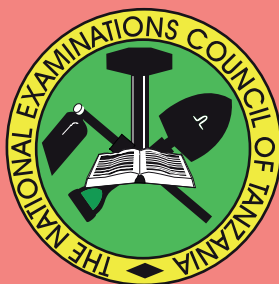


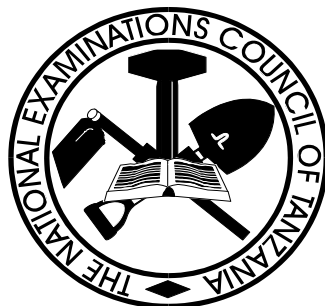
THE NATIONAL EXAMINATIONS COUNCIL OF TANZANIA



**CANDIDATES' ITEM RESPONSE ANALYSIS REPORT
FOR THE ADVANCED CERTIFICATE OF SECONDARY
EDUCATION EXAMINATION (ACSEE) 2019**

136 COMPUTER SCIENCE

THE NATIONAL EXAMINATIONS COUNCIL OF TANZANIA



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REPORT ON THE ADVANCED CERTIFICATE OF
SECONDARY EDUCATION EXAMINATION (ACSEE)
2019**

136 COMPUTER SCIENCE

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FOREWORD

The National Examinations Council of Tanzania is pleased to issue the Candidates' Item-Response Analysis (CIRA) report in the Computer Science subject for the Advanced Certificate of Secondary Education Examination (ACSEE), 2019. The analysis provides feedback to the candidates, teachers, parents, policy makers, and other education stakeholders on how the candidates answered the questions.

The Advanced Certificate of Secondary Education Examination marks the end of the two years of secondary education. It is a summative evaluation which shows, among other things, the effectiveness of the education system in general, and the education delivery system in particular. Essentially, the candidates' responses are a good indicator of what the education system was able or not to offer the candidates in their two years of advanced secondary education.

The analysis presented in this report is intended to contribute towards understanding some of the reasons for the candidates' good performance. The reasons include sufficient knowledge of the content in the topics tested, and correct interpretation of the questions. Additionally, the report also provides some of the reasons for a few candidates who scored low marks. The reasons include insufficient knowledge of computer basics and misinterpretation of the questions.

The feedback provided in this report will enable our education administrators, school managers, teachers, and the candidates to identify measures to be taken in order to improve the candidates' performance in future examinations in Computer Science.



Dr Charles E. Msonde
EXECUTIVE SECRETARY

1.0 INTRODUCTION

This report presents an evaluation of the candidates' performance in the 2019 Computer Science Examination. This examination assessed the competences and knowledge acquired by the candidates in accordance with the 2011 Examination Format.

The examination had two papers: Computer Science 1 (Theory), and Computer Science 2 (Practical). The theory paper had two (2) sections, A and B. Section A consisted of ten (10) compulsory questions each assigned 6 marks. Section B had three (3) optional questions with 20 marks each. Out of the three (3), the candidates were required to attempt two (2) questions. Furthermore, the practical paper had three (3) questions each weighing 25 marks. The candidates were required to attempt two (2) questions including question one.

In 2019 there were 36 candidates who sat for the Computer Science Examination. Out of these candidates, 94.29 percent passed the examination, and 5.71 percent failed. In 2018, there were 28 candidates who sat for the Computer Science Examinations of which 92.86 percent passed, and 7.14 percent failed. This means that the performance has improved by 1.43 percent.

This report provides feedback to stakeholders on the candidates' performance. It shows the candidates' strengths and weaknesses in answering the examination questions. In the analyses, the candidates' performance in each question or topic is regarded as good, average or poor if the percentage of candidates who scored 60-100, 35-59 and 0-34 respectively is 35 or more. In addition, the candidates' performance is presented in charts or tables using colours whereby the red colour stands for poor performance, yellow colour for average, and green colour for good performance.

The analysis of the candidates' performance is done by showing the requirements of the questions and the candidate's response. In poor responses, the report describes the mistakes they made while attempting the questions. Furthermore, the extracts for both correct and incorrect responses are included for illustration purposes. Finally, conclusion and recommendations are provided.

2.0 ANALYSIS OF CANDIDATES' PERFORMANCE IN EACH QUESTION IN PAPER 1

2.1 PAPER 1: THEORY

2.1.1 Question 1: System Development

The candidates were required to;

- (a) Mention six phases of system development life cycle.
- (b) Explain the importance of a feasibility study in system development.

A total of 35 candidates attempted this question, out of whom 11.4 percent scored from 0 to 2.0 marks, 37.2 percent scored from 2.5 to 3.5 and 51.4 percent scored from 4.0 to 6.0. The performance of the candidates in this question was good as 88.6 percent scored above 2.0 marks. The performance of candidates in this question is summarized in Table 1.

Table 1: Performance of Candidates in Question 1

Scores	Candidates' Percentage
0.0 – 2.0	11.4
2.5 – 3.5	37.2
4.0 – 6.0	51.4

In this question, most of the candidates (51.4%) had good performance since they scored from 4.0 to 6.0 marks. In part (a) they were able to list the six phases of system development life cycle correctly in an appropriate order. According to the requirements of the question the six phases are problem definition, system specification, system design, system coding, system implementation and system maintenance. However, some candidates combined two phases, problem definition and information gathering into one phase.

In part (b), there were few candidates who explained clearly how feasibility studies are useful in development system life cycle. These candidates were able to clarify the challenges faced by a particular system and emphasize how the intended system would resolve the impending problems. However, some candidates described the importance of feasibility studies by considering cost and time frames only. Further analysis shows that, there were some candidates who answered correctly this part as they had sufficient knowledge of the phases of system development and the importance of feasibility study. Extract 1.1 is a sample of a correct response provided by one of the candidates.

