FORM 5                                      COMPUTER STUDIES                                      TIME: 1h 45min

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:

<table>
<thead>
<tr>
<th>Question</th>
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<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>Paper Total</th>
<th>Course Work</th>
<th>Final Mark</th>
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<tbody>
<tr>
<td>Max</td>
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Section A - Answer all Questions

1 (a) A computer stores integers in two’s complement form in 8 bits. Write down in binary the two’s complement representation of the following values:
   i. 75
   ii. -80

   \[
   75 = \_
   \]
   \[
   -80 = \_
   \]

(b) What is the largest positive decimal number that can be held in 8 bits, using two’s complement?

   **Answer:**

   \[
   \]

(c) If 76 is the decimal ASCII code for L, what is the binary ASCII code for Q?

   **Answer:**

   \[
   \]

2 (a) Modern technology has made computers more accessible to people with special needs. Name and briefly describe an input device which is helpful for persons with special need.

   **Input device:**
   **Description:**

(b) A secondary storage medium can be one of three different types. Name the three types of media and for each type give an example of a device/medium.

   **1st Type:**
   **Example:**
2nd Type: ________________________________ 3rd Type: ________________________________
Example: ________________________________ Example: ________________________________

The Systems Analysis exercise is commonly carried out in 7 different stages. The first stage and last stage are: ‘Project selection and feasibility study’ and ‘System maintenance’. List the remaining 5 stages in their correct order.

Stage 1: Project selection and feasibility study.
Stage 2: ________________________________
Stage 3: ________________________________
Stage 4: ________________________________
Stage 5: ________________________________
Stage 6: ________________________________
Stage 7: System maintenance.

For each of the following I.T. related personnel, mention one main duty:

Data Entry Clerk: ________________________________
I.T. Trainer: ________________________________
Programmer: ________________________________
Web Master: ________________________________
Computer Technician: ________________________________

(a) What do the acronyms LAN and WAN stand for?
LAN: ________________________________
WAN: ________________________________

(b) Provide two advantages of having a LAN system in the school’s administration offices rather than standalone computers.
1st Advantage: ________________________________

2nd Advantage: ________________________________

(c) Besides browsing for information, mention two other services that a student can use over a WAN system.
  1st Service: ________________________________
  2nd Service: ________________________________

6 (a) What is software piracy?

Software piracy: ________________________________

(b) i. What is software registration?
    ii. Mention one advantage of registering newly bought software.
    iii. Name and explain one other software measure (excluding registration) and one hardware measure which are used by software publishers to deter piracy.

Software registration: ________________________________

Advantage: ________________________________

Software: ________________________________

Hardware: ________________________________

7 A room has two windows and one door and a security alarm system is wired to them. The alarm sounds (Logic 1) if any one window (or both windows) are open (Logic 1) or the door is open (Logic 1).

Using only two logic gates and the letters W1 (window 1), W2 (window 2), D (door) for the inputs and A (alarm) for the output:
  i. Draw the circuit for this alarm system.
  ii. Draw the truth table for this system.
  iii. Derive the Boolean expression for this alarm system.

Circuit:
8 (a) What is process control and give an example where process control is used.

**Process control:**

**Example:**

(b) Differentiate between general-purpose and dedicated computer systems.

**General-purpose:**

**Dedicated:**

9 **Real-time processing, Batch processing** and **Time-sharing** each require a different operating system.

i. Write down the type of operating system from those given above, that is normally associated with the each of the following applications:

<table>
<thead>
<tr>
<th>Application</th>
<th>Type of operating system</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM bank transaction system</td>
<td></td>
</tr>
<tr>
<td>Electricity billing system</td>
<td></td>
</tr>
<tr>
<td>Auto pilot system in airplanes</td>
<td></td>
</tr>
<tr>
<td>Payroll system</td>
<td></td>
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</tbody>
</table>

ii. Mention three major characteristics of a real-time system.

1st Characteristic: 

2nd Characteristic: 

3rd Characteristic: 

The Pascal snippet below is intended to read a mark between 0 and 100 (both marks being valid marks), and output Distinction, Merit or Fail according to the inputted mark. However it has two errors. Study the snippet and then answer the questions below. (Line numbers are included to facilitate your references).

```
Line 1:   Writeln(`Enter a mark between 0 and 100: `);
Line 2:   Readln(Mark);
Line 3:   If (Mark >= 0) AND (Mark >= 100) Then
Line 4:     Begin
Line 5:         Case    Of
Line 6:             75..100 : Writeln(`Distinction`);
Line 7:             50..74  : Writeln(`Merit`);
Line 8:             0..49  : Writeln(`Fail`);
Line 9:     End;   {of Case}
Line 10:    End {of If}
Line 11:    Else
Line 12:     Begin
Line 13:         Writeln(`You entered a wrong mark`);
Line 14:     End;   {of Else}
```

i. Write the line numbers where the two errors are.
ii. What type of programming error has been made in each case?
iii. Re-write the instructions without the errors.

1st Error: ___________________________  2nd Error: _______________________
1st Error type: ___________________________
2nd Error type: ___________________________
1st Instruction: ___________________________
2nd Instruction: ___________________________

Consider the following section of assembly language program. A semicolon indicates a comment.

```
LDA    #2  ; load number 2 into the accumulator
STA     X  ; store the contents of the accumulator in location X
LDA    #8  ; load number 8 into the accumulator
STA     Y  ; store the contents of the accumulator in location Y
```

(a) From the program above identify a mnemonic and an operand.

Mnemonic: __________________________
Operand: __________________________

(b) To run an assembly language program one needs an assembler.

i. What language level is assembly language?
ii. What is the function of an assembler?

Language Level: __________________________
For each of the statements below write one or more instructions in Pascal.

(a) Ask the user to input two integers $A$ and $B$; then output the integer part when $B$ is divided by $A$. *(Example - 9 divided by 4 will output 2)*

(b) Store the result of the expression on the right in variable $X$. *(Use the built-in mathematical functions where necessary.)* $\sqrt{b^2 - 4ac}$

(c) Write a conditional instruction for Question (b) above, which displays the word ‘Real’ when $X$ is greater or equal to zero (0), otherwise displays ‘Not real’.

(d) Declare a 2-dimensional integer array named Matrix with a size of 10 rows by 20 columns.

(e) Use a loop to ask the user to enter ten numbers and then the program outputs the smallest number entered.
13 (a) i. What is the **Fetch-execute cycle**?
   
ii. Write down the six typical **steps** involved during one fetch-execute cycle.

**Fetch-execute cycle:**

   1. 
   2. 
   3. 
   4. 
   5. 
   6. 

**Steps:**

   1. 
   2. 
   3. 
   4. 
   5. 
   6. 

(b) Define the terms: **word length**, **instruction set** and **control bus**.

   **Word-length:**

   **Instruction set:**

   **Control bus:**

(c) **Name** and briefly explain the **function** of any two **registers** found in the CPU.

   **1st Register:**

   **Function:**

   **2nd Register:**

   **Function:**