THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CANDIDATES' ITEM RESPONSE ANALYSIS REPORT ON THE ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION (ACSEE) 2023

COMPUTER SCIENCE

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136 COMPUTER SCIENCE

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FOREWORD

The National Examinations Council of Tanzania (NECTA) is pleased to issue this Candidates' Item Responses Analysis (CIRA) report on Computer Science subject in the Advanced Certificate of Secondary Education Examination (ACSEE) 2023. The analysis aimed at providing feedback to students, teachers, parents, policy makers and other education stakeholders on how candidates responded to the examination questions.

Generally, the candidates' performance in the 2023 Computer Science Examination was good as 92.41 per cent of the candidates passed. The analysis of performance in each topic shows that, the candidates had good performance in eight topics, average performance in one topic, and weak performance in one topic. The candidates performed well in the topics of IT Environment, Computer Security and Privacy, Website Development, Data Communication and Networking, C++ Programming, Data Representation, Data Structure and Algorithm, and Information Systems. The candidates' performance was average in the topic of Visual Programming and weak in the topic of Computer Basics. The weak performance in this topic was attributed to the candidates' lack of knowledge about hierarchy memory technologies and failure to understand the question's requirement.

The National Examinations Council expects that, the feedback provided in this report will help the education administrators, school managers, teachers, and students to identify proper measures to take in order to improve candidates' performance in future examinations administered by the Council.

Finally, the Council would like to thank the examination officers and all who participated in the preparation of this report.

Dr. Said A. Mohammed
EXECUTIVE SECRETARY

1.0 INTRODUCTION

This report presents an analysis of the candidates' performance in the Advanced Certificates of Secondary Education Examination (ACSEE) in Computer Science subject in the year 2023. The examination assessed knowledge and competences acquired by the candidates at the advanced level of secondary education.

The examination had two papers: Computer Science paper 1 (Theory) and Computer Science paper 2 (Practical). The theory paper had sections A and B. Section A consisted of 7 compulsory questions, carrying 10 marks each. Section B had 3 optional questions that carry 15 marks each. From which the candidates were required to answer 2. The practical paper had 3 questions, carrying 25 marks each. The candidates were required to answer 2 questions, including question one.

A total of 158 candidates sat for the Computer Science examination in 2023. Out of those, 146 (92.41%) passed the examination, and 12 (7.59 %) failed. In 2022, a total of 298 candidates sat for the Computer Science examination, and among them 66 (22.15%) passed, while 232 (77.85%) failed. This means that there is an increase in performance by 70.26 per cent.

The analysis of the candidates' performance in each question was done by considering the requirements of the questions, the candidates' responses and the mistakes they made while attempting the questions. Furthermore, the extracts of candidates' responses have been provided to illustrate the cases presented. The candidates' performance in each question/topic is categorized using the ranges of 0 to 34 (weak performance), 35 to 59 (average performance) and 60 to 100 (good performance). These intervals stand for the percentage of the candidates who scored 35 per cent or above of the marks allocated to different questions. The candidates' performance is also presented in different charts. Red stands for weak performance, yellow stands for average performance, and green represents good performance. Finally, the report presents conclusion and recommendations.

2.0 ANALYSIS OF THE CANDIDATES' PERFORMANCE PER QUESTION

2.1 136/1 Computer Science 1

This was a theory paper which lasted for 3 hours. The paper consisted of sections A and B, with a total of 10 questions. Section A consisted of 7 short-answer questions, each carrying 10 marks. Section B consisted of 3 essay/structured questions which carried 15 marks each. The candidates were required to answer all questions in Section A, and 2 questions from Section B, making a total of 9 questions.

2.1.1 Question 1: Computer Basics

This question had parts (a) and (b). The question was as follows;

(a) The use of hierarchy memory technologies is a cost effective technique for designing large computer systems. It includes six general classes of storage media;

(i) What are the six general classes of storage media made up a memory hierarchy?

(ii) Arrange the classes of storage media provided in 1 (a) (i) in a Typical Storage Hierarchy Ladder Diagram.

(b) Describe the two types of the memory located at the top of the hierarchy.

All 158 (100%) candidates attempted this question. A total of 129 (81.64%) candidates scored from 0 to 3 marks, 6 (3.80%) scored from 3.5 to 5.5 marks, while 23 (14.56%) scored from 6 to 10 marks out of 10 marks allocated. Figure 1 illustrates the candidates' performance on this question.

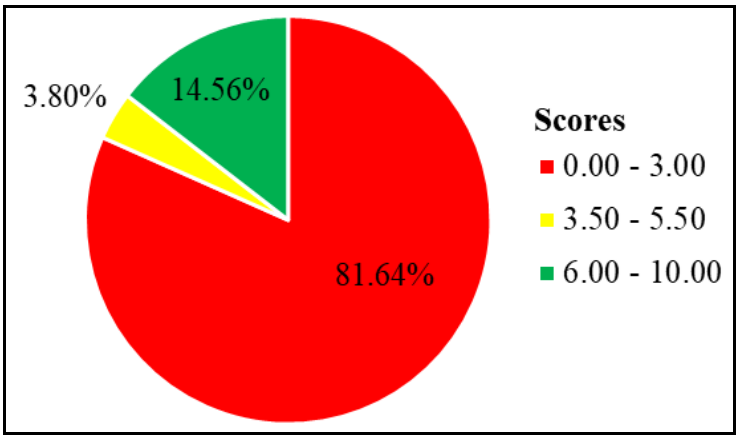
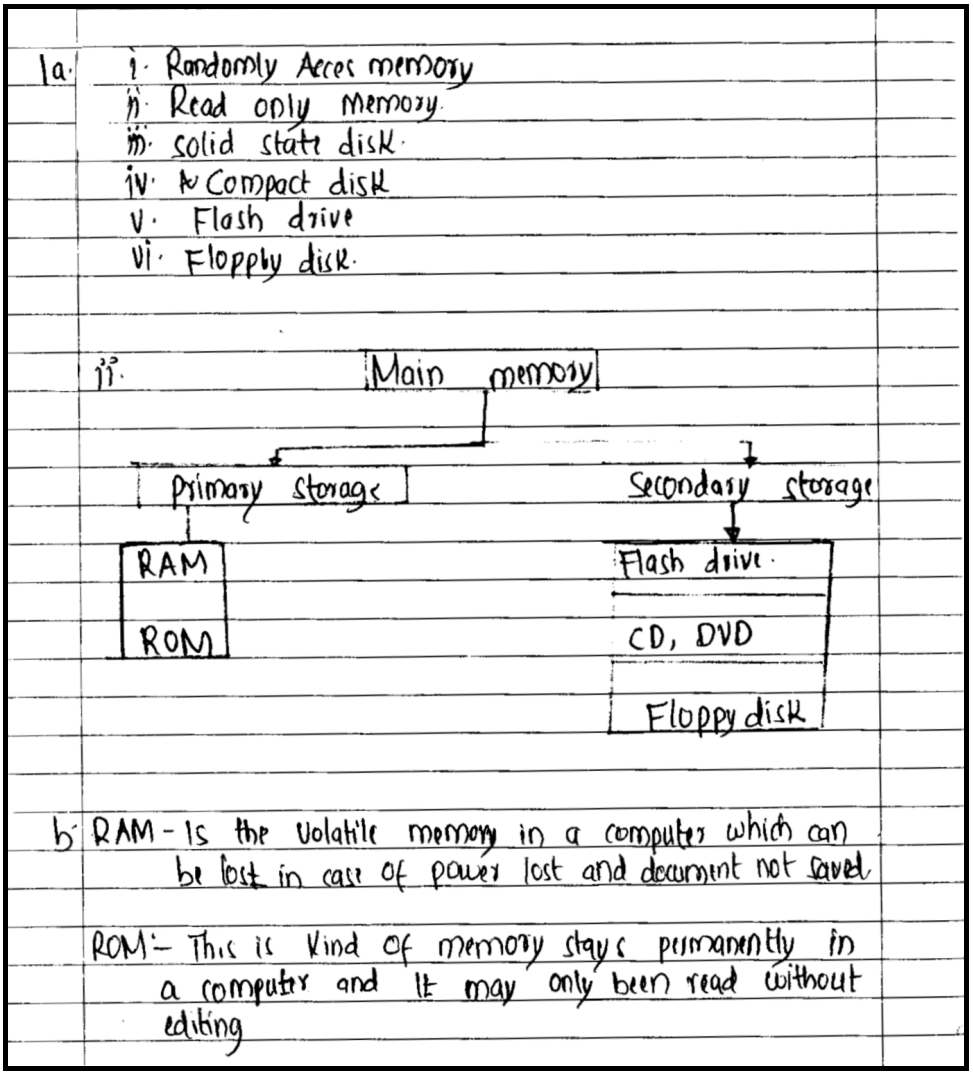


Figure 1: *The Candidates' Performance on Question 1 of Paper 1*

The general performance in this question was weak because 81.65 per cent of the candidates scored below 3.5 marks. Most of the candidates who scored low marks (0 – 3) identified one to three general classes of storage media in part (a) (i) correctly. Some candidates provided types of primary storages devices instead of classes of storage media. This indicates that, the candidates did not understand the question's demands. Further analysis showed that most of the candidates lacked knowledge about general classes of storage media, thus provided irrelevant responses. For example, some candidates provided parts of Central Processing Unit (CPU) instead of storage media. This signifies that the candidates could not differentiate between storage devices and processing devices in a computer system.

In part (a) (ii), some candidates drew the block diagram of CPU instead of storage media hierarchy ladder diagram. This shows that the candidates confused the availability of the memory unit within the CPU, and the arrangement of the classes of storage media. Furthermore, some of the candidates described primary and secondary memory instead of registers which is located at the top of the hierarchy, in part (b). Other candidates described the cloud computing as a type of memory in a computer system such as Google drives and iCloud storage. This shows that the candidates did not understand the requirement of the question. Extract 1.1 represents a sample of incorrect responses to question 1.



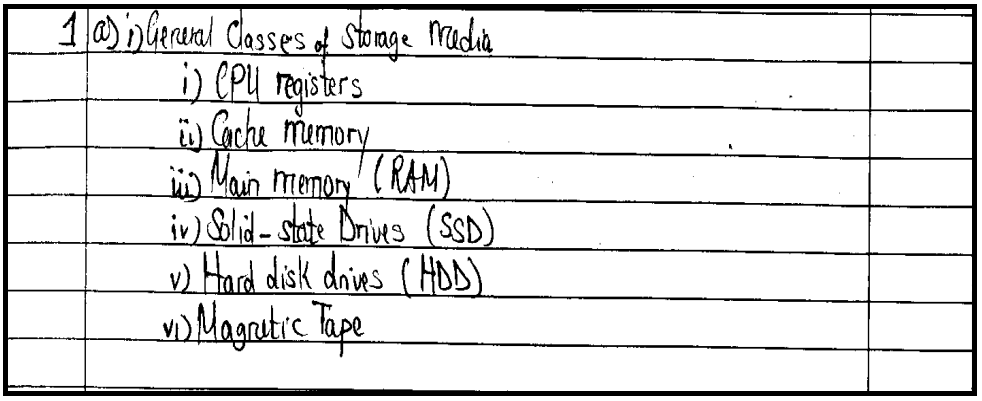
Extract 1.1: A sample of incorrect responses to question 1 of paper 1

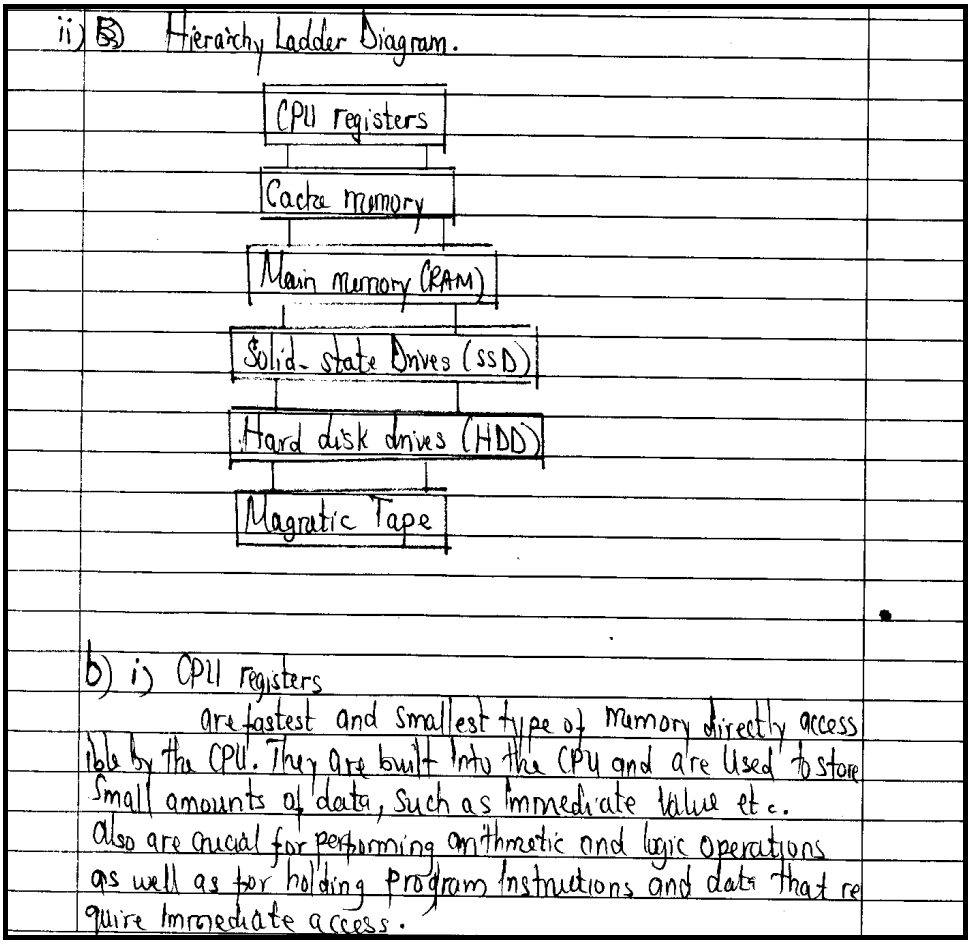
In Extract 1.1, the candidate provided example of storage media instead of general classes of storage media in part (a)(i). In part (a)(ii), the candidates drew the tree diagram to represent types of storage devices instead of hierarchy Ladder diagram. In part (b), the candidate described about RAM and ROM, instead of register.

On the other hands, 3.8 per cent of the candidates who scored average marks identified at least four classes of storage media in part (a) (i) correctly. Some candidates mixed up classes of the storage media with their types. Other candidates repeated the same type of the memory media. This

led them to lose some marks. In part (a) (ii), some of the candidates drew the storage hierarchy but failed to arrange the storage media sequentially. Other candidates drew tree diagram to arrange storage devices instead of hierarchy ladder. In part (b), the candidates described few types of memories without considering their position in the storage hierarchy diagram.

Apart from poor performance, few candidates (14.56%) scored high marks (6 - 10). Some of candidates mentioned all six general classes of storage media in part (a) (i) correctly. In part (a) (ii), the candidates managed to draw Hierarchy Ladder Diagram but failed to arrange all storage media as required. This led them to lose some marks. Some candidates arrange the same type of device twice. For example, the candidates arranged CD followed by DVD. These candidates failed to understand that both CD and DVD are in the class of solid state storage device. Other candidates reversed the arrangement of some storage media. Extract 1.2 presents a sample of correct responses from one of the candidates.





Extract 1.2: A sample of correct responses to question 1, paper 1

In Extract 1.2, the candidates wrote all six general classes of storage media in part (a)(i) correctly. In part (a)(ii), the candidates managed to draw hierarchy of storage media, but interchanged the position of HHD and SSD. Also, the candidates managed to explain the registers as the top most media at the hierarchy.

2.1.2 Question 2: Data Representation

The question had three parts: (a), (b), and (c). The question was as follows;

ABC Company Ltd wants to install an electric fence system to its customers. One of its logical circuits is derived from the Boolean expression

$X = AB + ABC + A\overline{B}\overline{C} + A\overline{C}$

(a) Use Boolean laws of algebra to simplify the given Boolean expression.
(b) Draw the logic gate circuit for the simplified Boolean expression in 2 (a).
(c) Use a truth table to determine what input conditions produce logic 1 output in the logic gate drawn in 2 (b).

A total of 158 (100%) candidates attempted this question. 40 (25.32%) scored from 0 to 3 marks, 17(10.76%) scored from 3.5 to 5.5 marks, and 101 (63.92%) scored from 6 to 10 marks out of 10 marks allocated. Figure 2 illustrates the candidates' performance in this question.

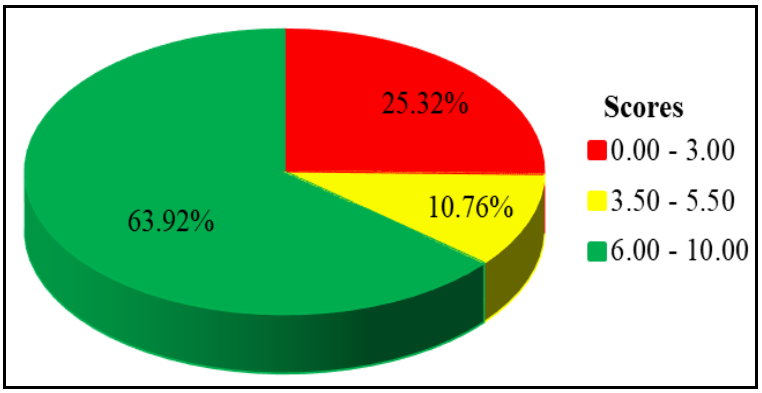
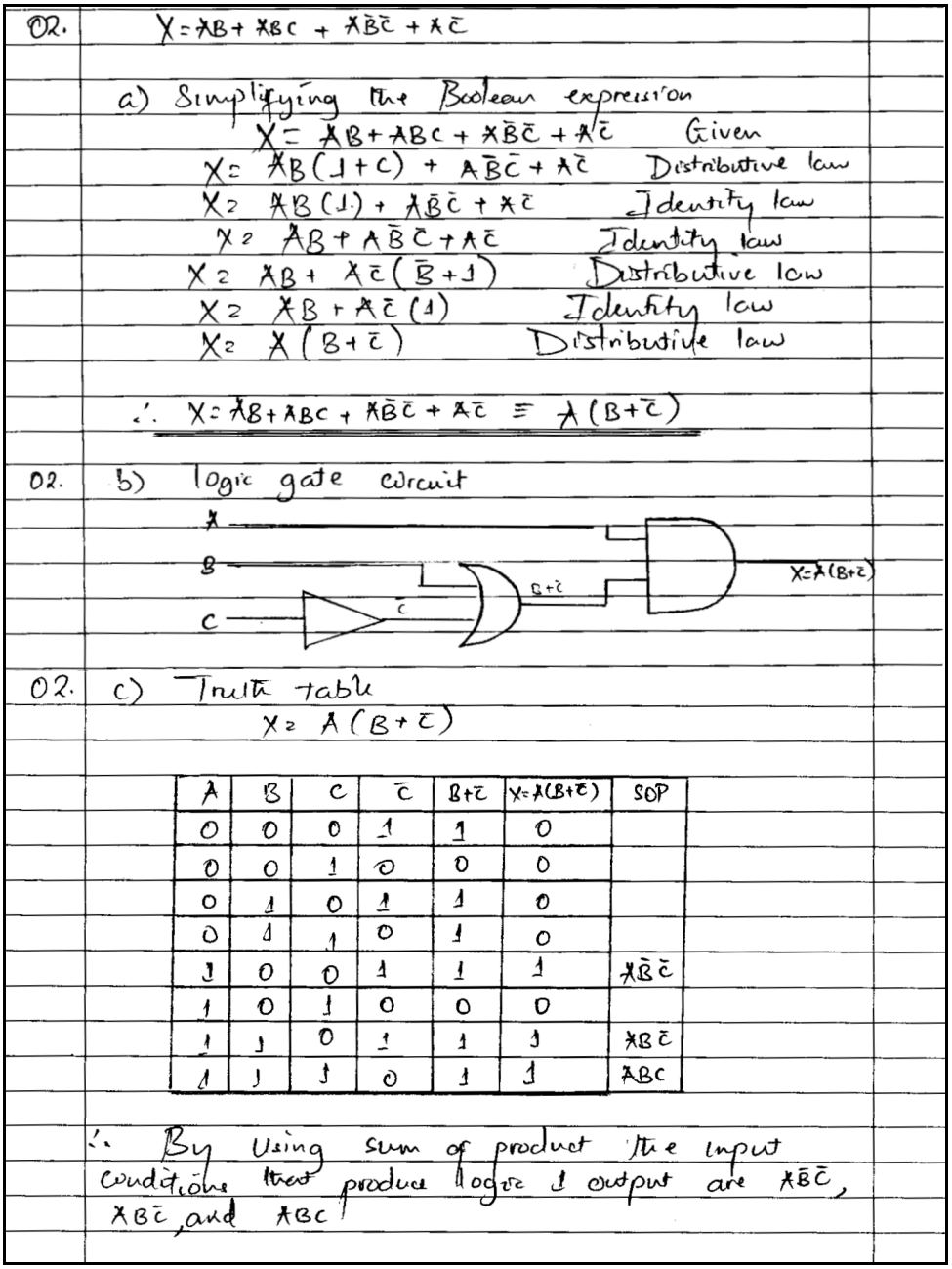


Figure 2: *The Candidates' Performance on Question 2, Paper 1*

The general performance in this question was good because 74.68 per cent of the candidates scored above 3 marks. Most of the candidates who scored high marks simplified the given expression using Boolean laws of algebra, in part (a) correctly. In part (b), the candidates drew correctly the logic gate circuit for the simplified Boolean expression. However, some of the candidates simplified the expression to $X = AB + A\overline{C}$ $X = A(B + \overline{C})$ in part (a). Hence, drew the logic gate of $X = AB + A\overline{C}$ in part (b). In part (c), the candidates correctly drew the truth table of the given Boolean expression. However, some of the candidates gave the Boolean expression as the input conditions required to produce logic 1 output from the truth table instead of logic numbers. For example, one

candidate wrote $A\overline{B}\overline{C} + AB\overline{C} + ABC$ instead of 100, 110 and 111. Extract 2.1 presents a sample of such correct responses to question 2.