Extract 1.1: A Sample of Correct Responses from one of Candidates

1	(a) Six (6) phases of a system development life cycle:
	- Problem recognition and definition.
	- Information gathering.
	- Requirements specification.
	- System design.
	- System construction (coding).
	- System documentation.
	- System review and maintenance.
	(b) Importance of feasibility study:
	- In feasibility study, we establish the costs involving for the changing of a system from old to new which influence to implements the whole requirements for the developed new system.

Candidates who scored average marks, that is 2.5 to 3.5, were able to list two to three phases correctly. In addition, some of these candidates did not explain how a feasibility study is useful, or even point out problems with the current system, and suggest how a new system could resolve them. This implies that, these candidates had insufficient knowledge of the importance of feasibility study in system development.

Further analysis of the data shows that, there were different reasons that led candidates to score low marks (0 to 2.0). In part (a), some candidates did not understand the demands of the question. For example, one candidate wrote, “input, processing, storage and output” as phases of system development life cycle. This candidate mentioned the stages of data processing by the computer instead of correct phases of system development life cycle.

Likewise, in part (b) some candidates explained the importance of feasibility study by describing the constraint of cost as the only problem to be addressed. This suggests that, the candidates had inadequate knowledge of the activities done during feasibility study. Moreover, they didn’t have knowledge of how feasibility study enlightens the real dimension to the problem to be solved and provides a way of a solution to the problem by giving the required steps. Extract 1.2 shows an example of a poor response provided by one of the candidates.

Extract 1.2: A Sample of Poor Solutions from one of Candidates

SECTION A.	
1	a)- Reports on fact finding.
	- Requirements specification.
	- System and module flow chart.
	- Table / file description.
	- Sample output test data.
	- Output report
	b) Importance of feasibility study in system development is that, it help in enter is the study that help in establishing Cost and benefits of the new system.

2.1.2 Question 2: Data Communication and Networking

In this question, the candidates were required to describe three limitations of computer networking.

The question was attempted by 34 candidates, out of whom 5 (14.7%) candidates scored from 0 to 2.0 marks. Furthermore, the analysis shows that 8 (23.5%) candidates scored from 2.5 to 3.5 marks, while 21 (61.8%) candidates scored from 4.0 to 6.0. The candidates' performance in this question was good as 85.3 percent of the candidates scored above 2.0 marks. Figure 1 shows a summary of the candidates' performance.

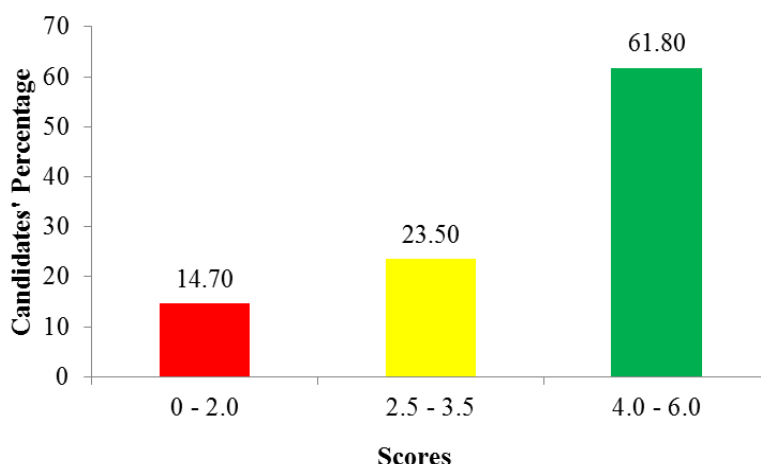


Figure 1: Candidates' performance in question 2.

In this question most of the candidates, that is 61.8 percent, scored high marks (4.0 to 6.0). In addition, there were two (2) candidates who scored full marks as they listed and described correctly three limitations of computer networking. For example, one candidate wrote;

The cost of installation is high: The network components are expensive for example the computers, printers, and cables are sold in high price hence a lot of money are required to create computer network.

These candidates had adequate knowledge of the limitations of computer networking. For example, a candidate wrote; “It is expensive: Some of the computer networks are expensive”. Extract 2.1 shows a sample of a good response.

Extract 2.1: A Sample of Good Responses in Question 2

2.	Data that is held on a computer
	connected to the internet is more prone to
	security threats such as unauthorized access,
	alterations, sabotage, hacking and others.
	High initial cost of setting
	up the network means a person incur
	expenses.
	Computer network has facilitated
	spread of terrorism and drug trafficking.
	because people easily communicate. Also has led to
	moral decay as people become exposed to
	obscene or derogatory language.

Some of the candidates who scored average marks, that is 2.5 to 3.5, mentioned correctly the limitations of computer networking and could not provide correct descriptions. For example, one candidate described, “Security issues is the data and information on the network lead to be in dangerous of affected by unauthorized access that can copy of change the information”. Instead, the candidate was supposed to explain that security issues can limit computer networking through illegal access of information, due to the fact that it is easy to access information on

a computer connected to the network as compared to stand alone computers. This implies that the candidate had inadequate knowledge on how security issues can limit computer networking. Likewise, some candidates provided incorrect limitations and explanations on some of limitations of computer networking, for example a candidate wrote: “The usage: User of computer network spend more time on the network which reduce their time to work in productive activities”. This suggests that the candidate lacked appropriate knowledge on limitations of computer networking.

