design of new system | Implementation and changeover methods |
      |-------------------|-------------------|-------------------------------|--------------------------------------|----------------------------------------|---------------------|-------------------------------------|

   b. Why is ‘Analysis’ an important **phase** in the System Life Cycle?
      
      ___________________________________________________________ [2]

8. a. Mention the three types of **documentation** (manuals) that are generally available with software.
      
      ___________________________________________________________ ___________________________________________________________ ___________________________________________________________ [3]

   b. In which type of documentation of part ‘a’ above would you expect to find **flowcharts**?
      
      ___________________________________________________________ [1]

   c. In which type of documentation of part ‘a’ above would you expect to find **instructions** on using the software?
      
      ___________________________________________________________ [1]
9. Name the following computer applications. *The first one has been given as an example.*

| a. The use of satellite systems and computer software to help in navigation. | GPS |
| b. The use of computers to train practicing pilots on a virtual plane. | [1] |
| c. The use of computer technology to design prototypes (e.g., car models) in industry. | [1] |
| d. The use of software to control tools and related machinery in order to manufacture goods. | [1] |
| e. The use of computer systems to carry out financial transactions electronically in a supermarket. | [1] |
| f. The buying and selling of services and products over the Internet. | [1] |

10. a. Write a full Pascal program that asks the user to enter the year of registration of his/her car and then outputs either ‘VRT testing required’ or ‘VRT testing not required’. VRT testing is not required if the car has been bought during or after the year 2008.

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b. The *For..Do* and *Repeat..Until* are two common looping constructs that are used in most programs. In which situation should you use one and not the other?

*For..Do:*

```
```

*Repeat..Until:*

```
```

[1]
11. The installation and use of software is regulated by its license.
   a. Mention two things that happen during software installation.
      i. ___________________________________________________________ [1]
      ii. _________________________________________________________ [1]
   b. What type of license comes with software that can be installed on any
      number of computers within a single location?
      _______________________________________________________ [1]
   c. What are the following types of software called?
      i. Software that is free to use only during a trial period.
         ___________________________________________________ [1]
      ii. Copyrighted software that is given away for free by the author.
         ______________________________________________________ [1]

Section B – Answer BOTH questions

12. Write a section of Pascal code for each of the following tasks.
   a. Declare a variable called name that can store a maximum of fifteen characters.
      ____________________________________________________________ [2]
   b. Allow the user to enter his/her surname in a variable called surname and display
      the first three characters (leftmost) of his/her surname.
      _______________________________________________________ [2]
   c. Declare an array called marks that can hold up to ten marks. Marks can only be
      whole numbers.
      ____________________________________________________________ [2]
   d. Allows the user to enter five values and then outputs the largest value entered.
      The values must be entered using a loop.
      ____________________________________________________________ [4]
e. Display the following **menu** and ask the user to enter his/her choice. The menu is repeatedly displayed until the user entries are correct, that is, only 1, 2 or 3 are accepted.

1. Play game
2. Pause game
3. Quit

Enter your choice?

13. The registers within the CPU together with the memory unit carry out most functions.
   a. What is a **register**?

   b. Briefly **explain** the role of the following registers found inside the CPU.
      i. Program Counter
      ii. Instruction Register
      iii. Accumulator
c. Given an **8-bit register**:
   
i. What is the range of unsigned binary numbers that can be represented in this register? Give your answer in decimal.
   
   [2]

   ii. What is the **range of two’s complement numbers** that can be represented in such a register?

   [2]

d. Modern CPUs often have a 32-bit or 64-bit wordlength.
   
i. What is the **wordlength** of a computer?

   [1]

   ii. How would a 64-bit CPU be **more efficient** than a 32-bit CPU when transferring the word ‘computer’ between the CPU and Main Memory?

   [2]

e. What is the **address space** of a computer?

   [1]

f. How is the address space **relevant** to the computer’s performance?

   [2]