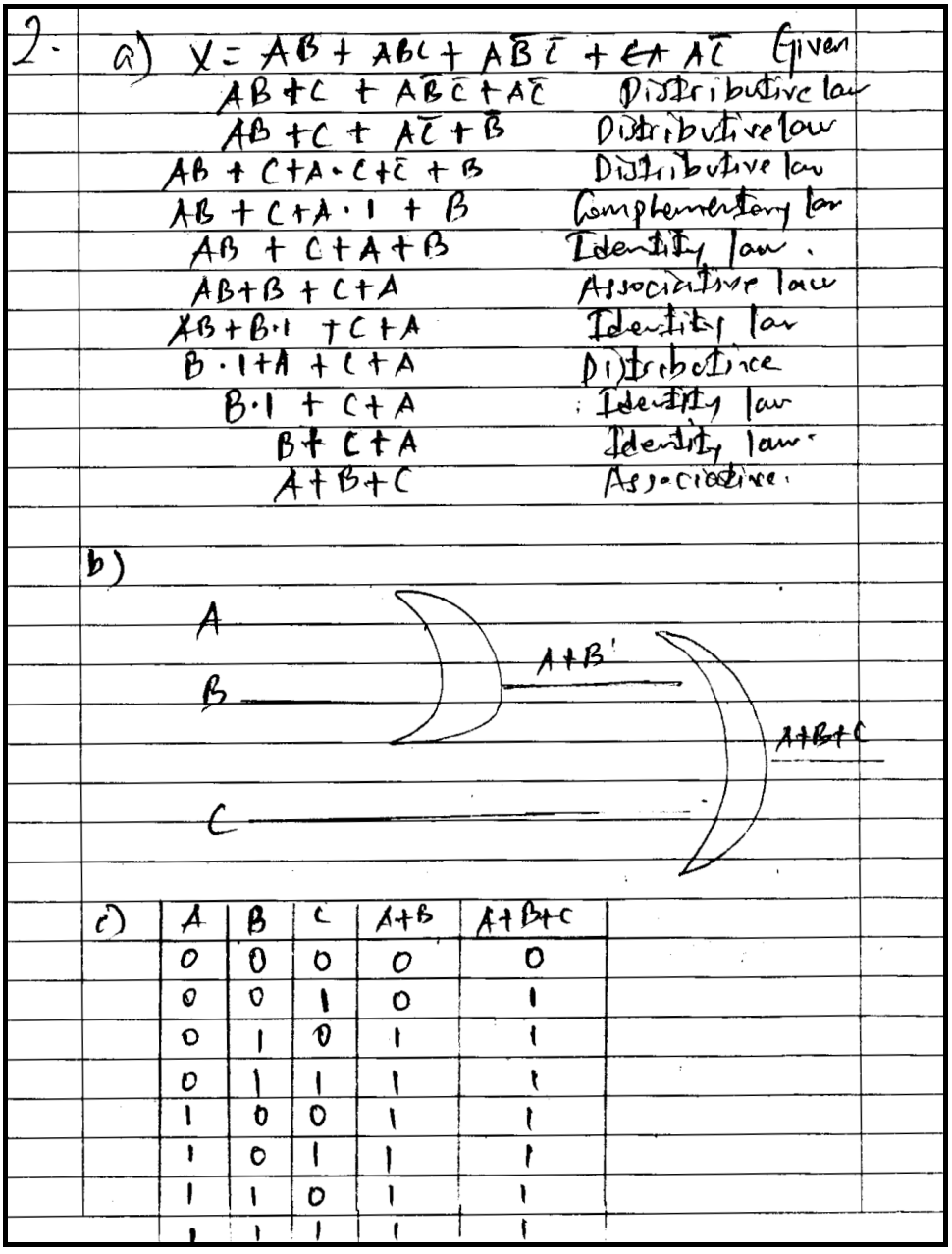
Extract 2.1: A sample of correct responses to question 2, paper 1

In Extract 2.1, the candidate simplified correctly the Boolean expression in part (a). The candidate also managed to draw correctly a logic circuit in

part (b). Moreover, the candidate drew the correct truth table and gave the correct input conditions whose logic output is 1.

On the other hand, most of the candidates (10.76%) who scored average marks (3.5 - 5.5) simplified the given Boolean expression in part (a) correctly. However, some candidates failed to complete all Boolean laws required to simplify the Boolean expression. In part (b), some of the candidates drew correctly logic gate for the simplified Boolean expression. Other candidates drew incorrect logic gate as a result of wrong simplified Boolean expression. In part (c), most of the candidates drew the truth table with the correct logic inputs data. However, some of them wrote wrong logic outputs data especially in a column of $B+\overline{C}$ and $A(B+\overline{C})$ because they mixed up between AND/OR operation. This shows that, the candidates had insufficient knowledge on data representation.

The statistics showed that few candidates (25.32%) scored low marks (0 - 3). Some of these candidates used correctly the Boolean laws to simplify the given Boolean expression in part (a). However, some of the candidates failed to identify the appropriate Boolean laws of algebra used in their expression. In part (b), most of candidates drew incorrect logic gate due to the wrong result obtained after simplifying the given Boolean expression. Others drew logical electric circuit diagram instead of logical gates. This signifies that, the candidates did not understand the question's demands. In part (c), some of the candidates managed to fill three inputs column A, B, and C, but failed to complete their output. Moreover, other candidates drew the truth table with incorrect number of rows. These candidates failed to understand that the number of rows is determined by the number of inputs in a truth table. Extract 2.2 presents a sample of such incorrect responses to question 2.



Extract 2.2: A sample of correct responses to question 2, paper 1

In Extract 2.2, the candidate wrote inappropriate laws and expression in part (a). In part (b), the candidate drew the wrong logic gate due to wrong expression obtained in part (a), as well as incorrect truth table in part (c).

2.1.3 Question 3: Data Structure and Algorithm

This question had two parts namely (a) and (b). The question was as follows;

(a) Programs allocate memory to variables statically or dynamically depending on the programmers' requirement;

(i) What does the variable mean?

(ii) What is the difference between dynamic and static memory allocation? Give one circumstance in which you would prefer one instead of the other.

(b) You are given the following set of integers 53, 45, 30, 67, 20, 55, 60. Design a program that would read and display them in an ascending order.

A total of 158 (100%) candidates attempted this question. 53 (33.54%) scored from 0 to 3 marks, 71 (44.94%) scored from 3.5 to 5.5 marks and 34 (21.52%) scored from 6 to 10 marks out of the 10 marks allocated. Figure 3 illustrates the candidates' performance in this question.

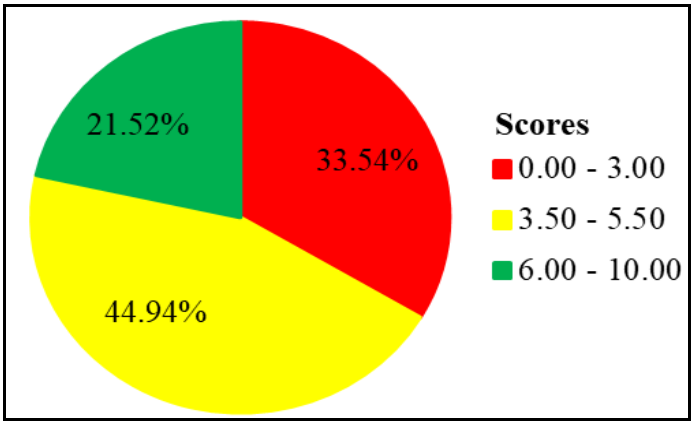
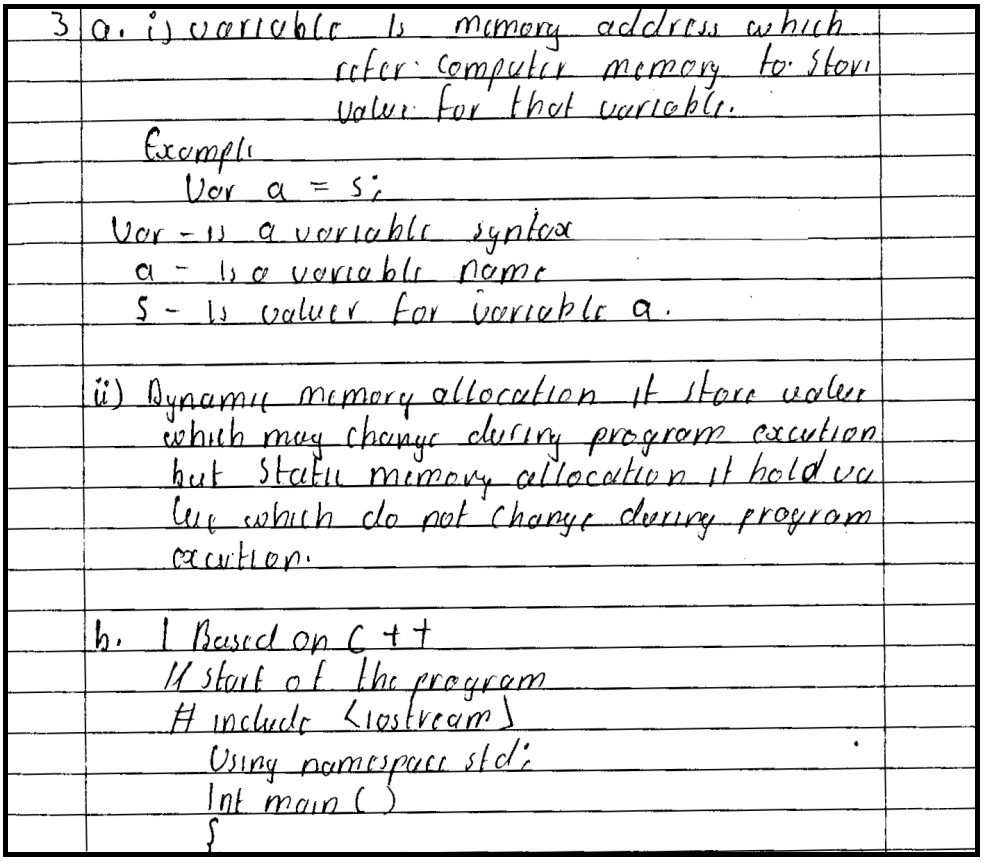


Figure 3: *The Candidates' Performance on Question 3, Paper 1*

The general performance in this question was good because 66.46 per cent of the candidates scored above 3 marks. Some candidates who scored low marks gave direct meaning of the term variable in part (a)(i). Other candidates gave the characteristics of the term variable. For example, one candidate wrote, *Variable refers to all characters or letters that can change*. Another candidate wrote, *Variable means data that found in a specific space*. These candidates failed to differentiate the term variable as

the parameters used in the program and variable which is the location where the information is stored. In part (a)(ii), most of the candidates gave unclear explanations on differentiating the term dynamic and static memory. Some of them differentiated RAM and ROM as a dynamic and static memory. For example, one candidate wrote *dynamic memory is a temporary memory as in it can be deleted or disappear when program is disable while static memory is a permanent memory and cannot disappear no matter what*. Other candidates interchanged between the concept of the term dynamic and static memory. Furthermore, some candidates could not give circumstance on applying either dynamic or static memory allocation. In part (b), most of the candidates arranged the given integers manually, instead of designing the program that arranges them. This shows that, the candidates had insufficient knowledge of data structure. Extract 3.1 presents a sample of an incorrect response in question 3.


3 a. i) variable is memory address which refer computer memory to store value for that variable.

Example

Var a = 5;

Var - is a variable syntax

a - is a variable name

5 - is value for variable a.

ii) Dynamic memory allocation it store value which may change during program execution but Static memory allocation it hold value which do not change during program execution.

b. // Based on C++

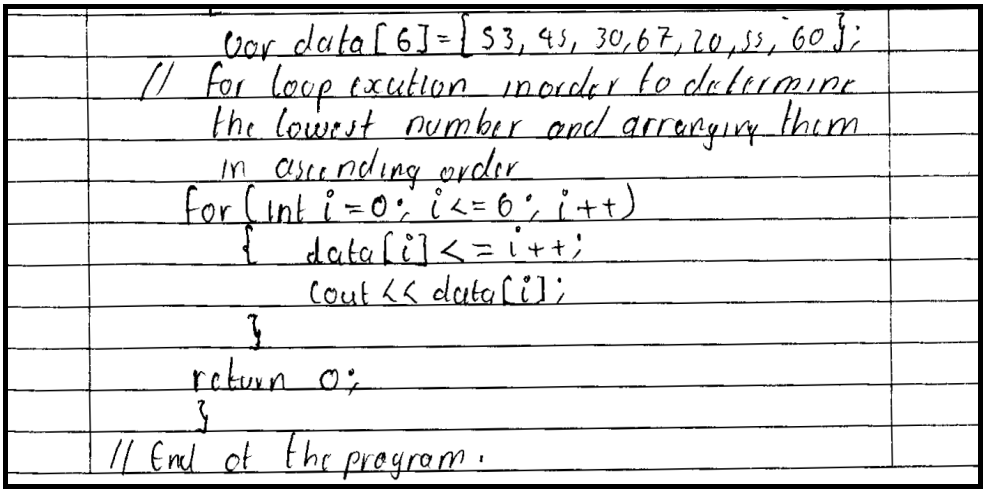
// start of the program

#include <iostream>

Using namespace std;

Int main ()

{



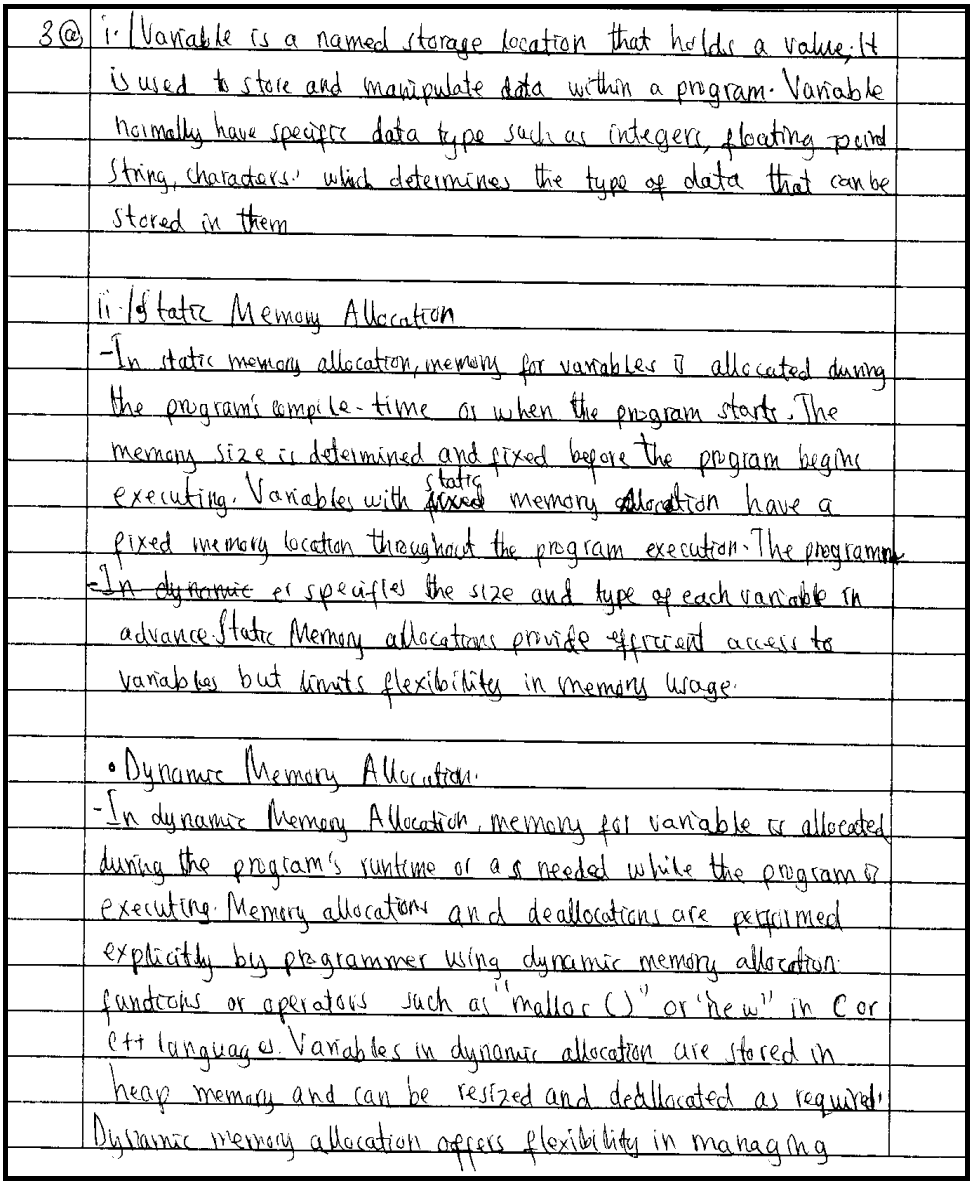
Extract 3.1: A sample of incorrect responses in question 3, paper 1

In Extract 3.1, the candidate gave unclear definition of variable, and use example of variable declaration and initialization, in part (a)(i). The candidate managed to give partial explanation of the term static and dynamic memory without stating the circumstance of applying those memories in part (a)(ii). In part (b), the candidates wrote wrong C++ program to ascend the number without input variable.

On the other hand, 44.94 per cent of the candidates who scored average marks (3.5 – 5.5) defined the term variable in part (a)(i) correctly. In part (a)(ii), the candidates differentiated correctly the term dynamic and static memory allocation. However, the candidates failed to give the correct reason that defends the preferred memory allocation. Some candidates explained dynamic memory allocation as the global variables and static memory allocation as a local variable. However the two terms are known as types of variable scopes. In part (b), the candidates designed a program that ascends the numbers using incorrect loop. This shows that the candidates had inadequate knowledge on looping in a programming.