On another note, few candidates scored low marks (0 to 2.0) with one candidate scoring a zero. Some of these candidates mentioned three limitations of networking without explaining them. It was observed that some of them mentioned one limitation but with incorrect explanations. In addition, others wrote only two limitations without clear explanations. For example, one of the candidates wrote the following computer network limitations;

- Security: Computer networking isn't guaranteed secure since any one can hack and use the network wires we use strong security software; and
- Access: Computer network can be accessed by the people who are unauthorized for that particular network; if you don't have access you can't use it.

This implies that the candidates had inadequate knowledge on Data Communication and Networking. Extract 2.2 shows a sample of such poor responses.

Extract 2.2: A Sample of Incorrect Answers from One of Candidates

2	Limitations of computer Network.
	- Computer network can only be established when there is a combination of different components i.e One component such as one phone or one computer cannot establish a network on its own rather with other devices
	- Computer Network can only be established when there is a means of communication or transmission i.e wires or wireless transmission
	- Computer Networks work on a certain range according to type of connectivity meaning it cannot be used to connect through devices at a wider range than specified.

2.1.3 Question 3: Information System

This question had three parts, (a), (b) and (c). The question asked:

- (a) What is an entity relationship (E-R) diagram?
- (b) Differentiate a primary key from a foreign key.
- (c) Explain three tools used to automate database in MS Access.

The question was attempted by 35 candidates, out of whom, 31 (88.6%) candidates scored from 0 to 2.0 marks. Furthermore, the analysis shows that 4 (11.4%) candidates scored from 2.5 to 3.5 marks, while there was no candidate who scored above 3.5 marks. The performance in this question was poor since only 11.4 percent of the candidates scored above 2.0 marks. Table 2 is a summary of candidates' performance.

Table 2: The Performance of Candidates in Question 3

Scores	Candidates' Percentage
0.0 – 2.0	88.6
2.5 – 3.5	11.4
4.0 – 6.0	0

In part (a) some of the candidates (11.4%) wrote that, the E-R diagram is just a relationship between data entities and their respective attributes. They did not understand that an E-R diagram indicates logical relationship between entities. For example, one candidate wrote, "Entity-Relationship diagram is the special pictorial diagram that is used to show the relationship of arrangement of field and data in the database relation". These responses indicate that candidates had insufficient knowledge of E-R diagrams.

On the other hand, there were some candidates who managed to differentiate a primary key from a foreign key by defining them as required in part (b). For instance, one candidate wrote, "A primary key is the key that uniquely identifies a record in a table while a foreign key is the record in a table whose primary key is found in another table". This response signifies that this candidate had adequate knowledge of primary and foreign keys.

Further analysis shows that the candidates did not explain the tools that are specifically used to automate database in MS Access in part (c). They explained features like primary key, sort and filter, macros, visual basic for application module and properties description window used in creating database tables. Extract 3.1 shows a sample of such incorrect response.

Extract: 3.1: A Sample of an Incorrect Responses in Question 3

(3)	
a)	Entity relationship diagrams are diagrams which are used to show the how entities in a relation interact.
b)	Primary key is a column whose records uniquely identify the row while foreign key is column whose primary is found in another table.
c)	<u>- Forms</u> Are used to fill the information concerning the records in the database.
	<u>- Reports -</u> Shows the report of records in the database.
	<u>- Queries</u> Allows searching/sorting Allows searching, updation, deletion etc of information in the database.

2.1.4 Question 4: Computer Basics

This question had three parts, (a), (b), and (c). The candidates were required to:

- outline four procedures for generating a table of contents in a word document;
- distinguish buffer memory from cache memory; and
- describe one function of the two microcomputer application softwares in health information processing and management.

This question was attempted by 33 candidates. Out of whom 5 (63.6%) scored from 0 to 2.0 marks, 12 (33.4%) candidates scored from 2.5 to 3.5 marks while 1(3%) scored from 4.0 to 6.0 marks. Therefore, the performance of candidates in this question was average as 36.4 percent scored above 2.0 marks. Figure 2 illustrates candidates' performance in this question.

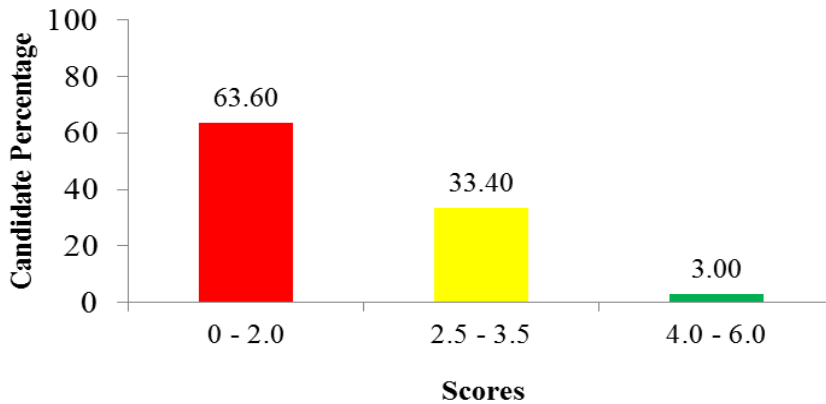


Figure 2: *Candidates' performance in question 4.*

The candidates who scored low marks (0 to 2.0), outlined correctly the first two procedures out of four for generating a table of contents in a word document in part (a), and some provided irrelevant answers. For example, one candidate wrote, “open Microsoft Word, click on Insert menu, select number of columns and rows, then click on Ok button”. This shows that, the candidate’s response was based on inserting a table in a word document instead of generating a table of content. These candidates lacked knowledge of the use of advanced features of Microsoft Word. A table of content may be generated through the following steps:

Mark entries by defining styles, press the cursor on the page where the table of content is to be placed, insert menu, point to reference then click index and table, click the table of content tab, set the table of content properties, then click ok.