Further analysis showed that some candidates (21.52%) scored high marks (6 – 10). Some candidates defined the term variable as applied in programming in part (a)(i) correctly. They also differentiated correctly the term dynamic and static memory in part (a) (ii). Moreover, some candidates failed to explain clearly the circumstance where the memory allocations can be applied. In part (b), most of the candidates designed the correct

program that reads and displays the given numbers in ascending order. Some of the candidates failed to assign variable for sorting the given numbers. This led them to lose some marks. Extract 3.2 presents a sample of such correct responses.


3@ i. Variable is a named storage location that holds a value. It is used to store and manipulate data within a program. Variable normally have specific data type such as integers, floating point String, characters. which determines the type of data that can be stored in them

ii. Static Memory Allocation
-In static memory allocation, memory for variables is allocated during the program's compile-time or when the program starts. The memory size is determined and fixed before the program begins executing. Variables with static memory allocation have a fixed memory location throughout the program execution. The programmer specifies the size and type of each variable in advance. Static Memory allocations provide efficient access to variables but limits flexibility in memory usage.

• Dynamic Memory Allocation.
-In dynamic Memory Allocation, memory for variable is allocated during the program's runtime or as needed while the program is executing. Memory allocations and deallocations are performed explicitly by programmer using dynamic memory allocation functions or operators such as "malloc()" or "new" in C or C++ languages. Variables in dynamic allocation are stored in heap memory and can be resized and deallocated as required. Dynamic memory allocation offers flexibility in managing

3(a) memory resources but requires careful memory management to avoid memory leaks or access violation.

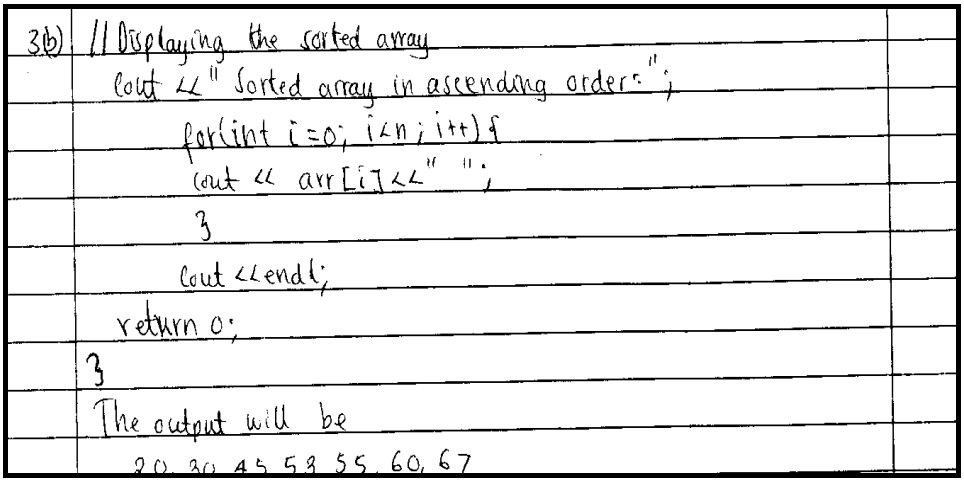
Circumstance for Preference:

Dynamic memory allocation may be preffered over static memory allocation when the programs needs to handle a variable amount of data or when the required memory size is unknown at compile time. It allows the program to allocate memory as needed, making it more suitable for scenarios where memory requirements are dynamic or ~~up~~ unpredictable.

On the other hand, static memory allocation may be preffered when the ~~memory~~ memory requirements are known in advance, and the program needs ~~efficient~~ and direct access to variable. It eliminates the overhead dynamic memory management and can be advantageous for small programs or scenarios where memory is fixed and constant.

Generally, the choice of static or dynamic memory allocation depends on the specific requirements and characteristics of the program.

(b)
```
#include <iostream>
using namespace std;
int main(){
 int arr[] = {53, 45, 30, 67, 20, 55, 60};
 int n = sizeof(arr)/sizeof(arr[0]);
 for(int i=0; i<n-1; i++){   // bubble sort algorithm
    for(int j=0; j<n-i-1; j++){
       if(arr[j] > arr[j+1]){
          int temp = arr[j];   // swapping the elements
          arr[j] = arr[j+1];
          arr[j+1] = temp;
       }
    }
 }
```



Extract 3.2: A sample of correct responses to question 3, paper 1

In Extract 3.2, the candidate defined the term variable in part (a) (i) correctly. In part (a)(ii), the candidate managed to differentiate between dynamic and static memory allocation. Also, the candidate explained clearly the circumstance to choose one among those two memory allocations. Moreover, the candidate designed the program to ascend the given numbers correctly.

2.1.4 Question 4: Website Development

In this question, the candidates were required to read the following scenario and answer the question that follows:

Umoja Secondary School introduced an awareness campaign for optimal use of its electricity to the community members. In that campaign, you decided to develop a site that will provide awareness of switching ON and OFF the light in classrooms appropriately. Write HTML embedded with JavaScript codes that will help you to display the webpage in Figure 1.

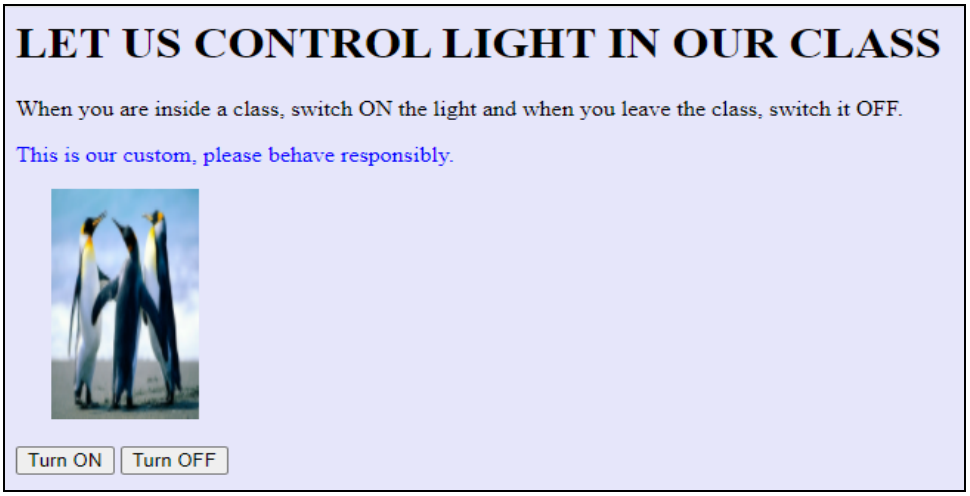


Figure 1

Use the following descriptions to design your page.

- *The Page background colour should be Lavender.*
- *The Heading should be set with level 1 effect.*
- *The Text colour in the third sentence should be blue.*
- *The Dimensions to a bulb should be 90 and 170, width and height respectively.*
- *When button "Turn ON" is pressed, the bulb switched ON and when button "Turn OFF" is pressed, the bulb switched OFF.*

A total of 158 (100%) candidates attempted this question. 18 (11.39%) scored from 0 to 3 marks, 62 (39.24%) scored from 3.5 to 5.5 marks and 78 (49.37%) scored from 6 to 10 marks out of the 10 marks allocated. Figure 4 illustrates the candidates' performance in this question.

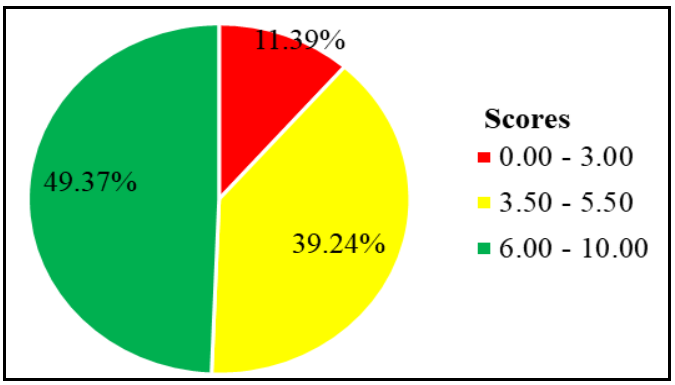
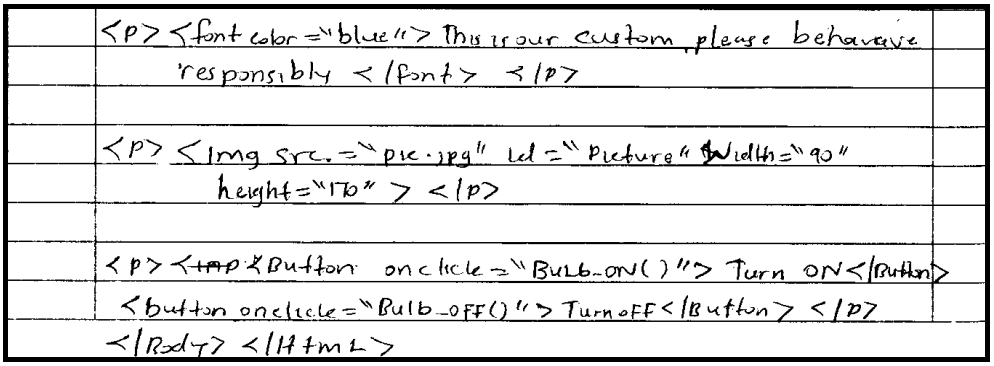


Figure 4: *The Candidates' Performance on Question 4, Paper 1*

The general performance in this question was good because majority of the candidates (88.61%) scored above 3 marks. The analysis showed that some of the candidates who scored high marks (6 – 10) wrote correct codes that opens and close HTML and JavaScript codes. The candidates also wrote the correct tags that formats the page background, level 1 effect of heading, and text colour. Furthermore, the candidates gave the correct codes that displays picture with their correct dimensions. They also managed to write HTML codes to activate Turn ON and Turn OFF buttons. Some candidates gave the correct JavaScript function that activates the buttons. Others wrote the correct function but failed to declare variable applied within the function which led them to lose some marks. This indicates that the candidates did not understand the requirements of the question. Extract 4.1 presents a sample of such correct responses in question 4.

```
4   <!DOCTYPE html>
    <html>
    <head>
    <Script type="javascript">
    //function to replace the picture with an image of a bulbon
    function BuLb-ON() {
    Var
    document.getElementById("Picture").src="bulbON.jpg";
    }

    //function to replace the picture with an Image of bulbOFF
    function Bulb-OFF() {
        document.getElementById("picture").src="bulbOFF.jpg";
    }

    </script>
    </Head>
    <Body bgcolor="Lavender">

     <H1> LET US CONTROL LIGHT IN OUR CLASS </H1>
    <P> When you are inside a class, switch ON the light and
        when you leave, switch it off </P>
```



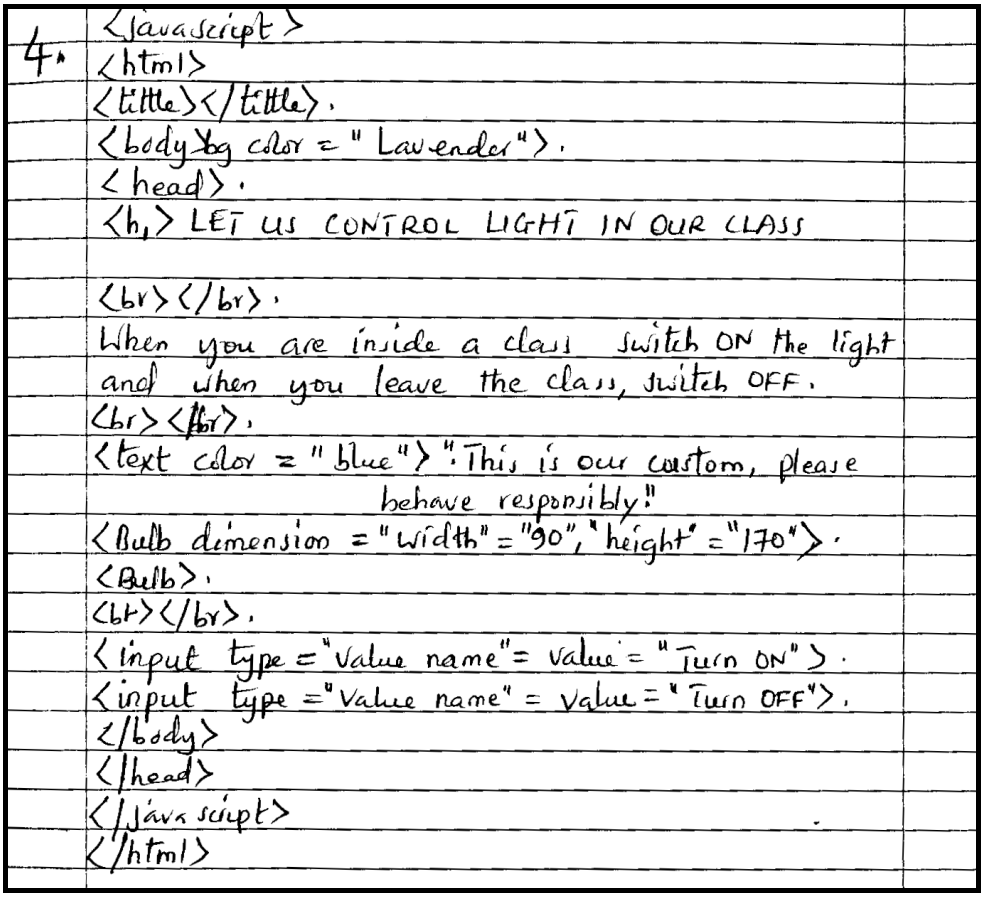
Extract 4.1: A sample of correct responses to question 4, paper 1

In Extract 4.1, the candidate wrote the correct HTML codes that displays the required interface. The candidates also correctly activated the button "Turn ON" and "Turn OFF" to change the given picture using JavaScript codes.

Further analysis from the candidates' responses revealed that, 39.24 per cent of the candidates who had an average performance (3.5-5.5) wrote correctly the opening and closing tags of HTML and JavaScript. They also wrote the correct tags that formats the background colour to Lavender, level 1 effect and text colours. Moreover, the candidates inserted the picture with correct dimensions. However, some candidates wrote the correct codes of inserting picture with incorrect path of the picture allocation. Other candidates did not close JavaScript tags "</script>". Likewise, some candidates wrote codes that design the textbox instead of button, while others wrote codes that designs table. Additionally, some of the candidates could not write JavaScript function to activate buttons. This signifies that, the candidates had insufficient knowledge about HTML.

On the other hand, 11.39 per cent of the candidates who scored low marks (0 – 3), wrote correctly the open and close tags and JavaScript. Some candidates wrote the correct formatting tags for page background and level 1 effect of heading. However, some of them faced difficulties in opening the JavaScript tag as they wrote "<javascript>" instead of "<script>". Others wrote codes that displays listed text and textbox instead of Turn ON and Turn OFF buttons. Moreover, some candidates had idea of codes for Turn ON and Turn OFF buttons, but lacked clear knowledge of syntax. For example, one candidate wrote *<input type = value = "Turn on">* for Turn on button and *<input type = value = "Turn OFF">* for Turn off button. The candidate was required to write the codes as <input type ="button"

onclick=”lightOn()” value=”Turn ON”> and <input type =”button” onclick=”lightOff()” value=”Turn OFF”>. Moreover, some candidates wrote the correct codes to display the given picture but failed to set its width and height. Few candidates wrote codes that designs table instead of interface. For example, one candidate wrote *<table border = “0”> <tr><th>LETS CONTROL LIGHT IN OUR CLASS</th>*. This shows that the candidates did not understand the question’s demands. Extract 4.2 presents a sample of such incorrect responses.



Extract 4.2: A sample of incorrect response to question 4, paper 1

In Extract 4.2, the candidate wrote correctly only the open and close html codes. However, the candidate wrote incorrect codes to display the button “Turn ON” and “Turn OFF” and failed to make other formatting of the interface using HTML codes such as img id = “bulb” and font colour. The candidates also did not write JavaScript codes to activate buttons.

2.1.5 Question 5: Visual Programming

The question had three parts: (a), (b), and (c). The question was as follows;

(a) Assume that Form1 in Visual Basic is a custom dialog box. What are the activities of the following statements?

(i) Form1.Show

(ii) Form1.Hide

(b) Tanzania Railway Cooperation (TRC) needs to validate the date of travel for the reservation facility. The booking should either be on the current day or the next 15 days. How would you implement this using Visual Basic?

(c) The following table shows ages of members and activities available in a Bonanza.

Age	***Activity***
51 and over	*Charting*
31 – 50	*Swimming*
16 – 30	*Playing volleyball*
Less than 15	*Dancing*

Use the information in the table to write a Visual Basic program that accepts the age of a member through a text box. The program should then display the activity on a message box.

A total of 158 (100%) candidates attempted this question. 86 (54.43%) scored from 0 to 3 marks, 37 (23.42%) scored from 3.5 to 5.5 marks, and 35 (22.15%) scored from 6 to 10 marks out of the 10 marks allocated. Figure 5 illustrates the candidates' performance in this question.

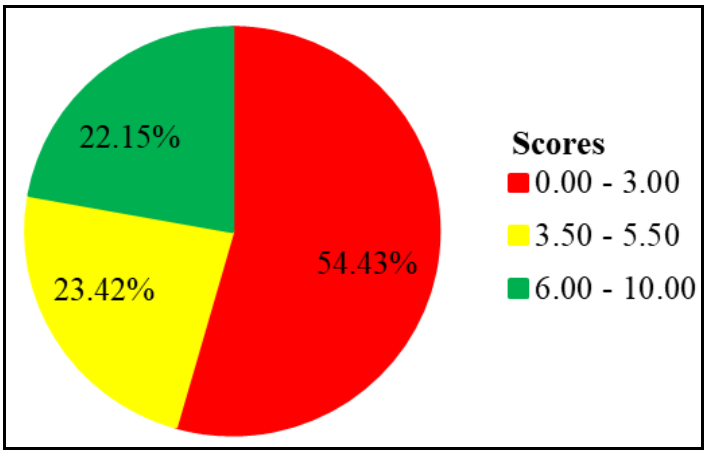
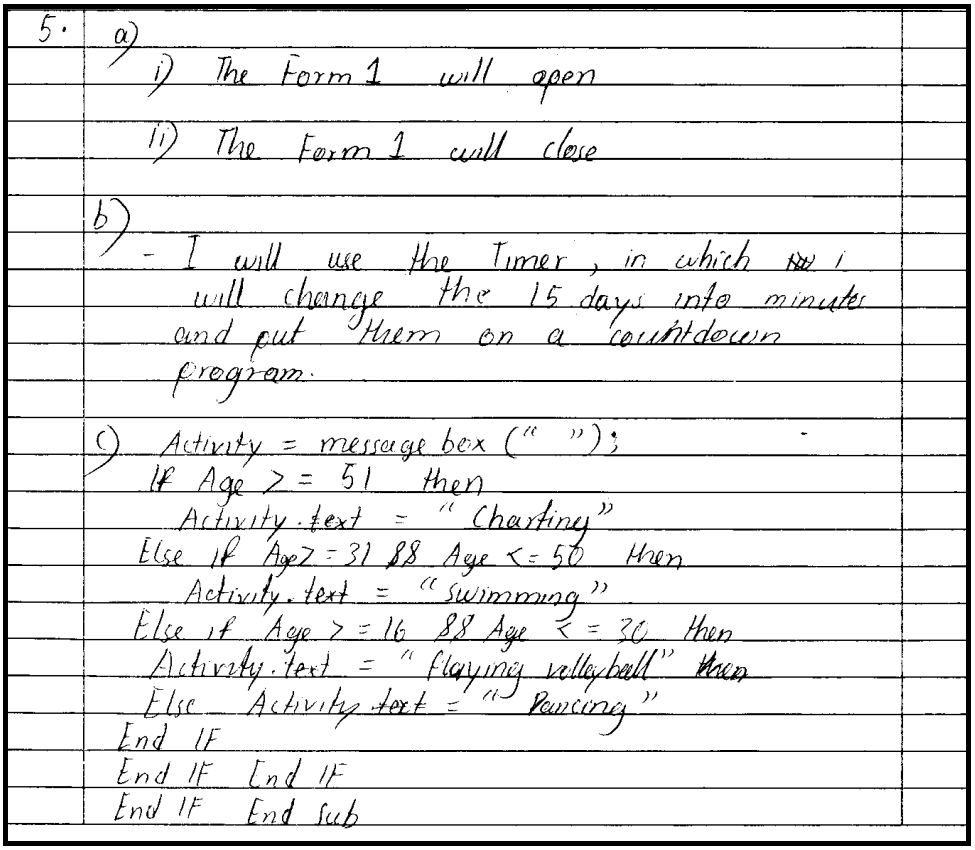


Figure 5: *The Candidates' Performance on Question 5, Paper 1*

The general performance in this question was average because 45.57 per cent of the candidates scored above 3 marks. The analysis showed that some of the candidates who scored low marks (0 - 3) explained correctly the function of "Form1.Show" as applied in a Visual Basic in part (a)(i). Other candidates wrote correctly the function of "Form1.Hide" in part (a)(ii). In part (b), most of the candidates gave the importance of validating the date instead of applying Visual Basic codes to create date validation program. For example, one candidate wrote; *By using properties window will help TRC to create the program of booking process and code editor will help to write code to validate date of travel for reservation facility and booking*. Other candidates wrote HTML codes to validate the date instead of Visual Basic codes. In part (c), some candidates gave the correct "open" and "close" Visual Basic codes but failed to include the "If statement" to relate the age and activity. Extract 5.1 represent a sample of such incorrect responses in question 5.



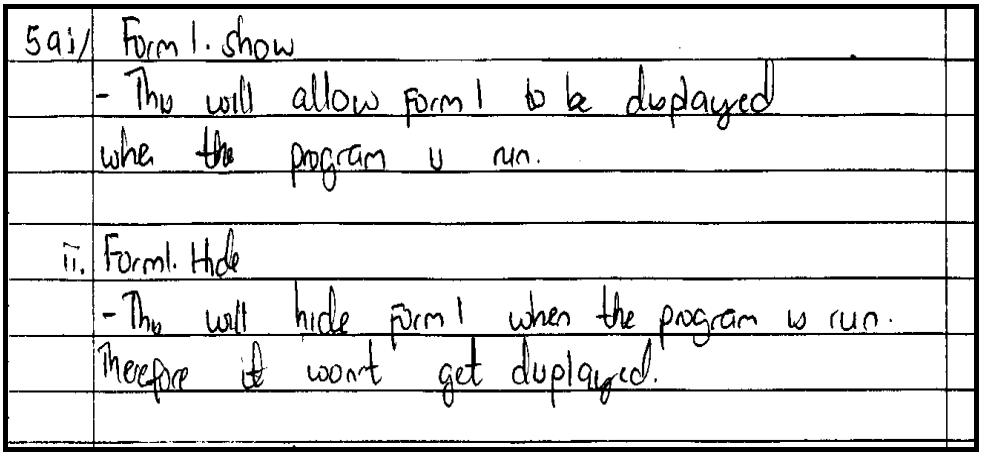
Extract 5.1: A sample of incorrect responses to question 5, paper 1

In Extract 5.1, the candidate wrote wrong function of statements "Form1.Show" and "Form1.Hide" in a Visual Basic in part (a). In part (b), the candidate explained date validation instead of designing a program. In part (c), the candidate wrote the correct "If statement" but failed to display the message in a message box.

In addition, 23.42 per cent of the candidates who had an average performance wrote correctly the function of "Form1.show" and "Form1.Hide" in part (a). In part (b), some candidates wrote Visual Basic codes which does not give current date or for the next 15 day as required by the question. Some candidates provided correctly variables and wrote the correct function to display the intended messages, but failed to write the correct syntax of "If statement" to provide the range of date. Other candidates wrote the text "Display" as the function to display the message instead of 'MsgBox("….")'. In part (c), the candidates wrote correctly the

codes for opening and closing Visual Basic but faced difficulties in giving the "If statement" that compare the ages and the activities. Some of them used "And" tag after "if statement" to display message instead of "Then" tag. For example, one candidates wrote, *Else if Age = 51 And else if Age>=31 then display activity = "swiming"*. This signifies that, the candidate had insufficient knowledge of Visual basic control structure.

On the other hand, 22.15 per cent of the candidates who scored high marks, correctly stated the activities of "Form1.Show" and "Form1.Hide" as applied in a Visual Basic programming in part (a). In part (b), the candidates interpreted the given scenario by writing the correct Visual Basic codes. Some candidates declared date as a string and not integers. Others wrote 'confirm("…")' instead of 'InputBox("…")' function in prompting a user to add the date. These candidates failed to understand that 'confirm("…")' is a JavaScript function not Visual Basic function. Moreover, some candidates wrote incorrect range of the date in the "If-statement". For example, one candidates wrote *If date.text>=15* instead of If Text1.text>=Date And Text1.text<=Date + 15. This led them to lose some marks. In part (c), the candidate wrote correct Visual basic codes to compare the given ages and activities. Extract 5.2 presents a sample of such correct responses.



```
5 b/  Form_Load()
      Dim x As Integer
      Dim dateoftravel As Integer

      x = Date
      dateoftravel = Val(text1.text)

      If (date of travel == x) OR (dateoftravel - Date == 15) THEN
        Msgbox ("Valid Booking")
      Else
        Msgbox ("Invalid Booking, Change the date of travel")
      End If
      End Sub

5 c/  Form_Load()
      Dim age As Integer

      age = Val(text1.text)

      If (age >= 50) THEN
        MsgBox ("Charting")
      Else If (age >= 31) THEN
        Msg Box ("Swimming")
      Else If (age >= 16) THEN
        Msg Box ("Playing volleyball")
      Else If (age < 15) THEN
        Msg Box ("Dancing")

      End If
      End Sub
```

Extract 5.2: A sample of correct responses to question 5, paper 1

In Extract 5.2, the candidate explains the function of the statement "Form1.Show" and "Form1.Hide" in part (a). In part (b), the candidates designed correctly Visual Basic program to validate date. The candidate correctly wrote a program to display activity depends on the age entered by the user, in part (c).

2.1.6 Question 6: Computer Security and Privacy

This question had two parts: (a) and (b). The question was as follows;

(a) The rapid growth in the use of Information and Communication Technology in the society has attracted tremendous attack of the government and organizations unauthorized data via internet. Explain two principles that can be applied to avoid cyber-attack.

(b) Emma Sugar Company (ESC) utilizes computerized system to operate its day to day activities. Recently, the company's manager claims to have lost employee details and therefore found it difficult to pay them timely;

(i) What are the two possible causes of the data loss?

(ii) Suggest two control measures you would take to avoid future loss of the data.

A total of 158 (100%) candidates attempted this question. 9 (5.70%) scored from 0 to 3 marks, 41 (25.95%) scored from 3.5 to 5.5 marks, and 108 (68.35%) scored from 6 to 10 marks out of the 10 marks allocated. Figure 6 illustrates the candidates' performance on this question.

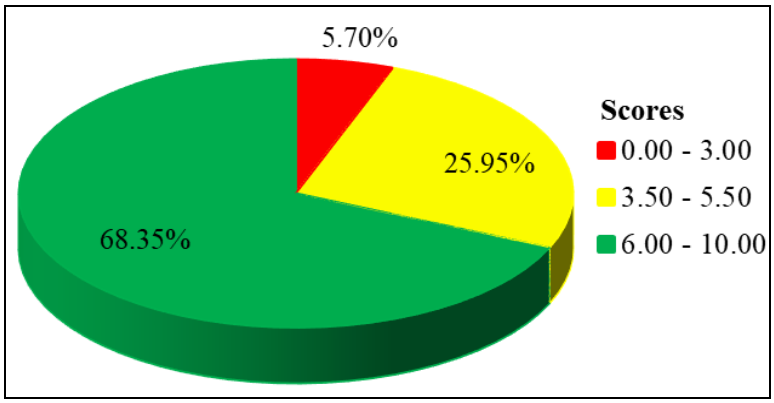
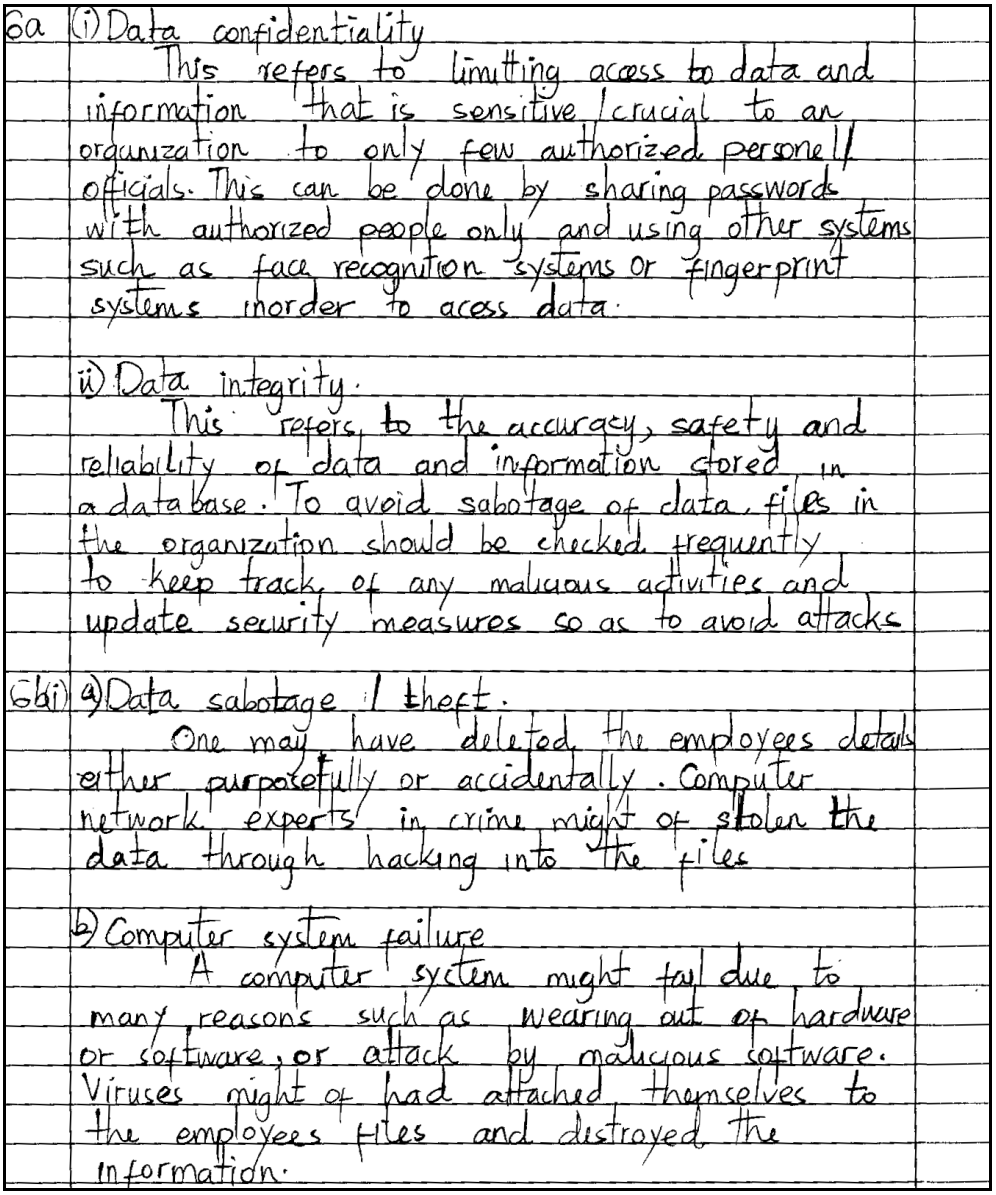


Figure 6: *The Candidates' Performance on Question 6, Paper 1*

The general performance in this question was good because 94.30 per cent of the candidates scored above 3 marks. The statistics show that, (68.35%) of the candidates scored high marks. The analysis of the candidates' responses shows that majority of them explained properly the principles of data security that avoids cyber-attack, in part (a). However, some candidates

gave unclear explanations to some principles. Moreover, some candidates combined principal of data security and control measure of data loss. This led them to lose some marks. In part (b), most of the candidates suggested two causes of data loss in a computerized system as well as measures against data loss correctly. Other explained one point and gave unclear explanation to the other point. Extract 6.1 presents a sample of such correct responses in question 6.

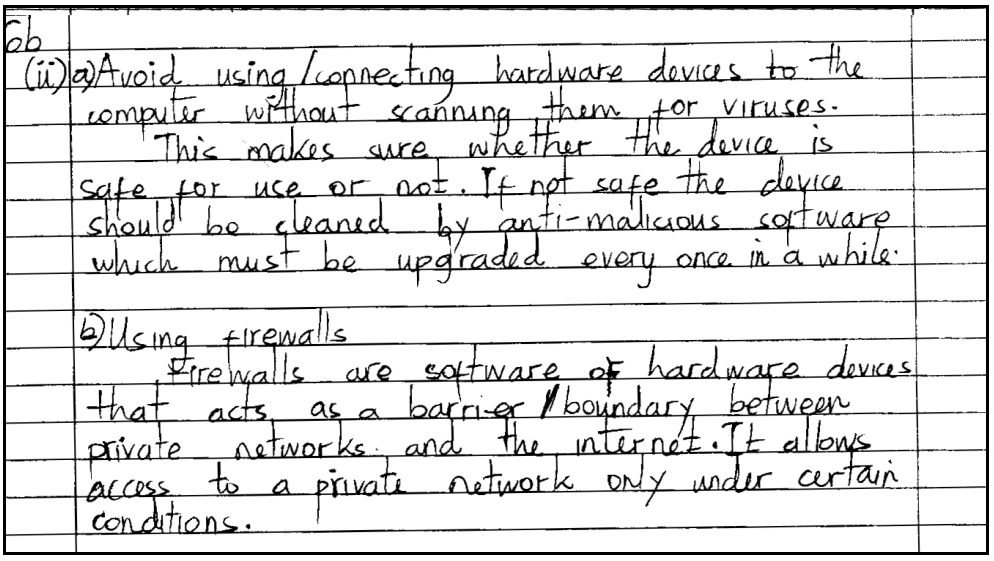


6a (i) Data confidentiality
This refers to limiting access to data and information that is sensitive / crucial to an organization to only few authorized personell / officials. This can be done by sharing passwords with authorized people only and using other systems such as face recognition systems or fingerprint systems inorder to acess data.

ii) Data integrity.
This refers to the accuracy, safety and reliability of data and information stored in a database. To avoid sabotage of data, files in the organization should be checked frequently to keep track of any malicious activities and update security measures so as to avoid attacks

6bi) a) Data sabotage / theft.
One may have deleted the employees details either purposefully or accidentally. Computer network experts in crime might of stolen the data through hacking into the files

b) Computer system failure
A computer system might fail due to many reasons such as wearing out of hardware or software, or attack by malicious software. Viruses might of had attached themselves to the employees files and distroyed the information.


6b
(ii) a) Avoid using/connecting hardware devices to the computer without scanning them for viruses.
This makes sure whether the device is safe for use or not. If not safe the device should be cleaned by anti-malicious software which must be upgraded every once in a while.

b) Using firewalls
Firewalls are software or hardware devices that acts as a barrier/boundary between private networks and the internet. It allows access to a private network only under certain conditions.

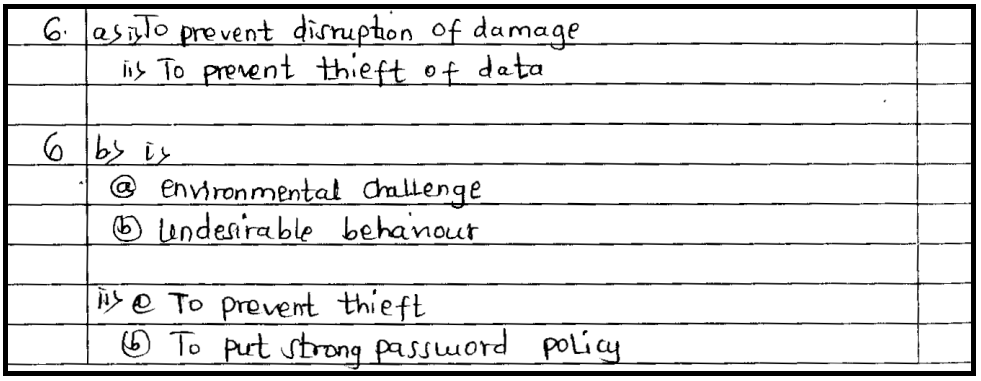
Extract 6.1: A sample of correct responses to question 6, paper 1

In Extract 6.1, the candidate explained principles to avoid cyber-attack in part (a) correctly. In part (b), the candidate gave the possible causes of data loss and their control measures correctly.

On the other hand, some of the candidates (25.95%) who scored average marks (3.5-5.5) gave the correct principles of data security without giving explanations them, in part (a). Other candidates wrote using firewall and strong password as control measures of data loss, instead of principles of data security. Further analysis shows that some candidates wrote at least one possible causes of data loss, in part (b) (i). Others listed the point without giving explanations. This implies that the candidates had insufficient knowledge on computer security. In part (b)(ii), the candidates suggested correctly at least one control measure to avoid data loss. Other candidates repeated the same control measure. For example, one candidate wrote, (i) *Data backup*, (ii) *Storing data in SSD*. The candidate failed to understand that when you store the data in a SSD you have created backup of the particular data for the future use.

Further analysis shows that, 5.70 per cent of the candidates who scored low marks failed to explain the principles to avoid cyber-attack, in part (a). Some of the candidates provided ways of avoiding cyber-attack such as to register software owners. Other candidates wrote awareness of avoiding

cyber-attack. For example, one candidate wrote: *providing education and training*. Moreover, some candidates provided ways of preventing viruses such as *avoid downloading free games from the internet*. In part (b) (i), some of the candidates provided only one possible causes of data loss. Other candidates wrote factors that affect computer system such as dust and humidity. In part (b) (ii), some candidates wrote only one control measure of data loss. Extract 6.2 presents a sample of such incorrect responses.



Extract 6.2: A sample of incorrect responses in question 6, paper 1

In Extract 6.2, the candidate wrote control measures to prevent data loss instead of principles to avoid cyber-attack in part (a). In part (b) (i), the candidates wrote irrelevant answers. In part (b) (ii), the candidate wrote two control measures without explaining them.

2.1.7 Question 7: Data Communication and Networking

In this question, the candidates were required to study the following scenario and answer questions that follow:

Makole district hospital employees are facing a challenge of slowness in updating and retrieving of the information from their computers connected in a network. After detailed investigation, you realized that the network topology used produces much traffic as users connecting to the network increases. Suppose you are requested to redesign the network so as to improve the performance of the system;

(a) What type of network topology was used in the hospital computer network?

(b) Outline four factors you will consider before proposing a new network topology to the hospital management.

(c) *Which type of network topology will you suggest to design in order to replace the current network? Give a reason.*

(d) *What are the four communication devices will be required to setup a new network topology?*

All 158 (100%) candidates attempted this question. A total of 10 (6.33%) scored from 0 to 3 marks, 52 (32.91%) scored from 3.5 to 5.5 marks, and 96 (60.76%) scored from 6 to 10 out of the 10 marks allocated. Figure 7 illustrates the candidates' performance in this question.