In part (b), the candidates had the knowledge of the usefulness of buffer memory but could not explain its specific function in the input/output devices. Also, the candidates were unable to explain the function of cache memory as enhanced by RAM. For instance, one candidate wrote, “buffer memory is a type of memory found in the input/output devices while cache memory is stored in different devices”, instead of writing; buffer is a special memory found in input/output devices used to hold data temporarily when it is being moved from one place to another while Cache is a temporary storage where the frequently accessed data and instructions can be stored for quick access.

Moreover, in part (c) some candidates wrote one correct function of microcomputer application software in health information processing and management, and were not able to identify the appropriate application software as per question demand. For example, one candidate wrote, “Helps in preparing

patient files by entering their records” instead of writing, “Database is used in keeping medical records, patient records and billing information”. These candidates had general knowledge on the functions of the application software but could not identify specifically the name of particular application software and its function. Extract 4.1 is a sample of such poor responses.

Extract 4.1: A Response of a Candidate who was Unable to Distinguish Buffer Memory from Cache Memory in Part (b)

4. b). Buffer memory is the memory that
are mounted inside the processor while
Cache memory are the memory that
are mounted on the output devices.

For the candidates who scored average marks, that is 2.5 to 3.5, in part (a), some were unable to write correctly all the procedures. For example, one candidate wrote: “open Microsoft Word, from the menu bar select (click) insert table, then table of content and reference, select the table of content”. This indicates that the candidates had adequate knowledge of inserting the table of content but they gave incomplete procedures. Moreover, in part (b), few candidates were able to distinguish correctly buffer memory and cache memory, for example, one candidate wrote,

Buffer memory is a type of memory found in the peripheral devices (input/output) used to temporarily hold data while cache memory is used to enhance the processing speed by holding data and instructions that are instantly required by the processor.

However, in part (c) the candidates mentioned only one function of microcomputer application software. For example, one candidate wrote: “Microsoft Access is used for recording patient’s health information and diagnosis as well as controlling the stock of drugs and hospital equipment” instead of describing two microcomputer application software and giving one function for each microcomputer application software. This indicates that, the candidates had knowledge on computer basics but could not understand the requirement of the question.

In addition, only one candidate scored 5 out of 6 marks. The candidate outlined the procedures for generating a table of contents in a word document and distinguished buffer memory from cache memory correctly. Also, the candidate described correctly one function of the two microcomputer applications software in health

information processing and management. This indicates that the candidate had adequate knowledge of computer basics.

2.1.5 Question 5: Problem Solving and C++ Programming

In this question the candidates were required to read the following algorithm steps and answer the questions that follow:

Step 1: Start the program.

Step 2: Set the loop up to the size of an array. Then, use the loop to enter the marks of 10 candidates and calculate the sum of elements stored in an array.

Step 3: Calculate the average.

Step 4: Print the sum and average of the marks.

Step 5: Stop.

(a) Draw a flow chart to represent the algorithm above.

(b) Write C++ statements for step 2 and 3.

The analysis shows that this question was attempted by 35 candidates, of which 54.3 percent scored 0 to 2.0 marks, 25.7 percent scored from 2.5 to 3.5 marks and 20 percent scored 4.0 to 6.0. The performance of candidates in this question was average because 45.7 percent of candidates scored above 2.0 marks. Figure 3 presents a summary of the candidates' performance in this question.

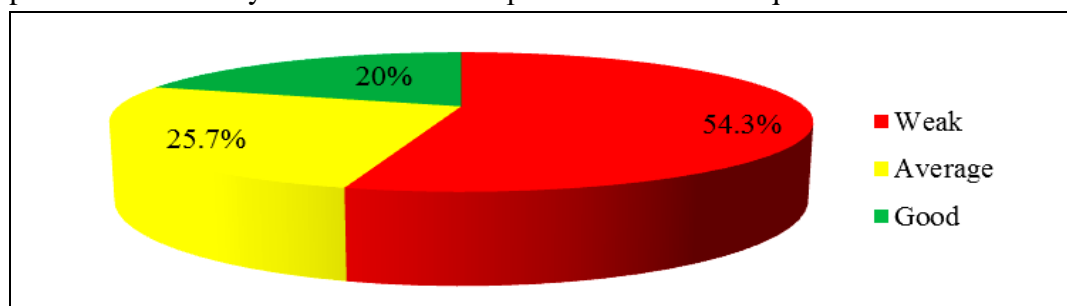


Figure 3: Candidates' performance in question 5.

Most of the candidates who scored low marks drew incorrect flowchart. They also could not write corresponding C++ statements. Some of these candidates had an idea of flowchart symbols and C++ programming, but did not understand the requirements of the question. For example, in part (a), one of the candidates wrote: "is n=5?" in a decision making symbol instead of "is n<10?". In part (b), candidates did not manage to write proper formula for cumulative sum inside the loop. Furthermore, others were able to write the correct formula for average marks but placed it outside the loop. The candidates also could not use correctly the flowchart symbols. This shows that, most candidates lacked problem solving skills

and knowledge on looping and arrays. For example, one of the candidates wrote the following C++ statements:

```
int marks[10]= a, b, c, d, e, f, g, h, i, j, k;
for (int i=1; i< marks[10]; i++s)
{sum+=i;
Average=sum/10
}
```

These responses indicate that the candidates had inadequate knowledge of flowcharts, algorithm and C++ programming. Extract 5.1 is an example of the incorrect response from one of the candidates.