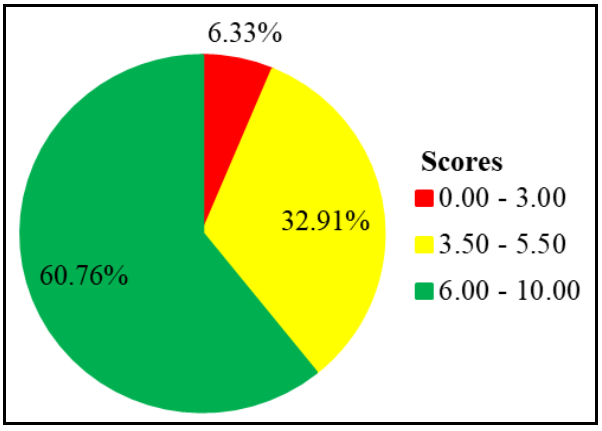


Figure 7: *The Candidates' Performance on Question 7, Paper 1*

The general performance of the candidates in this question was good because 93.67 per cent of the candidates scored above 3 marks. Most of the candidates (60.76%) who scored high marks (6 – 10) identified the correct network topology used in the hospital computer network, in part (a). In part (b), the candidates outlined at least three factors to consider before proposing a new network topology. Some candidates wrote rules for data integrity instead of factors for proposing a new network topology. Other candidates mixed up the factors for proposing a new network and provided the factors to consider while buying a new computer. In part (c), most of the candidates identified correctly the required network topology that should replace the current one. However, some of them failed to give clear reason for the suggested network topology. For example, one candidate wrote; *it uses a central hub that can handle many people at once, since it shares resources*. This candidate failed to explain how the central hub removes traffic. Others wrote factors which give the same meaning using different terminologies. This led them to lose some marks. Moreover, in part (d), the

candidates wrote correctly all communication devices required to setup a new topology. Extract 7.1 presents a sample of such correct responses.

7a.	The type of network topology used was Bus topology.	
bi	Number of users it can support.	
ii	The cost of installation.	
iii	Effeciency and productivity.	
iv.	Complexity in configuration	
c)	The network topology to replace the current network to be star topology. Star topology would suit to replace the current network topology because it can be easily to incr number of users without producing traffic as each node ha its own channel and connected to a central hub. Also failure one device will not affect the network topology.	
d)i	Hub	
ii	Network interface card (NIC)	
iii	Switch	
iv	Router.	

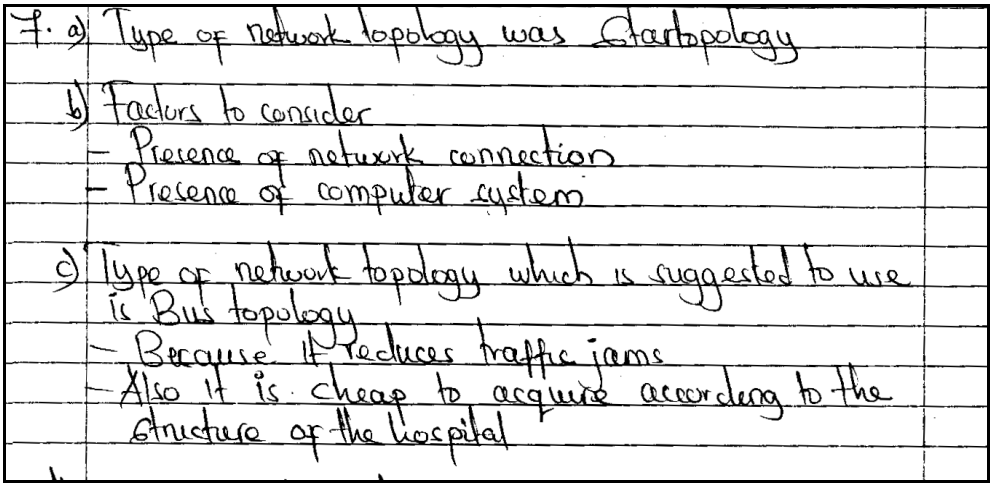
Extract 7.1: A sample of correct responses in question 7, paper 1

In Extract 7.1, the candidate identified the correct name of the topology used in the hospital computer network, in part (a). In part (b), the candidate outlined correctly factors to consider before proposing a network. The candidate also gave a correct topology that replace the old topology and stated the correct reason, in part (c). The communication devices also provided in part (d) were correct.

Statistics shows that 32.91 per cent of the candidates scored average marks (3.5-5.5). Most of them correctly wrote the network topology used in the hospital computer network. However, some of the candidates wrote mesh topology instead of star topology. In part (b), the candidates were able to write one or two correct factors. Some candidates wrote factors for choosing software instead of proposing the new topology. Other candidates wrote factors for buying new computer device. This implies that the candidates did

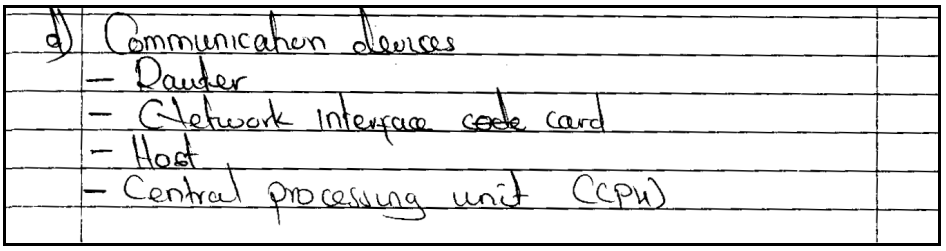
not understand the requirement of the questions. In part (c), some candidates suggested the correct network topology that would replace the bus topology, but gave incorrect reason for their suggestion. Other candidates did not write any reason for their suggestion. Moreover, some candidates explained the structure of star topology instead of giving the reason for suggesting new topology. Other candidates wrote the advantages of using star topology compared with other types of topologies. Lastly, the candidates also wrote one or two communication devices, in part (d), while others wrote transmission media such as cable, instead of communication devices.

On the other hand, 6.33 per cent of the candidates who scored low marks managed to identify the appropriate network topology, in part (a). However, some candidates wrote types of computer network such as LAN, MAN and WAN instead of network topology. Other candidates wrote other topologies such as Ring, Mesh and Tree instead of star topology. In part (b), some candidates wrote factors for buying software, while others wrote factors for buying new computers. In part (c), the candidates wrote types of computer network instead of network topology. For example, one candidate wrote; *the local area network can replace the current network*. In part (d), some of the candidates wrote correctly only one communication device but failed to write other devices. It was noted that other candidates wrote communication media such as TV, Radio, Cell phones instead of communication device. Extract 7.2 presents a sample of such incorrect responses.


7. a) Type of network topology was Startopology

b) Factors to consider
- Presence of network connection
- Presence of computer system

c) Type of network topology which is suggested to use is Bus topology
- Because it reduces traffic jams
- Also it is cheap to acquire according to the structure of the hospital



Extract 7.2: A sample of incorrect responses in question 7, paper 1

In Extract 7.2, the candidate wrote "star" instead of "bus" as the network topology used in the hospital, in part (a). In part (b), the candidate wrote general factors for creating network connection. The candidate also wrote bus topology instead of star topology as a suggested network, in part (c). This candidate interchanged the proposed and the previous network. However, the candidate wrote correctly two communication devices required to setup a new network, in part (d).

2.1.8 Question 8: C++ Programming

This question was an essay question and the candidates were required to read the scenario and answer the questions that follow:

A computer science student was assigned to create a program to help his teacher to produce annual students' reports. However, he was advised to use low and high levels of programming languages. Why was the student advised to use both programming languages? Give three points for each.

The statistics shows that 123 (77.85%) candidates attempted this question. 14 (11.38%) scored from 0 to 5 marks, 12 (9.76%) scored from 5.5 to 8.5 marks, and 97 (78.86%) scored from 9 to 15 out of the 15 marks allocated. Figure 8 summarises the candidates' performance in this question.

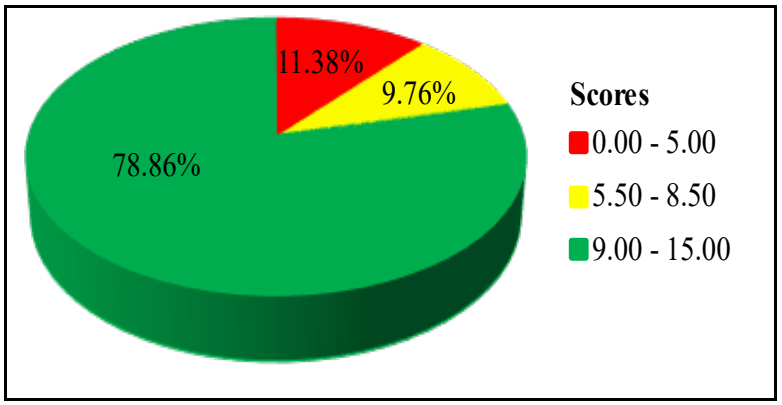


Figure 8: *The Candidates' Performance on Question 8, Paper 1*

Generally, the candidates' performance on this question was good because 88.62 per cent of candidates scored above 5 marks. The analysis of the candidates' responses showed that 78.86 per cent of the candidates who scored high marks (9 to 15) gave the correct benefits of using low and high level programming language for creating a program. Some of the candidates gave the correct introduction and conclusion with unclear explanations to some benefits points. Moreover, some candidates explained correctly only two benefits to each level of programming. Other candidates had an idea but interchanged the benefits of the low and high level language. For example, one candidate wrote, *low level languages are very simple to design*. Additionally, some candidates concluded by explaining the advantages of low level language, while others wrote the disadvantages of high level language. This led them to lose some marks. Extract 8.1 presents a sample of such correct responses.

8. Programming Language is the process language of user employ to interact with set of instruction to solve a particular task. There are different types of programming language such as C, C++, Java, Javascript Ruby Python and also visual basic language and also programming language having two different level included. low level language and also high level language which low level language consider with machine together with Assembly language but also high level language consist with fifth generation which are used to describe the generation of the computer.

The following are the reason of why was the student advised to use both programming language.

Low level programming language does not need interpreter and compiler to change the utility of the process; Those student they advised to use low level language because it does not need compiler and interpret during the utility processing take place so they are used in order to reduce some of the interpreted and compiler which can affected them during represent the program.

Low level programming language required or developing in less memory to stored the process. Through use of low level programming language are required less memory during the processed of the program Also the are translated freedly and high speed according to the machine language which are native language and also Assembly language which are more control on hard ware and Easy to understand and and use.

Low level programming Language provide direct communicate to the hardware or between the hardware and the low level program language; Through using of low level programming language can provide

8 communication which communicate between the hardware and low level language according to the machine language and assembly which are tedious and easy to understand use those language the are used because can prepare them program simple not complex to them.

High level programming language can be easy to Understand ; Because high level Language are usually use language of human being like typical English like phrases which process and computer can understand faster without need any intermediate and also need generation to assesses those language.

High level programming language can be easier to maintenance and realiability ; Through high level Language can help to maintenance them and realiability easy because of the simple language which Understanding with people and also computer through using of the interpreter compiler translator and also source program together with object which are used to indicated and identify the language which are used by it's English or phrases.

High level programming Language can ensure and protect the proper doumentation and debugging easy. Through high level programming language people were able to ensure the program are doumentation and debugging through testing so the use of high level language its simple and easier to understand on how the debugging and doumentation can be easy to done those issues to the program

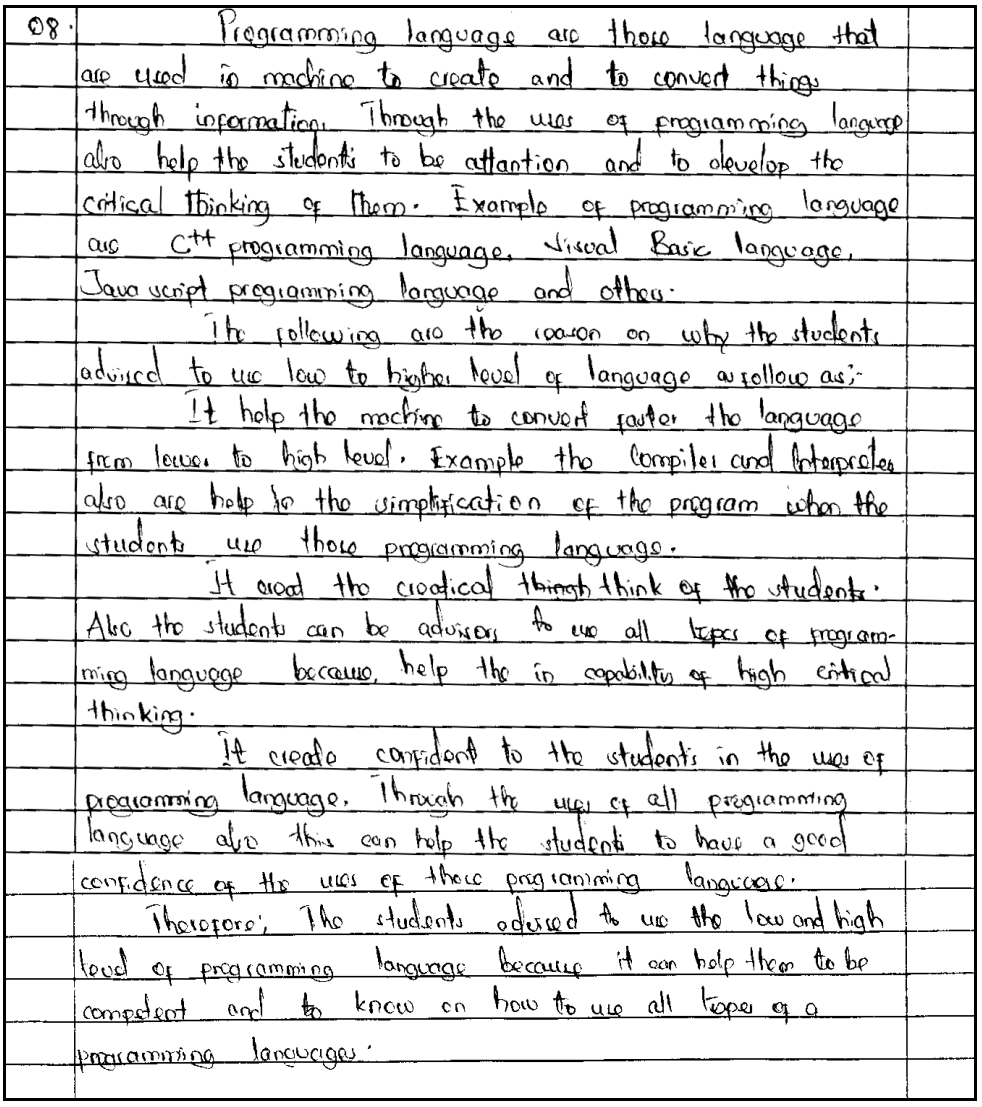
Therefore programming language are used to the different program and the user should able to identified the suitable programming language by consist the ease to learner, safety promote structured Language portability and also the nature of the application and other

Extract 8.1: A sample of correct responses to question 8, paper 1

In Extract 8.1, the candidate gave the correct introduction and conclusion, and gave the correct benefits of using low and high level language when creating a program.

The candidates (9.76%) who scored average marks (5.5 to 8.5) provided the benefits, introduction and conclusion of programming levels correctly, but failed to give detailed explanation. Some candidates defined the term "programming language" without explaining low and high level languages. Moreover, other candidates explained correctly one or two benefits from each language level. Some of the candidates explained the benefit of machine or assembly language which are both low level language. For example, one candidate wrote; *low level languages are short and clear since, they contain English like words eg:-ADD*. This candidate should understand that, not all low level languages had this characteristic. Moreover, some of the candidates generalized the concept of programming language instead of specifying its levels in their conclusion. This led them to lose some marks. Other candidates concluded their essays by summarizing the explained benefits of the low and high level languages. This indicates that these candidates lacked knowledge on writing conclusions.

On the other hand, most of the candidates (11.38%) who scored low marks (0 – 5) described the benefit of each level correctly but could not provide clear introduction and conclusion. Others explained high level programming language as a natural language. This shows that the candidates had unclear understanding of levels of programming language. Furthermore, some candidates explained translators such as interpreter, assembler and compiler, instead of the benefits of low and high level. Also, others explained five generations of programming language. Further analysis showed that some candidates explained different type of high level programming language such as Python, C++, Visual programming. Additionally, other candidates explained about binary number system instead of machine language. This implies that, the candidate did not understand the requirements of the question. Extract 8.2 represents a sample of incorrect responses.



08. Programming language are those language that are used in machine to create and to convert things through information. Through the uses of programming language also help the students to be attention and to develop the critical thinking of them. Example of programming language are C++ programming language, Visual Basic language, Java script programming language and others.

The following are the reason on why the students advised to use low to higher level of language as follow as;-

It help the machine to convert faster the language from lower to high level. Example the Compiler and Interpreter also are help to the simplification of the program when the students use those programming language.

It avoid the creatical ~~thinnk~~ think of the students. Also the students can be advisers to use all types of programming language because, help the in capability of high critical thinking.

It create confident to the students in the uses of programming language. Through the uses of all programming language also this can help the students to have a good confidence of the uses of these programming languages.

Therefore, The students advised to use the low and high level of programming language because it can help them to be competent and to know on how to use all types of a programming languages.

Extract 8.2: A sample of incorrect responses in question 8, paper 1

In Extract 8.2, the candidate wrote how programming language will help him personally and not the benefits of low and high level languages effectively. The candidate also wrote incorrect introduction and conclusion.

2.1.9 Question 9: Information System

This was an optional question, the candidates were required to elaborate four procedures of collecting information required to design electronic system that manages book borrowing process in a school library. The question was as follows;

The school librarian thought of having an electronic system to manage book borrowing process. If you were asked to collect information required to design this system, how would you carry out your task? Elaborate your answer by giving four points.

The statistics show that 47 (29.75%) candidates attempted this question. 17 (36.17%) scored from 0 to 5 marks and 30 (63.83%) scored from 9 to 15 out of the 15 marks allocated. Figure 9 summarises the candidates' performance in this question.

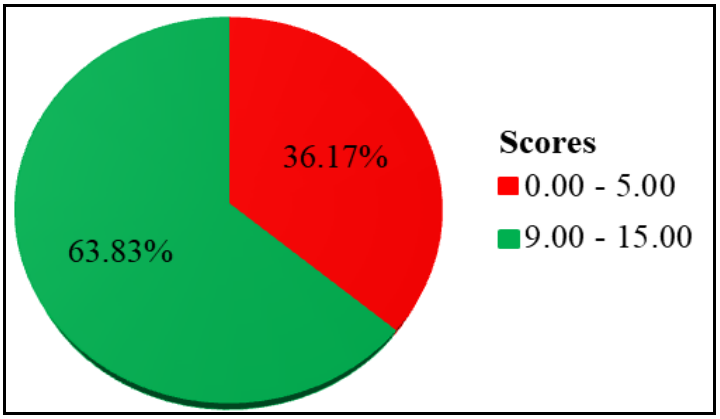


Figure 9: *The Candidates' Performance on Question 9, Paper 1*

The general candidates' performance in this question was good because only 36.17 per cent scored low marks (0 – 5). The analysis shows that the candidates (63.83%) who scored high marks described clearly the concept of information gathering for the system design in their introduction. The candidates also provided the correct meaning of electronic library management systems. Moreover, most of the candidates correctly explained at least three methods of information gathering. Others gave some data collections method with explanation contrary to the question. For example, one candidate wrote; *the use of automated method: -is a program in a computer to collect data, in a sense that to use internet to enhance proper collection of data from the student*. The candidate should realize that it is not necessary to have the internet to gather information using automated methods such as Video camera. Additionally, most of the candidates wrote wrong conclusions which led them to lose some marks. Extract 9.1 presents a sample of such correct responses to this question.

9. Data Information collection and gathering is a Fundamental ~~is~~ steps in system development processes. It involves collection of information required for development of new system. The information may include users previews on the previous system or the how the system of effective in meeting their needs. Collection of information is done through various ~~processes~~ methods. These methods include:

Interview. To collect information needed for development of new system, Interviews can be conducted on people who have been using the old system and they will be the ones using the new system. In interview the system developer asks questions regarding the system and the user answers. The developer ~~asks~~ qu is the interviewer and the user an interviewee. Interview allows the the interviewee to gain data the bodily reactions whe the interviewee answers the question.

Questionnaire. This is a sheet of paper that contains questions that the users of the system should answer. It can have questions that require yes or no answer, and some questions ~~can~~ require brief explanation. Questionnaire allow the developer to gain data from multiple users easily because many questionnaires are given to many people and then later collected or returned. However a good questionnaire takes effort whe preparing it.

Observation. This method involves the process of the developer visiting the organization or the place where the system is to be developed For. The developer observes how different processes that are to be replaced with computing processes

9. are run. The developer gathers information on how the processes to be replaced are conducted and therefore he comes up with ~~the~~ a better way of replacing those processes with less problems arising.

Reading available documents. To gain information required for building new system, the developer can go through available documents of the existing system. It can be reports, suggestions or how books are stocked in the Library. This makes it easier for the developer to design best replacement of the existing system.

To sum it all; Without information collection the creation and development of new systems wouldn't be possible. Information gathering enables the developer to know clearly where the problem lies and the best way to solve it.

Extract 9.1: A sample of correct responses to question 9, paper 1

In Extract 9.1, the candidate gave the correct means of information gathering. The candidate also gave correct introduction and conclusion.

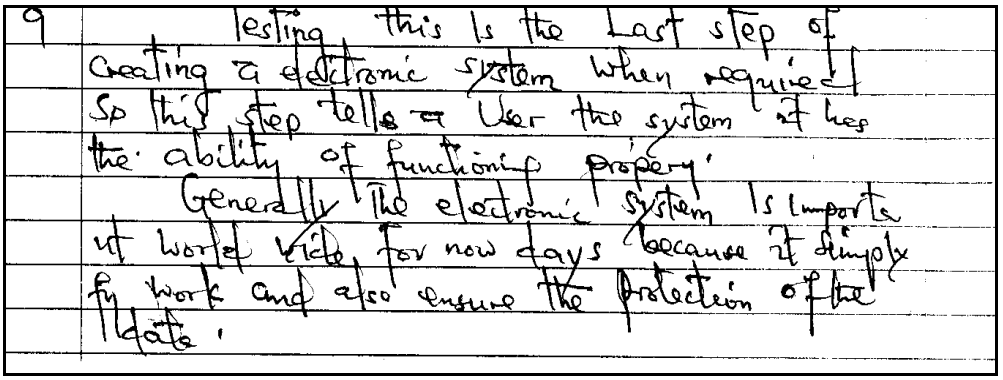
Furthermore, 36.17 per cent of the candidates who scored low marks (0 – 5) explained the term "information" as their introduction without relating it with the methods of information gathering. Other candidates gave irrelevant explanations on their introduction part. For example, some candidates explained the term "program" while others "problem solving". This indicates that the candidates did not understand the question's demands. It was noted that some candidates listed methods of information gathering without giving explanations. Other candidates explained components of e-library management system such as computer, user and user 'ID instead of methods of information gathering. Further analysis showed that, some candidates wrote factors to consider before designing system such as system designer, financial, programmer, etc. Few candidates gave unclear conclusion. Extract 9.2 presents a sample of such incorrect responses.

9 Electronic System this is a system which Createde electronically in Order to Simplify the different Task, In order to create the system there is different steps which Must be followed In order to Complete the system the following are the four steps which would followed by Librarian in Order to Complete the the system

identifying the problem, this Is the first step which required to Understand for a Librarian In order to what goin On in the Workig place.

identification of the requirement This is the second step which fullfill the requirement which Can Used during the time of creating the electronic system example of the requirement is Compter, Cable and switch

designing the system, This is the Time of Creating a whole system by Connecting the instrument which is Used during the Time of Making system.



Extract 9.2: A sample of incorrect responses to question 9, paper 1

In Extract 9.2, the candidate explained steps of system development instead of information system gathering.

2.1.10 Question 10: IT and Environment

This was an optional question; the candidates were required to analyze three opportunities and three challenges brought by IT in the work place.

The statistics show that 146 (92.4%) candidates attempted this question. 1 (0.68%) scored from 0 to 5 marks, 8 (5.48%) scored from 5.5 to 8.5 marks and 137 (93.84%) scored from 9 to 15 out of the 15 marks allocated. Figure 9 illustrates the candidates' performance in this question.

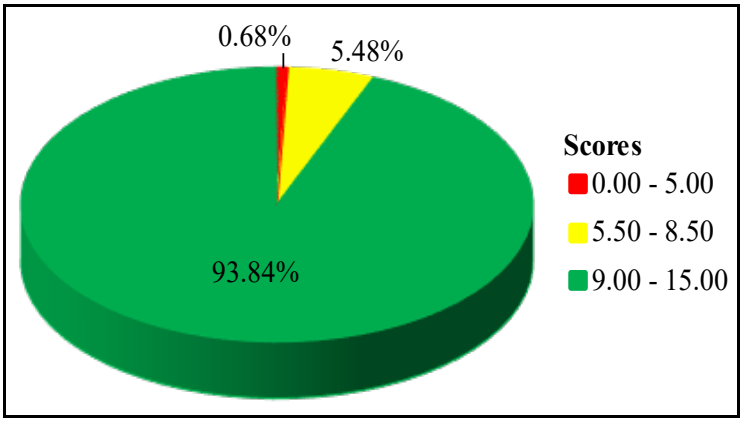
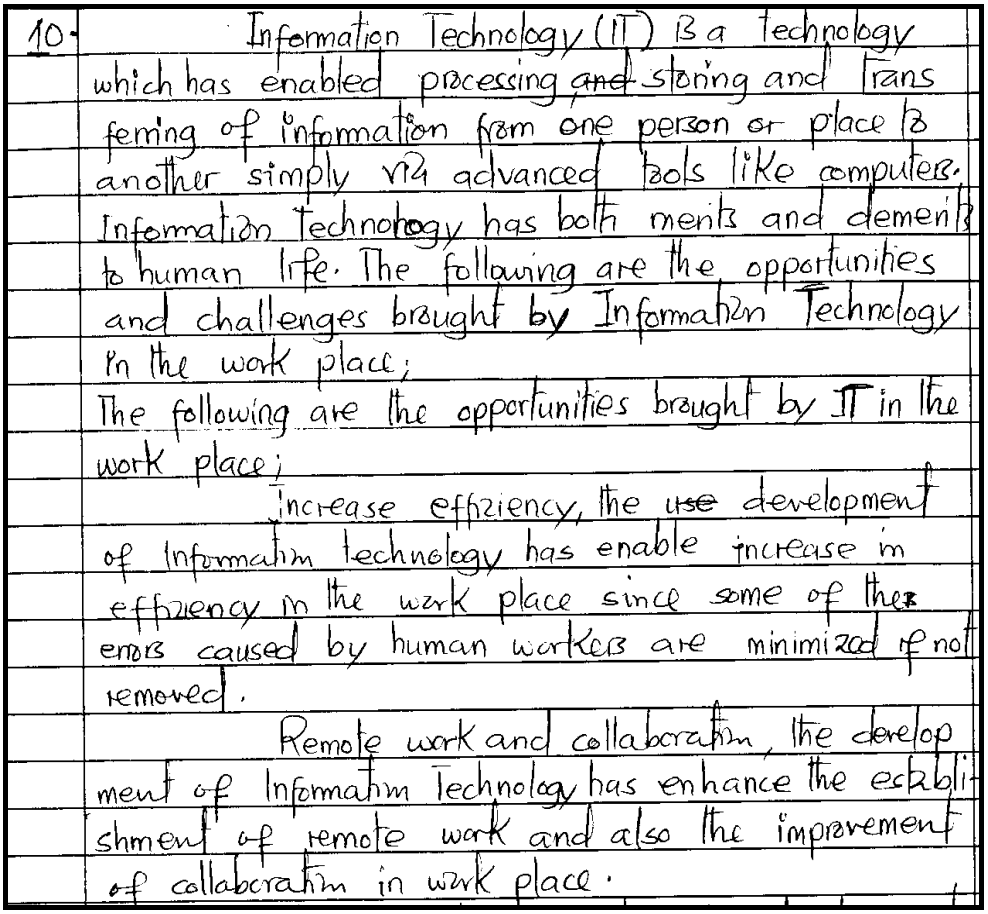


Figure 10: *The Candidates' Performance in Question 10, Paper 1*

The general performance of candidates in this question was good because 99.32 per cent of the candidates scored high marks (9 – 15). The analysis

showed that majority of the candidates wrote the correct introduction and conclusion. Most of the candidate analyzed correctly at least two opportunities and two challenges brought by IT in the work place. However, some candidates gave unclear introduction as they explained the term "IT Career" instead of IT in general. Other candidates defined the term "IT" without relating it with sectors where IT can be applied. This led them to lose some marks in this part. Other candidates repeated the same points but with different terminologies. In addition, most of the candidates gave correct conclusion based on IT, while others wrote conclusion based on comparison between opportunities and challenges. For example, one of the candidates wrote *Opportunity brought by IT are better than challenges*. Extract 10.1 presents a sample of such correct responses to this question.

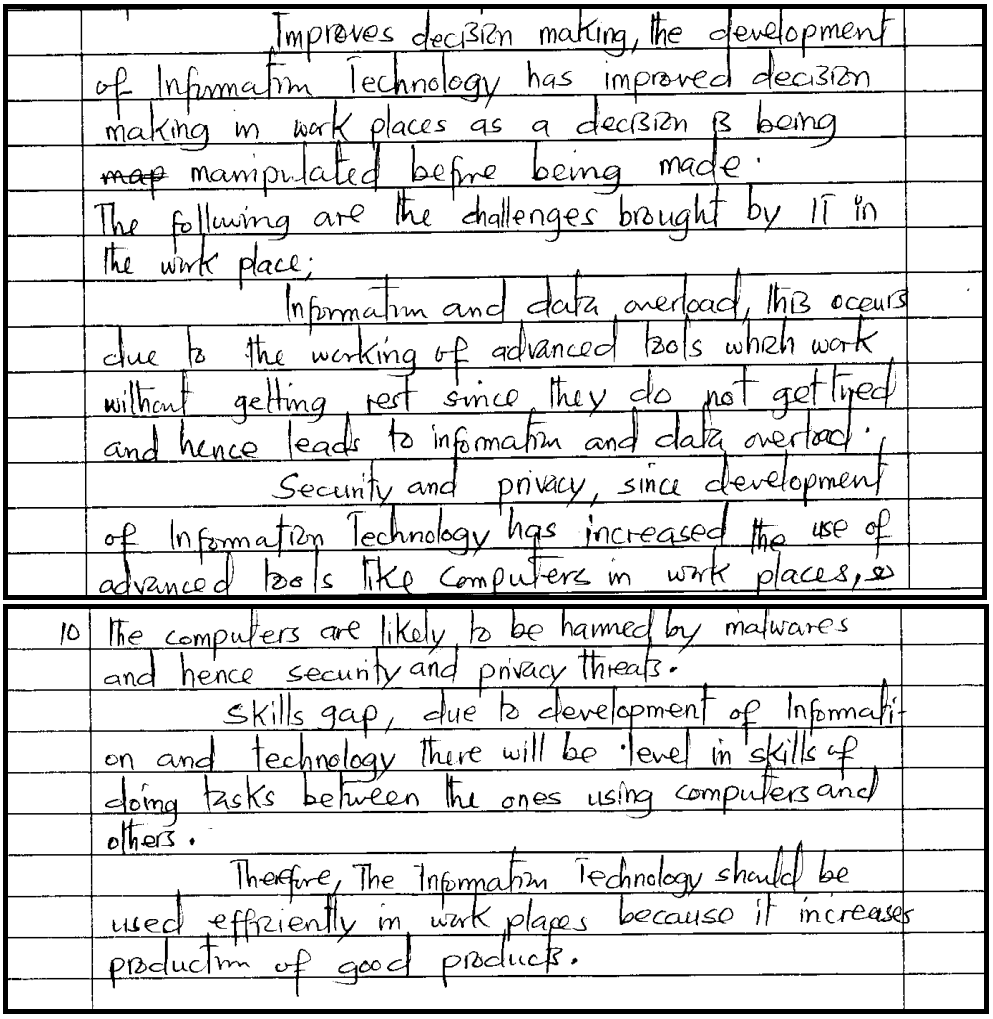


10. Information Technology (IT) is a technology which has enabled processing, ~~and~~ storing and transfering of information from one person or place to another simply via advanced tools like computers. Information Technology has both merits and demerits to human life. The following are the opportunities and challenges brought by Information Technology in the work place;

The following are the opportunities brought by IT in the work place;

Increase effiziency, the ~~use~~ development of Information technology has enable increase in effiziency in the work place since some of the errors caused by human workers are minimized if not removed.

Remote work and collaboration, the development of Information Technology has enhance the establishment of remote work and also the improvement of collaboration in work place.


Improves decision making, the development of Information Technology has improved decision making in work places as a decision is being ~~map~~ manipulated before being made.
The following are the challenges brought by IT in the work place;
Information and data overload, this occurs due to the working of advanced tools which work without getting rest since they do not get tired and hence leads to information and data overload.
Security and privacy, since development of Information Technology has increased the use of advanced tools like Computers in work places, so
10 the computers are likely to be harmed by malwares and hence security and privacy threats.
Skills gap, due to development of Informati-on and technology there will be level in skills of doing tasks between the ones using computers and others.
Therfore, The Information Technology should be used effiziently in work places because it increases productin of good products.

Extract 10.1: A sample of correct responses to question 10, paper 1

In Extract 10.1, the candidate explained opportunities and challenges brought by IT correctly. However, the conclusion provided by this candidate was incorrect.

On the other hand, the candidates (5.48%) who scored average marks (5.5 – 8.5) provided either introduction or conclusion correctly but not both. Some of them explained communication technology instead of information technology in their introduction. For example, one candidate wrote, *IT involves transfer of information from one place to another*. Moreover, the candidates wrote correctly one to two opportunities and the challenges brought by the in the work place. Other candidates listed opportunities and

challenges without giving explanations. It was observed that, some candidates wrote the impact of the communication technology instead of information technology, while others explained the carrier opportunities of IT such as programmer, network administrator, etc. This implies that, these candidates could not differentiate the IT from communication technology.

Further analysis showed that only one candidate (0.68%) scored low marks. This candidate explained the difficulties that hinder the use of IT, instead of the challenges brought by IT in the working place. However, the candidate correctly mentioned two opportunities brought by the use of IT in education. This shows that the candidate had insufficient knowledge on the uses of IT.

2.2 136/2 Computer Science 2

This was a practical paper which lasted for 3 hours. The paper consisted of 3 questions. The candidates were required to answer 2 questions, including question 1 which was stipulated from the topic of C++ programming. Each question carried 25 marks, making a total of 50 marks.

2.2.1 Question 1: C++ Programming

The candidates were required to use the concept of C++ programming language to construct a program that calculates the area of various shapes. The question was as follows:

Considering COVID 19 pandemic outbreak, many places across the world were economically and socially affected. During that moment, lots of social services including schools were in lockdown. Manager at Udzungwa primary school recommended that; mathematics lessons should continue to be taught online alternatively to physical classes. You are required to develop a C++ e-learning program by defining a string array named ***str[10],*** *to compute area of various shapes such as square, rectangle, triangle and circle. It shall also be able to calculate volume of rectangular box and cylinder respectively. The program must allow user to choose "A" if intending to compute Area and "V" if intending to compute Volume, followed by the name and measurements of the shape.*

Use the following formula to develop your program:

(i) In case of area use;

Name of the figure	***Formula to use***
Square given by	*Side x side*
Rectangle given by	*Length x width*
Triangle given by	$\frac{1}{2} \times \text{base} \times \text{height}$
Circle given by	*3.14 x radius x radius*

(ii) In case of volume use;

Name of the figure	***Formula to use***
Rectangular box given by	*Length x width x height*
Cylinder given by	*3.14 x radius x radius x height*

A total of 158 (100%) candidates attempted this question. 15 (9.49%) scored from 0 to 8.5 marks, 19 (12.03%) scored from 9 to 14.5 marks, and 124 (78.48%) scored from 15 to 25 out of the 25 marks allocated. Figure 11 illustrates the candidates' performance in this question.

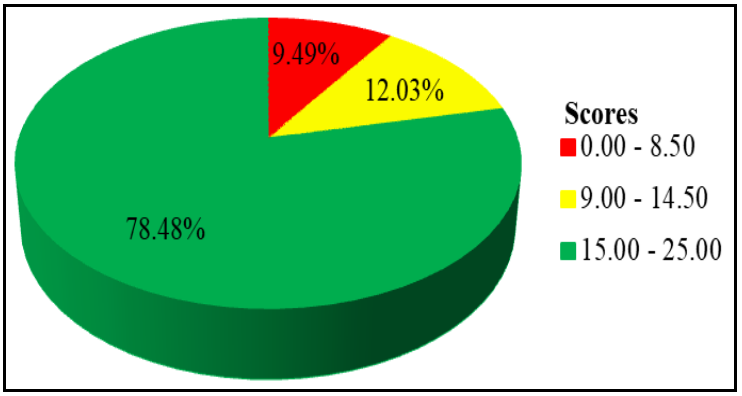


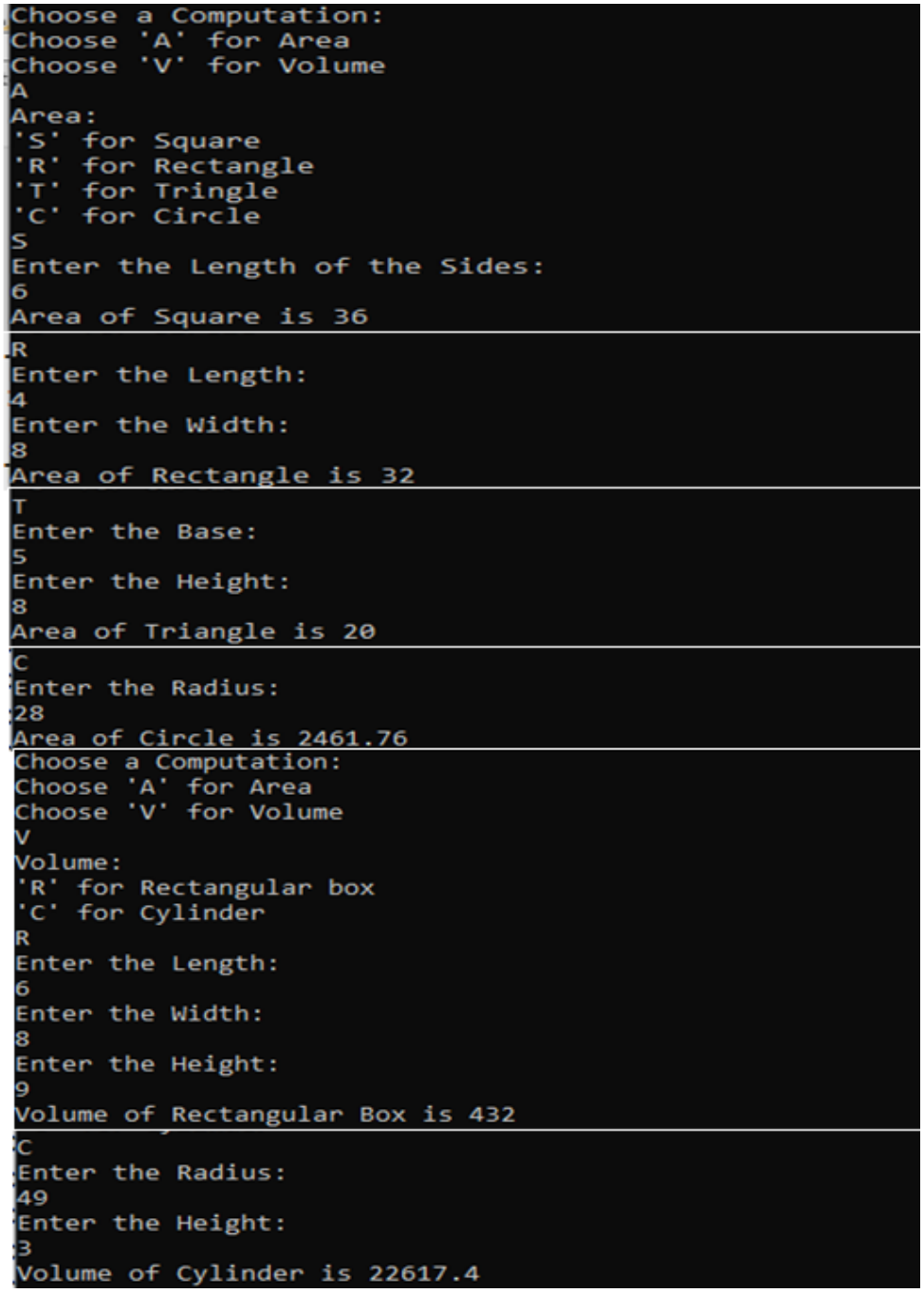
Figure 11: *The Candidates' Performance on Question 1, Paper 2*