Extract 5.1: A Sample of Incorrect Answers in Question 5

5 a)

```
graph TD
    Start([start]) --> Input[/a, b, c, d, e  
f, g, h, i, j/]
    Input --> Process[Sum = a + b + c + d + e + f + g + h + i + j  
Avg = Sum / 10]
    Process --> Output[/Sum, Avg/]
    Output --> Stop([stop])
```

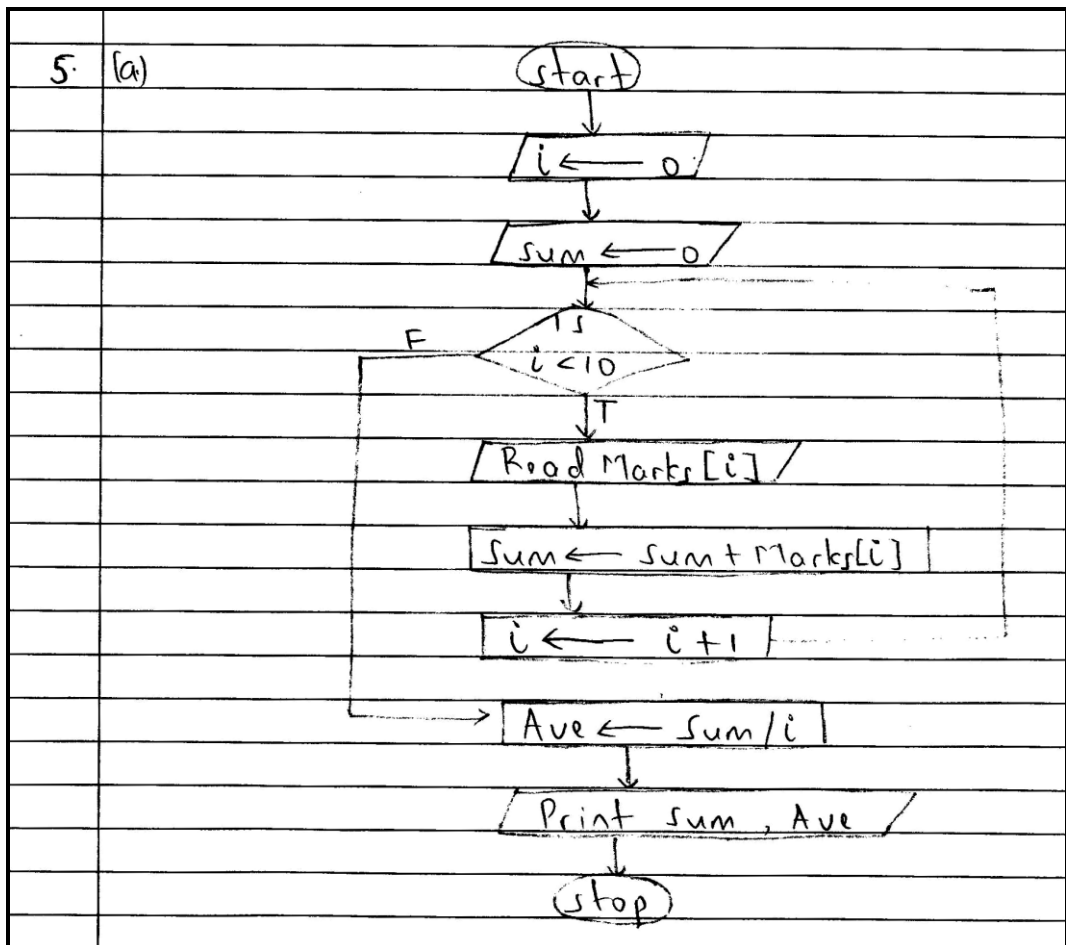
b)

```
for (int i = 1 ; i <= 10 ; i++)
{
    sum += i ;
}
avg = sum / 10 ;
```

Furthermore, some of the candidates who scored average marks (2.5 to 3.5) were able to draw correctly the flowchart and write C++ statements. These candidates skipped some of the steps and statements. However, some of the candidates combined summation and average formula in the same process symbol. Moreover, others wrote incorrect formula for summation and average in a correct flowchart process symbol.

Nevertheless, few candidates (20%) scored from 4.0 to 6.0 marks as they drew correctly the flowchart with all looping concepts and arrays, but could not draw some steps. Additionally, most of these candidates were able to write C++ statements for step 2 and step 3 correctly. A sample of a correct response is shown in Extract 5.2.

Extract 5.2: A Sample of Correct Responses in Question 5



5.	(b)	int i, Marks[], Sum=0, Ave;
		for (i=1; i<=10; i++)
		{cout << "Enter marks";
		cin >> Marks[i];
		sum = sum + Marks[i]; }
		Ave = sum/i;

2.1.6 Question 6: Data Representation

In this question the candidates were asked to:

- use circuit diagram to explain how half adder operates.
- show that $(A + \bar{B} + \bar{C})(A + \bar{B}C) = A + \bar{B}C$.

The analysis of data shows that 34 candidates attempted this question, out of whom 11.8 percent scored from 0 to 2.0 marks, 64.7 percent scored from 2.5 to 3.5 marks while 23.5 percent scored from 4.0 to 6.0 marks. This suggests that the performance of candidates in this question was good as 88.2 percent scored above 2.0 marks. The summary of the candidates' performance is shown in Figure 4.