The candidates' general performance in this question was good because 90.51 per cent scored from 9 to 25 marks. The analysis of candidates' responses showed that 78.48 per cent of the candidates who scored high marks correctly used conditional statements to construct C++ Program which computes the Area or Volume of a given shapes. They also used an array concept to capture the names of the given figures. Moreover, the candidates used the correct operand in the given formula to compute the

areas and the volume of the given figures. However, some of the candidates applied *if statement* instead of *else if statement* to calculate areas and volume of figures. Other candidates used the correct *switch case control structure* as required for a program to calculate the areas and volume of the figures, but they failed to give the *case statement* required to set the condition that selects the type of the figure. Others typed correctly "switch case control structure", but failed to type the correct operand in the formula to compute areas and volume of identified figures. This indicates that, the candidates had insufficient knowledge on conditional statements in C++ programming. Furthermore, some of the candidates declared the name of the figure as integer, instead of string data type. Other candidates declared choice as a string, instead of character "*char*" data type on selecting area or volume. Few candidates used the function *int main ()* with no return type. These candidates had insufficient knowledge about declaration of function in C++ programming. Extract 11.1 shows samples of such correct responses to this question.

```cpp
#include <iostream>
#include <string.h>
using namespace std;
int main (){
    string str[10];
    char option, option1, option2;
    cout<<"Choose a Computation: "<<endl;
    cout<<"Choose 'A' for Area"<<endl;
    cout<<"Choose 'V' for Volume"<<endl;
    cin>>option;

    switch(option){
        case 'A':
            cout<<"Area:"<<endl;
            cout<<"'S' for Square"<<endl;
            cout<<"'R' for Rectangle"<<endl;
            cout<<"'T' for Tringle"<<endl;
            cout<<"'C' for Circle"<<endl;
            cin>>option1;

                switch (option1){
                    case 'S':
                        double Sarea, side;
                        cout<<"Enter the Length of the Sides: "<<endl;
                        cin>>side;
                        Sarea = side * side;
                        cout<<"Area of Square is "<<Sarea<<endl;
                        break;
                    case 'R':
                        double Rarea, length, width;
                        cout<<"Enter the Length: "<<endl;
                        cin>>length;
                        cout<<"Enter the Width: "<<endl;
                        cin>>width;
                        Rarea = length * width;
                        cout<<"Area of Rectangle is "<<Rarea<<endl;
                        break;
                    case 'T':
                        double Tarea, base, height;
                        cout<<"Enter the Base: "<<endl;
                        cin>>base;
                        cout<<"Enter the Height: "<<endl;
                        cin>>height;
                        Rarea = 0.5 * base * height;
                        cout<<"Area of Triangle is "<<Rarea<<endl;
                        break;
                    case 'C':
                        double Carea, radius;
                        cout<<"Enter the Radius: "<<endl;
                        cin>>radius;
                        Carea = 3.14 * radius * radius;
                        cout<<"Area of Circle is "<<Carea<<endl;
                        break;
                    default:
                        cout<<"Invalid Option!"<<endl;
                }
```

```
            break;
        case 'V':
            cout<<"Volume:"<<endl;
            cout<<"'R' for Rectangular box"<<endl;
            cout<<"'C' for Cylinder"<<endl;
            cin>>option2;

                switch(option2){
                    case 'R':
                        double Rvolume, length, width, height;
                        cout<<"Enter the Length: "<<endl;
                        cin>>length;
                        cout<<"Enter the Width: "<<endl;
                        cin>>width;
                        cout<<"Enter the Height: "<<endl;
                        cin>>height;
                        Rvolume = length * width * height;
                        cout<<"Volume of Rectangular Box is "<<Rvolume<<endl;
                        break;
                    case 'C':
                        double Cvolume, radius, height2;
                        cout<<"Enter the Radius: "<<endl;
                        cin>>radius;
                        cout<<"Enter the Height: "<<endl;
                        cin>>height2;
                        Cvolume = 3.14 * radius * radius * height2;
                      cout<<"Volume of Cylinder is "<<Cvolume<<endl;
                      break;
                }

            break;
        default:
            cout<<"Invalid Option!"<<endl;
    }

return 0;
}
```



Extract 11.1: A sample of correct responses to question 1, paper 2

In Extract 11.1, the candidate correctly used C++ program to construct a program which calculate area and volume of a given figure.

Further analysis showed that (12.03%) of the candidates who scored average marks typed correctly C++ codes which help a user to choose “A” or “V” to compute area and Volume of various figures. They also managed to enter measurements of different figures and prints the message “*wrong option*” when a user typed invalid choice. It was noted that most of them did not type conditional statements that allows a user to select the names of the figures. This led them to lose some marks. Some candidates’ type incorrect formula for solving area of triangle which resulted to logical errors and others could not declare variables. Moreover, others failed to set the correct condition statements which led the program to produce wrong output. This implies that the candidate did not understand the application of conditional statement in C++ Programming.

Statistics show that 9.49 per cent of the candidates scored low marks. Some of these candidates correctly wrote the header files. They also wrote C++ statements for prompting a user to choose “A” or “V” to compute Area and Volume of the given figures. However, they failed to type formulas for computing Areas and Volumes of the given figures and could not declare variables. They also failed to apply conditional statements to choose the required figures. Some candidates typed functions that calculates the Area and Volume of a given figures, but failed to define and call them in the main function. This shows that the candidate lacked the knowledge about the creation of function. Few candidates typed C codes instead of *C++* programming language. Extract 11.2 shows a sample of incorrect responses from one of the candidates.

```
#include <iostream>
using namespace std;
int main(){
    int A,V, S,R,T,C,RB,CY,ch,x,y,r,str[10];
        cout<<"Enter\n S for square\n R for rectangle\n T for tiangle\n";
        cout<<"C for cicle\n RB for rectangular box\n CY for cylinder\n";
    cin>>ch;
    cout<<"Choose\n A to compute area\n V to compute volume\n";
    cin>>ch;
    for(int i=1; i<=10; i++)
    switch(ch){
            case 'S':
            cout<<"area of square="<<(x*y);
            cin>>S;
            case 'T':
            cout<<"area of triangle="<<(x*y)/2;
            cin>>T;
            case 'R':
            cout<<"area of rectangle ="<<(x*y);
            cin>>R;
            case 'c':
            cout<<"area of circle="<<(x*y);
            cin>>S;
            case 'RB':
            cout<<"volume of rectangular box="<<(x*y);
            cin>>S;
                default:
                    cout<<"ivalid\n";
}
}
```

```
Enter
 S for square
 R for rectangle
 T for tiangle
C for cicle
 RB for rectangular box
 CY for cylinder
T
Choose
 A to compute area
 V to compute volume
ivalid
ivalid
ivalid
ivalid
ivalid
ivalid
ivalid
ivalid
ivalid
ivalid

--------------------------------
Process exited after 4.991 seconds with return value 0
Press any key to continue . . .
```

```
#include<iostream>
using namespace std;

int main(){
    int A,V;
    char Sq,Rt,Tr,c, rect,cyl;

    string str[10];
    float select;

    cout<<"To compute area choose A and to compute Volume choose V";
    cin>>A,V;
    cout<< "select" <<" input measure for shape as Sq for square,Rt for rectangle,Tr for triagle, c for circle ";
       cin>> select >> Sq,Rt,Tr,c, rect,cyl;
    return 0;
}
```

```
To compute area choose A and to compute Volume choose VA
select input measure for shape as Sq for square,Rt for rectangle,Tr for triagle, c for circle
--------------------------------
Process exited after 4.742 seconds with return value 0
Press any key to continue . . .
```

Extract11.2: A sample of incorrect responses to question 1, paper 2

In Extract 11.2, the candidate failed to declare variables that hold the user input. The candidate also failed to type a C++ program that displays the volume of rectangle and volume of cylinder. The candidate also declared volume as *Integer* instead of *char* data type.

2.2.2 Question 2: Website Development

The question was divided into three parts: (a), (b) and (c). The candidates were required to use html and JavaScript function to design the interactive loan calculator. The question given to the candidate was as follows:

(a) Most of the Mambo Microfinance Bank (MMB) customers are complaining on the poor handling of their loan calculations. Currently, their loans are being calculated by the bank personnel without sharing necessary information to them. To solve this problem, MMB manager decided to add online loan calculator page on the bank website which will allow customers to manage their loan online. Use HTML to design the interactive loan calculator page as given in Figure 1.

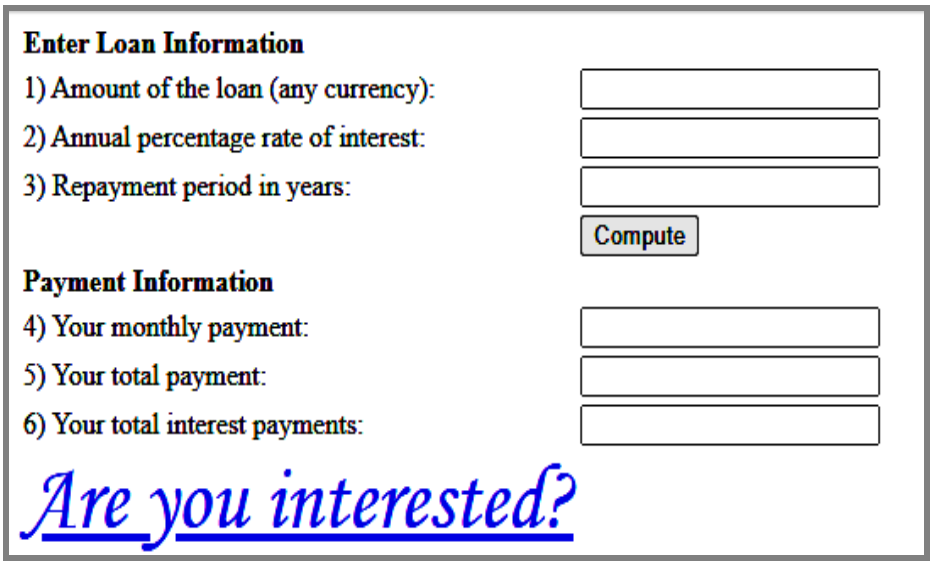


Figure 1

(b) Use JavaScript to activate the page given in Figure 1 in order to calculate monthly payment, total payment and total interest payments after clicking the command button "Compute".

HINT: -

(i) Use the following formula to calculate monthly payment, total payment and total interest payments.

- $\textit{Monthly payment} = loan\left[1+\frac{\text{interest}}{100\times 12}\right]$
- $\textit{Total payment} = loan\left[1+\frac{\text{interest}}{100\times 12}\right]^{\text{years}}$
- *Total interest payment = total payment – loan.*

(ii) The font style and size of the text "Are you interested?" should be Apply "lucida handwriting."

(c) Activate the link "Are you interested?" in Figure 1 to enable interested customer to fill all required details as given in Figure 2.

Figure 2

A total of 126 (79.75%) candidates attempted this question. 1 candidate (0.79%) scored from 0 to 8.5 marks, 25 (19.84%) scored from 9 to 14.5 marks, and 100 (79.37%) scored from 15 to 25 marks out of 25 marks allocated. The general performance of candidates in this question was good as 99.21 per cent scored above 8.5 marks. Figure 12 represents the candidate's performance in this question.

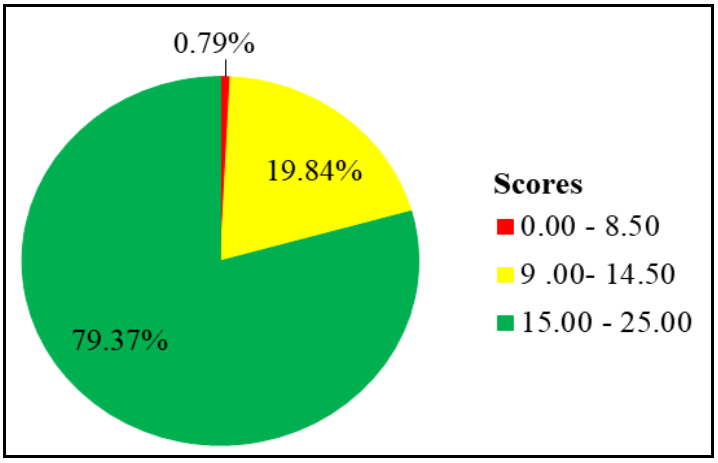
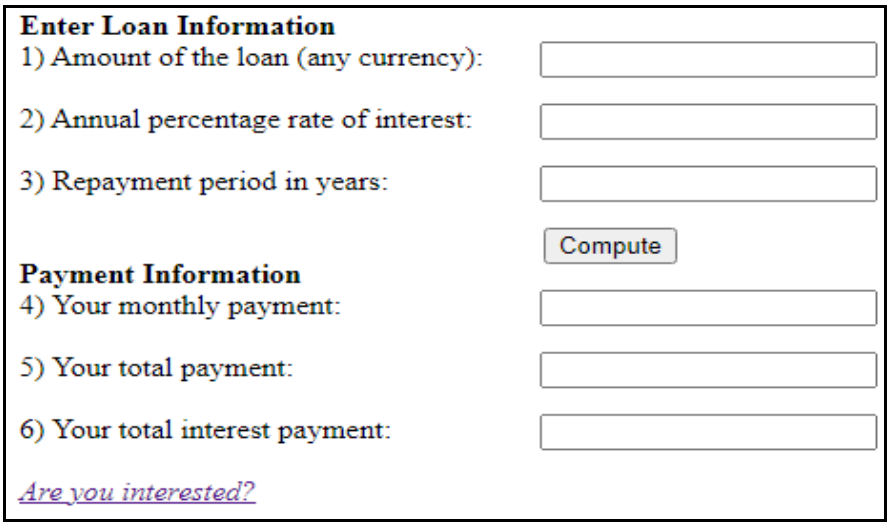


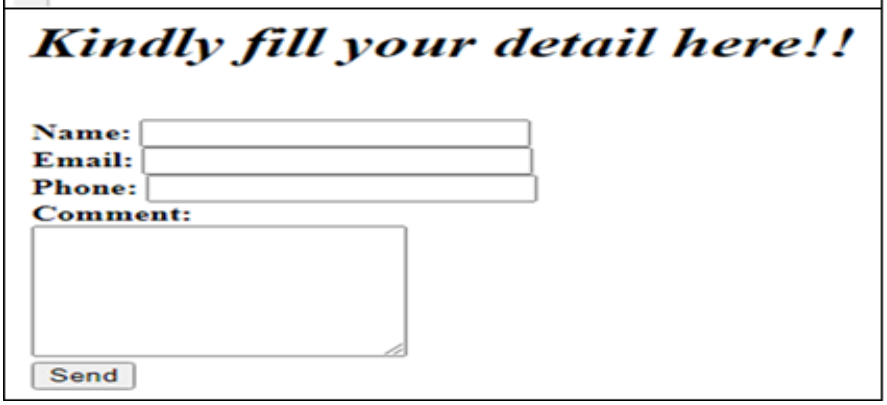
Figure 12: *The Candidates' Performance on Question 2, Paper 2*

The analysis shows that 79.37 per cent of the candidates who scored high marks correctly typed HTML codes that designs an interactive online loan calculator, in part (a). They also used tables and listing tags to align the textboxes and buttons shown in the figure. In part (b), the candidates correctly typed JavaScript codes that calculates the monthly payment, total payment and total interest payments after clicking the button "Compute". However, some of the candidates typed wrong formula because they lacked knowledge about BODMAS rules. This indicates that they lacked the basic knowledge about arithmetic calculations. For example, one candidate typed, *Monthly payment = loan*(1+interest/100*12)* instead of *Monthly payment = loan*(1+interest/(100*12))*. This candidate had insufficient knowledge on the uses of brackets in a formula. Additionally, some candidates had insufficient knowledge on applying mathematical function in JavaScript, thus they gave wrong formula. For example, one candidate wrote; *document.getElementById("t5").value=loan(1+intrest/100*12))pow(years);* instead of *document.getElementById("t5").value = loan*(Math.pow((1+intrest/(100*12)),years));*. In part (c), the candidates designed the correct web page and text "*Are you interested?*" to enable interested customer to fill all required details. However, some candidates failed to link the page with the correct page name. Extract 12.1 shows a sample of the correct responses from one of the candidates.

```
<!DOCTYPE html>
<html>
<head>
    <title>calculator</title>
    <style type="text/css">

        input{
        float: right;
    }
    .main a{
        font-family: lucida handwriting;
        color: black;

    }
    fieldset{
        width:450px;
    }
    button{
        float: right;
        margin-right: 105px;
    }
    </style>
</head>
<body>
<fieldset>
<b>Enter Loan Information</b><br>
1) Amount of the loan (any currency):
<input type="number" name="amount" id="amount"><br><br>
2) Annual percentage rate of interest:
<input type="number" name="rate" id="rate"><br><br>
3) Repayment period in years:
<input type="number" name="period" id="period"><br><br>
<button onclick="calc()" >Compute</button>
<br>

<b>Payment Information</b><br>
4) Your monthly payment:
<input type="number" name="monthly" id="monthly">
<br><br>
5) Your total payment:
<input type="number" name="totalpay" id="totalpay">
<br><br>
6) Your total interest payment:
<input type="number" name="interest" id="interest">
<br><br>

<a href="2.c).html"><i>Are you interested?</i></a>
</fieldset>
<script type="text/javascript">
function calc(){

    var amount= document.getElementById('amount').value;
    var rate= document.getElementById('rate').value;
    var t=document.getElementById('period').value;

    if(amount!=="" && rate!=="" && t!==""){
   var x=((rate/(100*12))+1);

   var monthly=amount*x;
   document.getElementById('monthly').value=monthly;

  var total=x**t;

  var totalpay=total*amount;
   document.getElementById('totalpay').value=totalpay;

  var interest=totalpay-amount;
   document.getElementById('interest').value=interest;
    }
    else{
        alert("Please fill all fields");
    }

}

</script>

</body>
</html>
```




```
<!DOCTYPE html>
<html>
<head>
    <title>details</title>
    <style type="text/css">
        textarea{
    height: 15vh;
}
    </style>


</head>
<body>

<b><h1><i>Kindly fill your detail here!!</i></h1></b><br>
<form>
<b>Name:</b>
<input type="text" name="Name" id="Name"><br>
<b>Email:</b>
<input type="text" name="Email" id="Email"><br>
<b>Phone:</b>
<input type="number" name="Phone" id="Phone"><br>
<b>Comment:</b><br>
<textarea >
</textarea><br>

<button>Send</button>

</form>

</body>
</html>
```



Extract 12.1: A sample of correct responses to question 2, paper 2

In Extract 12.1, the candidate correctly typed the HTML codes that designed the interactive loan calculator page and accepts the inputs and displays the intended outputs as required, in part (a). The candidate also managed to calculate monthly payments, total payment, and total interest payments after clicking the command button "*Compute*", in part (b). In part (c), the candidate correctly created a page that enables interested customers to fill all the required details.

Moreover, 19.84 per cent of the candidates who scored average marks designed the interface of online loan calculator using HTML tags and the respective components, in part (a). In part (b), most of the candidates failed to type JavaScript codes that calculates the monthly payment, total payment, and total interest payments after clicking the button "Compute". Some of the candidates were able to create and link page of part (a) with page in part (c). This led them to lose some marks. Others typed incorrect link text *"Are you interested?"* Also, they failed to define its font style in part (c).

Despite good performance, one candidate 0.79 per cent scored low marks. The candidate wrote HTML tags with incorrect syntax in part (a). The candidate also did not type any JavaScript codes in parts (b) and (c). This indicates that the candidate lacked HTML coding skills. Extract 12.2 shows a sample of an incorrect response from one of the candidates.

2.2.3 Question 3: Visual Programming

The question intended to measure the ability of the candidates to design the interface and use conditional statements to activate button in a Visual Basic interface provided. The question given to the candidate was as follows:

Dobi Washing Company provides washing and cleaning services in Arusha region. Currently, the company operates its billing processes manually, which delays the bill provision to customers. To improve its billing process, the company intends to deploy a Computerized Billing System. Among other functions, the system will enable receptionist to bill the customer by selecting the requested services along with its discount for his/her customer as shown in Figure 3. Using Visual Basic Program;

(a) Create an interface form as depicted in Figure 3.

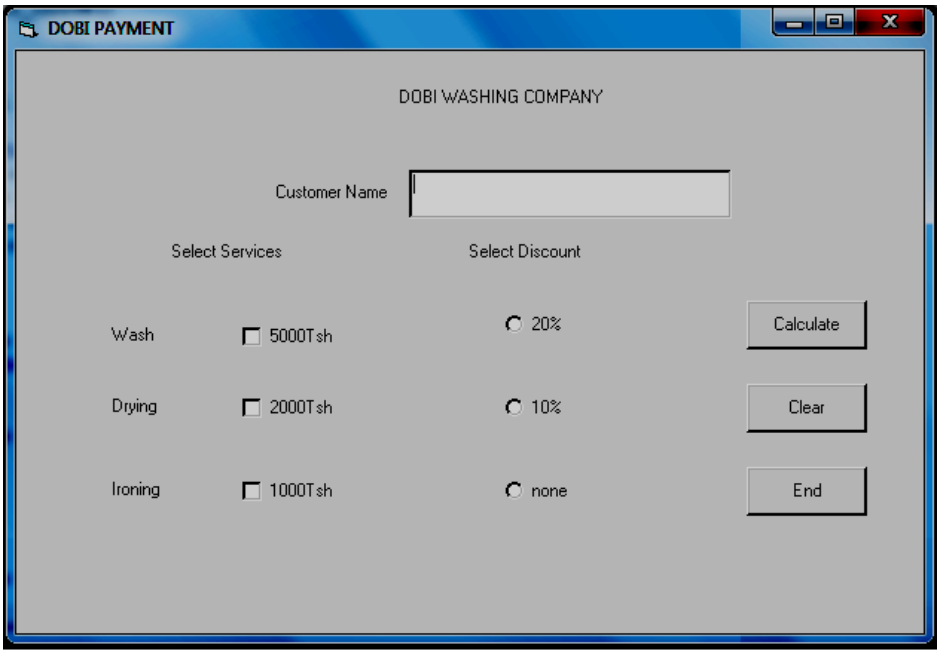


Figure 3: DOB Payment Form

(b) Activate the button "Calculate", so that when a user clicks on, the program displays a Message Box showing calculated price after discount and customer name.

(c) Activate the button "Clear", so that when user clicks on, the program erases all inputs data in the form.

(d) Activate the button "End", so that when user clicks on, the program exits the window form.

This question was answered by few candidates 32 (20.3%). Among those who answered this question 9 (28.13%) scored from 0 to 8.5 marks, 6 (18.75%) scored from 9 to 14.5 marks, and 17 (53.13%) scored from 15 to 25 marks out of 25 marks allocated. The overall performance in the given question was good as 71.88 per cent scored above 8.5 marks. Figure 13 illustrates the candidates' performance in this question.

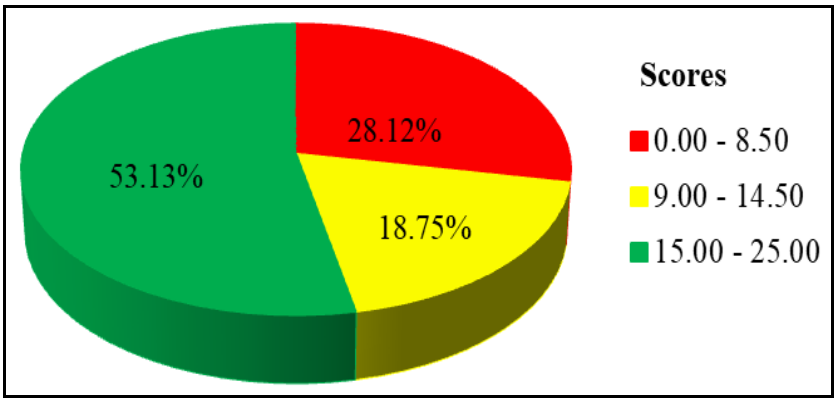
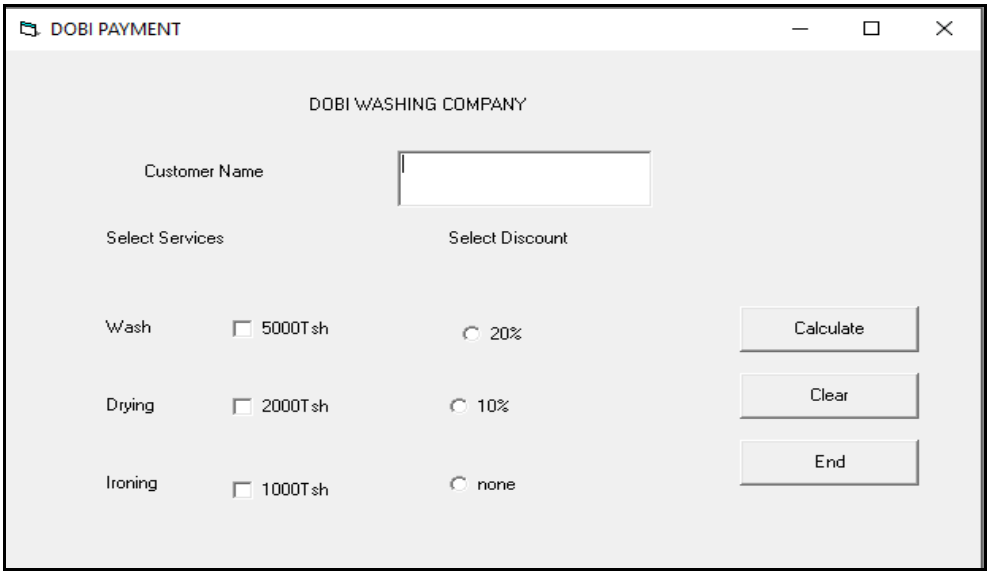
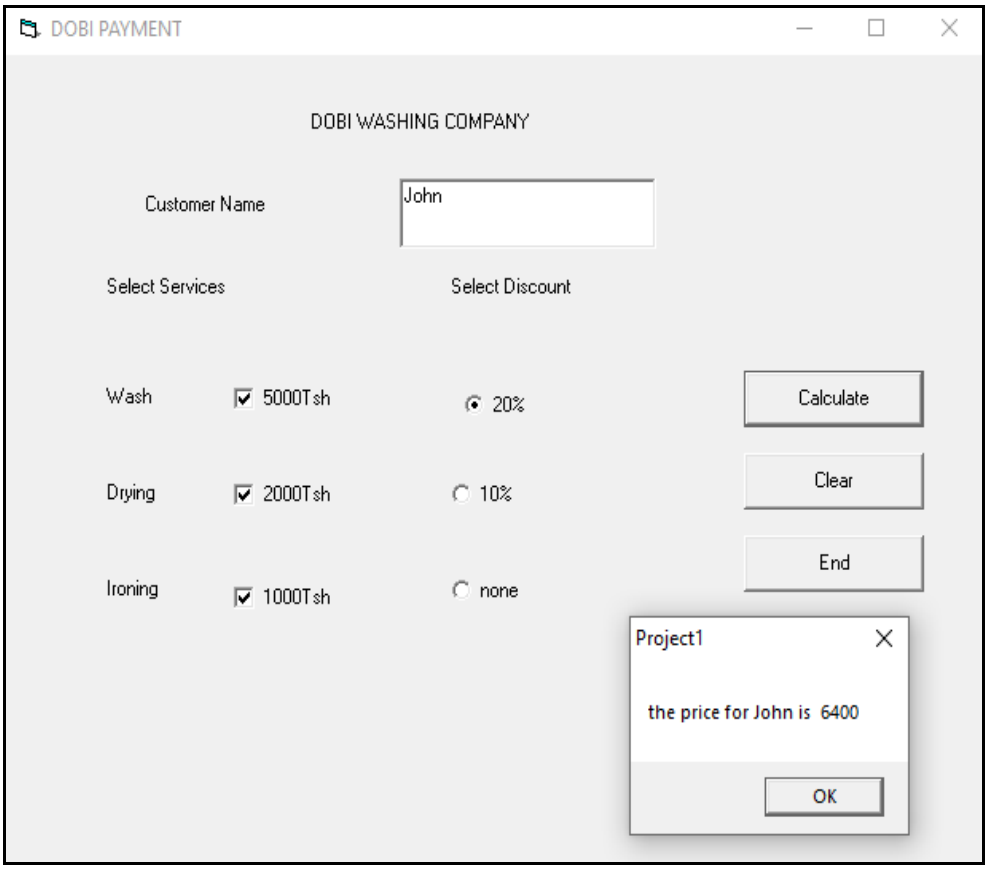
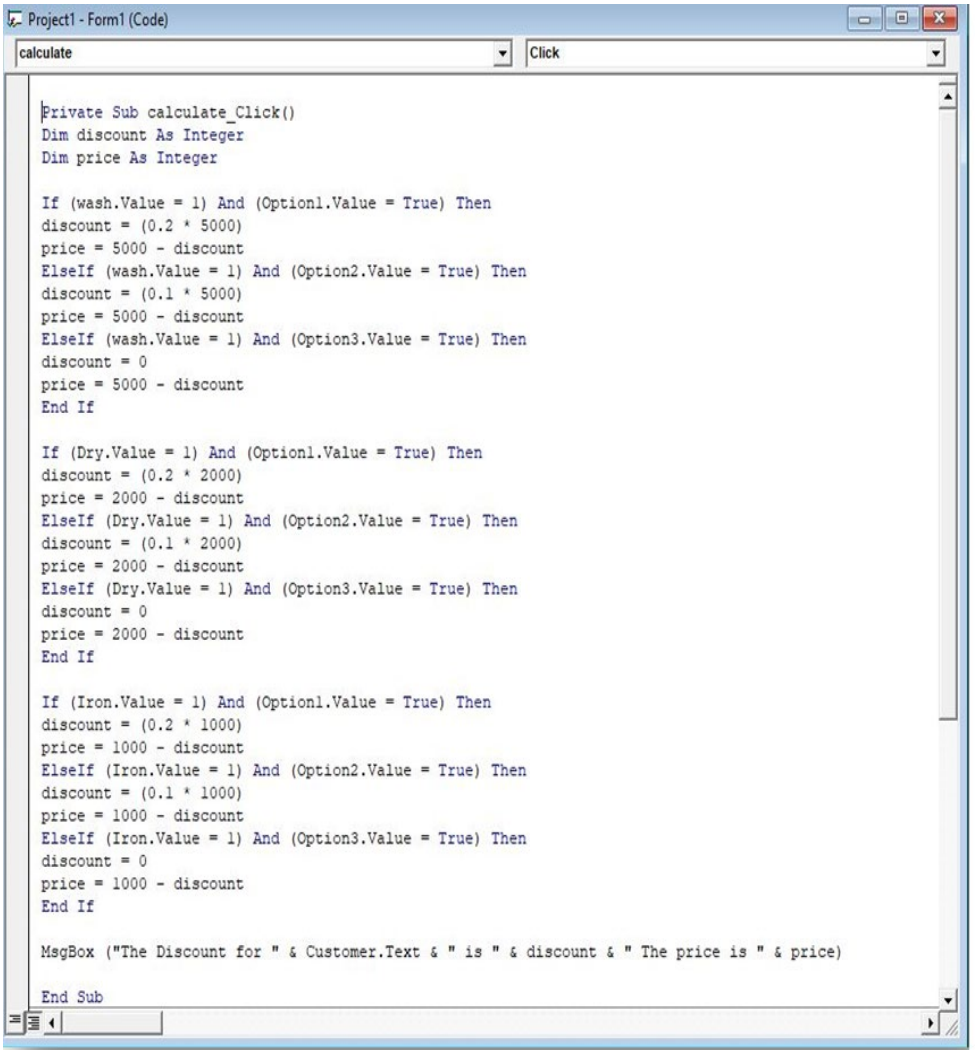


Figure 13: *The Candidates' Performance on Question 3, Paper 2*

The analysis showed that 53.13 per cent of the candidates who scored high marks correctly designed the given interface. They also correctly activated the "Calculate" button with their respective radio buttons and applied the correct formula to calculate the price after discounts, and display it and the name of customer in the Message Box. Moreover, some of the candidates applied conditional statements to switch from one checkbox to another along with their radio buttons. Some candidates failed to concatenate the name and the calculated prices in the Message Box. Others failed to activate the "Clear" button to clear all the information in the form. This made them to lose some marks. Extract 13.1 shows a sample of the correct responses to question 3, paper 2.




DOBI PAYMENT
DOBI WASHING COMPANY
Customer Name
John
Select Services
Select Discount
Wash
5000Tsh
20%
Calculate
Drying
2000Tsh
10%
Clear
Ironing
1000Tsh
none
End
Project1
the price for John is 6400
OK

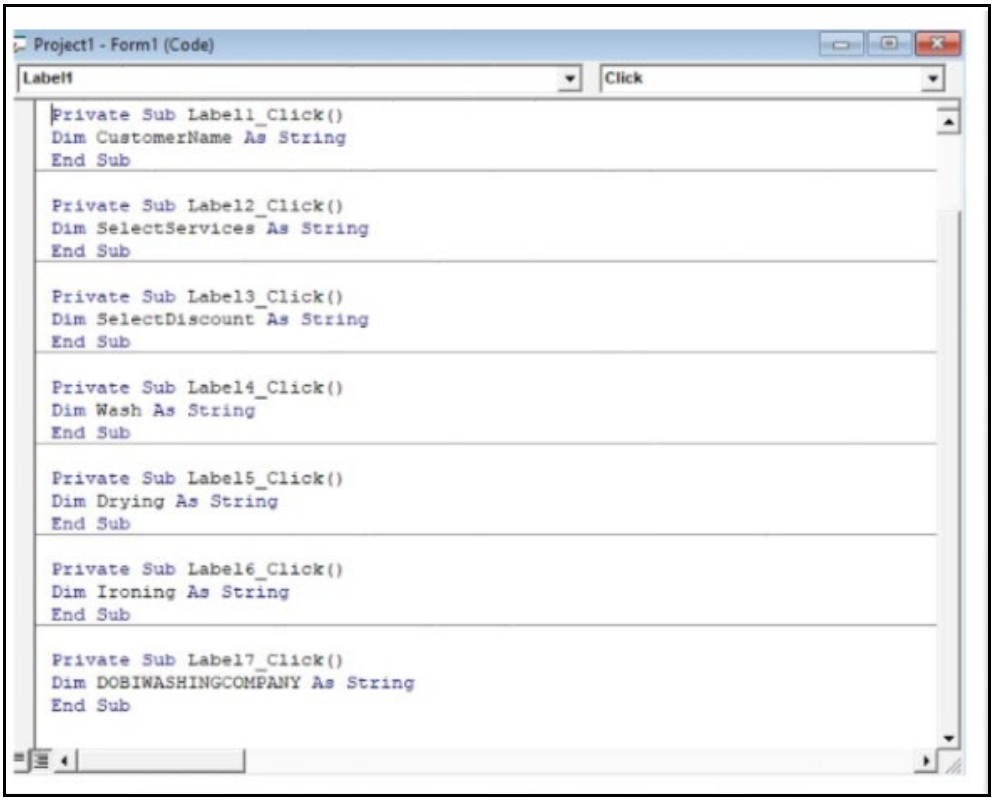


Extract 13.1: A sample of correct responses to question 3, paper 2

In Extract 13.1, the candidate applied Visual Basic codes to design the given interface. The candidate also activated all buttons and display calculated price and name in the Message Box.

On the other hands, 18.75 per cent of the candidates who scored average marks designed the given interface. They also activated “Calculate” button and radio buttons by using Visual Basic codes. However, the candidates failed to type the correct Visual Basic code that displays the name and the calculated price in Message Box. The candidates also failed to apply conditional statements in “Calculate” buttons, and failed to apply correct formula for calculating price after discount. Some candidates displayed the name and the price in the textboxes, instead of message boxes. This indicates that the candidates had insufficient knowledge on Visual basic control structure.

In addition, 28.13 per cent of the candidates who scored low marks designed an interface with all Visual Basic controls like textbox, checkbox, Radio button and command buttons using Visual Basic codes. However, they could not type any conditional statements to activate the buttons created. Some of the candidates also failed to type Visual Basic codes to activate “Clear” and “End” buttons. Moreover, some candidates failed to display the name of customer and the price in the Message boxes. Other candidates applied notepad, instead of Visual Basic application to type visual basic codes. This implies that the candidates did not understand the requirements of the question. Extract 13.2 shows a sample of incorrect responses from one of the candidates.



Extract 13.2: A sample of incorrect responses to question 3, paper 2

In Extract 13.2, the candidate managed to design required interface. However, the candidate failed to add visual basic codes to activate buttons like “Calculate”, “Clear” and “End”. The candidate also failed to display the calculated price and the name of the customer in the Message Box.

3.0 PERFORMANCE OF THE CANDIDATES PER TOPIC

The analysis done in relation to each topic shows that the candidates performed well in eight topics, average in one topic, and weak in one topic. The candidates performed well in the topics of *IT Environment* (99.32%), *Computer Security and Privacy* (94.30%), *Website Development* (93.91%), *Data Communication and Networking* (93.67%), *C++ Programming* (85.56%), *Data Representation* (74.68%), *Data Structure and Algorithm* (66.46%) and *Information Systems* (63.83%). The good performance is a result of the correct interpretation of the questions, and the candidates' good practical skills. The candidates’ performance was average in the topic of *Visual Programming* (58.72%). This performance is due to lack of practical skills. The candidates' performance was weak in the topic of *Computer Basics* (18.35%). The weak performance is attributed to the candidates' inadequate knowledge on the function of different memory in storing data and instructions. The *Appendix* shows the performance of the candidates in each topic.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The analysis of candidates’ performance in Computer Science subject in ACSEE 2023 has shown that out of 10 topics which were examined, 8 topics had good performance, 1 topic had average performance, and 1 topic had weak performance. Therefore, the overall performance in Computer Science in 2023 was good. The analysis of the candidates’ responses indicates that the candidates had difficulties in answering questions from the topic of *Computer Basics*. The weak performance in this topic is attributed to the candidates’ insufficient knowledge and skills on the function of different memory in storing data and instructions, and wrong interpretation of the given information.

4.2 Recommendations

In order to improve the candidates' performance in the future Computer Science examination, the following are recommended to teachers:

(a) guide students in identifying and describing the functions of different memories in storing data and instructions.

(b) guide students to use different tools in creating programs, and provide more exercises session on practical to build their ability to make productive programs in real life.

(c) give students to do exercises and tests to improve their skills in creating database by applying all the important features for both theoretical concepts and practical skills using the Ms Access.

Appendix

Candidates' Performance per Topic

S/N	Topic	Number of Questions	Percentage of Candidates who Scored 35% of the Marks or Above	Remarks
1	IT Environment	1	99.32	Good
2	Computer Security and Privacy	1	94.30	Good
3	Website Development	2	93.91	Good
4	Data Communication and Networking	1	93.67	Good
5	C++ Programming	2	85.56	Good
6	Data Representation	1	74.68	Good
7	Data Structure and Algorithm	1	66.46	Good
8	Information Systems	1	63.83	Good
9	Visual Programming	2	58.72	Average
10	Computer Basics	1	18.35	Weak