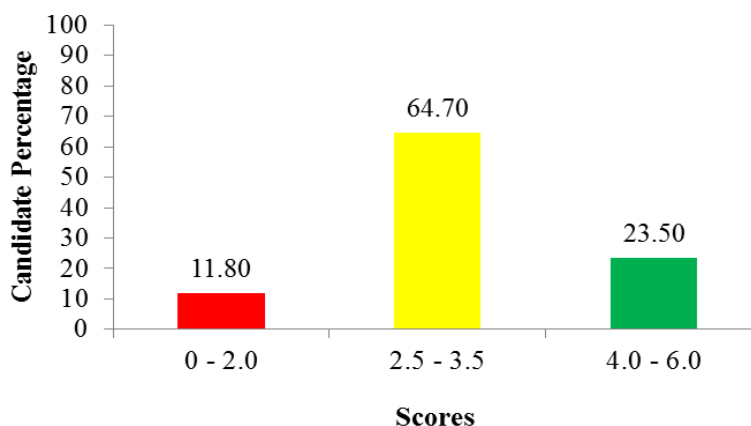


Figure 4: Candidates' performance in question 6.

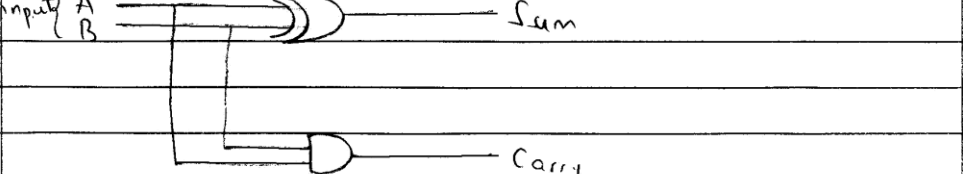
The analysis shows that, majority of the candidates scored average marks (2.5 to 3.5). They were able to use circuit diagram to explain how the half adder operates in part (a) only. Despite the fact that candidates explained how half adder operates, they could not state which logical gates are used in half adder operations. For example, one candidate wrote, "Half adder operates by adding two binary digits and produces sum and carry as output". Others managed to apply the laws and

rules used in manipulating Boolean expression but did not describe all steps which were required.

Furthermore, few candidates who scored low marks (0-2.0) attempted either part (a) or (b) only in this question. Those who selected part (a) only managed to draw an AND and Exclusive OR gates which are used in half adder operations. They were incompetent in describing how half adder operates. Additionally, the candidates who attempted part (b) only, lacked mathematical skills and techniques in solving the Boolean algebraic expression.

On the other hand, the candidates who scored high marks (4.0 to 6.0) in this question were able to explain clearly how half adder operates as required in part (a). They also wrote how this logic gate circuit performs binary addition of two binary inputs, using an exclusive OR gate and AND gate to give output SUM and CARRY respectively. Also, they drew a circuit diagram clearly. In addition, candidates had adequate knowledge and skills in mathematical computations in applying the basic laws and rules governing Boolean algebra as required in part (b). Extract 6.1 is a sample of a correct response.

Extract 6.1: A Sample of Correct Responses in Question 6

6.	(a) Half adder performs binary addition
	of numbers (two bits)
	It combines exclusive OR gate and AND
	gate
	It takes two inputs to give
	two outputs, (a sum and a carry).
	
	Circuit diagram for half-adder.

6.	(b) consider the left hand side
	$= (A + \bar{B} + \bar{C})(A + \bar{B}C)$
	$= AA + A\bar{B} + A\bar{C} + A\bar{B}C + \bar{B}\bar{B}C + \bar{B}C\bar{C}$ - distributive
	$= A + A\bar{B} + A\bar{C} + A\bar{B}C + \bar{B}C + \bar{B}C\bar{C}$ - AND law
	$= A + A\bar{B} + A\bar{C} + A\bar{B}C + \bar{B}C + 0$ - $xx' = 0$ law
	$= A(1 + \bar{B} + \bar{C} + \bar{B}C) + \bar{B}C$ - associative law
	$= A(1) + \bar{B}C$ - OR law
	$= A + \bar{B}C$ - OR law
	Hence shown.

2.1.7 Question 7: Visual Programming

The question required the candidates to:

- explain local variables and static variables as used in Visual Basic program;
- write an example of an event procedure for a Command Button that counts and displays the number of clicks made; and
- show how an empty Visual Basic form can be opened giving four steps.

The analysis shows that this question was attempted by 34 candidates, out of whom 76.5 percent scored 0 to 2.0 marks, 8.8 percent scored from 2.5 to 3.5 marks and 14.7 percent scored 4.0 to 6.0 out of 6.0 marks. The performance of candidates in this question was poor since only 23.5 percent of candidates scored above 2.0 marks. Figure 5 presents the summary of the performance.

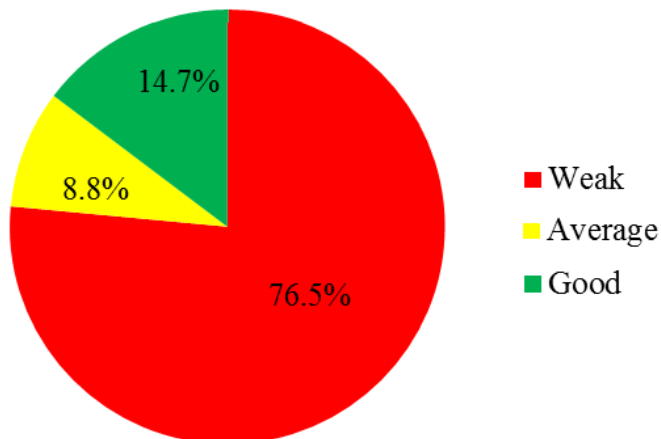


Figure 5: Candidates' performance in question 7.

Most of the candidates who scored low marks in this question could not explain clearly part (a). Some of them managed to explain local variables but could not provide correct explanations for static variables as used in the visual program. Some candidates did not give correct explanation. For example, one of the candidates wrote, “local variable is the variable which declared on the body area and work for only body apart”. Furthermore, the candidate wrote, “static variable is the variable which is declared on the top before the body and work for a fulfill control page”, instead of writing, local variable is one that is declared inside a procedure and exists as long as the procedure in which they are declared is executing; and static variables are not re-initialized each time the visual basic invokes a procedure, and thus retains or preserves value even when the procedure ends.

In addition, these candidates were not able to write an example of an event procedure for a command button that counts and displays the number of clicks made. For example, one of the candidates wrote, “<input type=“button” onclick = “count number ()”>” which is not related to the visual basic program at all. Others wrote only few lines of codes correctly. Likewise, most candidates were not able to write the steps of opening visual basic form. They mentioned the steps but the order was from opening visual basic application and not after opening the visual basic window. This caused most of the candidates to score low marks in this question. Furthermore, they wrote inappropriate responses. For instance, one candidate wrote, “When open empty visual basic start to click all programs, then search the Audio Visual Basic then click it, then choose the standard, ex then click, this form is opened”. This shows that, these candidates had inadequate knowledge of visual programming. Extract 7.1 shows a sample of incorrect responses.

Extract 7.1: A Sample of Incorrect Responses in Question 7

7b	Form Command1.Caption = msg (Option1.opt) or Command1.Caption = msg (Text1.text). or Command1.Caption = msg (label1.Caption) or Command1.Caption = InputBox (Option1.opt = "true")
7c	→ from the given file of the form of VB click it → after it opening, click standard exe.

	→ Then from the form menubar click the new form which you want by double clicking it.
	→ Then the message will be done, click yes or no, then the form will opened.
7a-	local variable are those variable which are declared at the top of vb coding. place before enter into the body.

On the other hand, few candidates scored average marks from 2.5 to 3.5 marks. These candidates explained correctly the meaning of local variables and static variables in visual basic program, but they did not write correctly an example of event procedure. Furthermore, they could not declare the counting variable; initialize counter; and used wrong output statements such as “msgbox” instead of statements like “print” and “output”. Others declared variables but not the type of event in the private sub. This shows that the candidates had insufficient knowledge of Visual Programming. For example, one of the candidates wrote the following codes;

```
Private sub_command1
    dim count, dim x;
    count=x+1;
    count=msgbox (“number of clicks are” count)
End sub.
```

In part (c), most candidates wrote less than 4 steps while others repeated the steps to open an empty visual basic form. For example, one of the candidates wrote, “(i) open your visual basic program, (ii) the dialog box will appear which have different options, (iii) select the standard exe form (iv), then your form will appear”.

The candidates who scored high marks (4.0 to 6.0) were able to explain correctly the meaning of local variables and static variables in the visual basic program. Furthermore, they managed to write an example of an event procedure for a command button that counts and displays the number of clicks made. However, the candidates could not score full marks in this part because they could not declare correctly the variables. They managed to initialize a counter and display count. Additionally, they could not score full marks in part (c) because they failed to write all steps of opening visual basic form as required. Extract 7.2 is a sample of good responses provided by one of the candidates.

Extract 7.2: A Sample of Good Responses in Question 7

7	(a) Local variables are the variables defined inside a function and can only be used inside that particular subfunction only while
	Static variables are the variables which are declared outside subfunction and can be used by any function in the program.
	(b) Dim i As Integer
	Dim count As Integer
	i = 0
	count = 0
	Button1_On Mouse Click () {
	count = count + 1;
	text1.text = "Number of clicks are : " + count
	}

2.1.8 Question 8: IT Environment

In this question the candidates were required to:

- describe three healthy problems experienced by people who work with computers; and
- explain three ways of reducing the health risks when using ICT equipment.

A total of 35 candidates attempted this question, out of whom 11.4 percent scored from 0 to 2.0 marks, 17.2 percent of the candidates scored from 2.5 to 3.5, and 71.4 scored from 4.0 to 6.0 marks. The candidates' performance in this question was good as 88.6 percent scored above 2.0 marks. The performance of the candidates in this question is summarized in Table 3.

Table 3: Candidates' Performance in Question 8

Scores	Candidates' Percentage
0.0 – 2.0	11.4
2.5 – 3.5	17.2
4.0 – 6.0	71.4

In this question, most of the candidates (71.4%) scored high marks (4.0 to 6.0). These candidates described correctly two to three problems which people experience when using ICT. The problems described by some candidates were eye strain, headache, and repetitive strain injury. However, some of them described only two correct problems. In part (b), most candidates were able to describe correctly three ways used to reduce health risks, like the use of antiglare screen, sitting up straight, using ergonomic chair, using wrist rest, and taking regular breaks. However, some candidates outlined the correct ways but did not describe them. Extract 8.1 is an example of a good response provided by one of the candidates.

Extract 8.1: Health Risks and Ways to Prevent them When Using ICT Equipment.

8	<p>a) Healthy problems experienced by people who work with computers are:</p>
	<p>i) Eye problems; this results due to prolonged view of output devices example monitor, screen whose emitted light damage the eye and causes eyesight problems.</p>
	<p>ii) Back ache; this is from incorrect sitting posture when using computer devices, the back is strained and starts to ache.</p>
	<p>iii) Repetitive strain injuries; this injuries occur on repeated use of computer devices example continuous typing can cause pain and injury in the neck, and wrists.</p>
	<p>b) One ways of reducing health risks are;</p>
	<p>i) Use of proper equipments; proper eqm for those performing specific tasks example typers should be give keyboards that facilitate typing easily.</p>
	<p>ii) Regulated use of computers. The computers should be used at an interval to allow time of relaxation and exercise.</p>
	<p>iii) Correct posture when using computer equipments, they should sit upright and not on bending chairs and the arms with wrists should be positioned accurately. This reduces RSI problems to the users.</p>

Candidates who scored average marks (2.5 to 3.5) listed three health risks correctly in part (a), and in part (b) they were also able to list three correct ways of reducing the health risks, but these candidates did not describe them in both parts. Moreover, some candidates described correctly the ways of reducing health risks in part (a) but in part (b) they did not describe the correct ways to reduce health risks. For example, one of the candidates described the applications of ICT in health industry by writing, *ICT equipment's helps to support life of patient; and television and projector are used for giving knowledge to the society.* This implies that, some candidates had insufficient knowledge on health hazards associated with the use of information technology. Furthermore, there were some candidates who did not understand the demands of the questions.

Majority of candidates who scored low marks, that is 0 to 2.0, in part (a), provided only one fact which is correct but without describing it. Some candidates wrote health problems which are not associated with the use of ICT equipment. For example, one candidate wrote heart failure and psychological illness. Moreover, some candidates misunderstood the demand of the question as they described the effects of improper disposal of electronic waste. For example, one candidate wrote global warming and respiratory diseases instead of writing eye strain, headache, stress, backache, or joint ache, and repetitive strain injury.

Furthermore, in part (b), most candidates listed one way of reducing health risks without describing it. Some candidates listed ways which are not correct to be used for reducing the risks when using ICT equipment. They listed physical exercise and meditation as ways of reducing health risks to ICT equipment users which is incorrect. This shows that some candidates were not aware of the ways to reduce health risks arising from using ICT equipment. Extract 8.2 is a poor response provided by one of the candidates.

Extract 8.2: A Sample of Incorrect Responses in Question 8.

8	a) Three healthy problem:
	i) Eye and headache. This occur when the user use
	that use the computer improper uses and use
	without used any thing that help to detect
	ii) Stress injury. This occur when user that use
	the computer for long time without to change

position example! their injury is nucleus block shock.
ii) Shoulder and all body damage: Example (maximum you response) that all the time the people to use of computer without limit.
b) Three ways of reducing the health risk when ICT equipment.
i) To use the way of re-engineer! The devices that create again from this material and then use again
ii) To remove the ϕ material in far of human life: For example to remove from the used to another that people is not life.
iii) Re-cycle the material in special section and to store this material.

2.1.9 Question 9: Computer Security and Privacy

In this question the candidates were required to:

- explain what is meant by the term data backup;
- mention six steps of troubleshooting process; and
- differentiate open ended questions from closed ended questions as applied in troubleshooting.

The number of candidates who attempted this question was 35, out of whom 88.6 percent scored from 0 to 2.0 marks, and 11.4 scored from 2.5 to 3.5 marks out of 6.0 marks. In addition, there was no candidate who scored above 3.5 marks. Therefore, the candidates' performance in this question was poor. Table 4 presents a summary to the candidates' performance in this question.

Table 4: Candidates' Performance in Question 9

Scores	Percentage of Candidates
0.0 – 2.0	88.6
2.5 – 3.5	11.4
4.0 – 6.0	0

In this question, most of the candidates who scored low marks (0 to 2.0), gave correct meaning of data backup in part (a). For example, one candidate wrote:

“Data backup is the process of creating one or more copies of a data that would be used in case the original data is lost or become unusable”. Further analysis shows that, most candidates lacked knowledge in data backup. For example, one candidate wrote: “Data Backup is the file that is developed in the computer in order to prevent loss of data in the computer”. Another candidate wrote, “Data backup: Is the process of recovering of a data in order for the future use” instead of defining data backup as a copy of the data on a computer hard drive that is stored in another storage device or in cloud storage. Furthermore, these candidates were unable to mention the six steps of troubleshooting process in part (b). Furthermore, they failed to differentiate open ended questions from closed ended questions as applied in troubleshooting in part (c). The analysis shows that, these candidates had inadequate knowledge of computer security and privacy. An example of a poor response is shown in Extract 9.1.

Extract 9.1: A Sample of Incorrect Responses in Question 9

9. (a)	Is the process of making a separate copy of data online or on a storage device in case of data loss or computer crash.
9. (b)	check to see that all there is electricity supply and that the power plug is switched on. check to see that all wires are connected and there is no loose connection. check to see that all the peripherals are connected to the computer such as mouse, keyboard, motherboard. Restart your computer after switching it off.

	Restart your computer after switching it off.
	check that every device is functional and there is no device which has malfunctioned.
	Isolate the problem to see whether the problem comes from software issues or hardware issues. For software you can use troubleshooter program.
9. (c)	Open ended questions are not specific in what the actual problem is, they try to solve all general problems.
	Closed ended questions are specific in what is actually the problem and how to solve that particular problem.

On the other hand, only a few candidates scored average marks (2.5 to 3.5). These candidates gave correct meaning of data backup in part (a), but failed to give correct steps of troubleshooting process in part (b). Moreover, these candidates differentiated correctly the open ended questions from closed ended questions as applied in troubleshooting in part (c). For example, one candidate wrote,

Open ended questions do not limit the respondent in giving information from what he/she knows about the problem while closed ended questions limit the respondents in giving information from what he/she knows about the problem.

In part (b), the candidates wrote general steps of examining the computer for use such as checking the connection of cables to the computer, switching on the computer, and loading the software to a stage where a computer is ready for use. This shows that, the candidates had insufficient knowledge of troubleshooting process which involves the following steps: identification of the problem, establishment of a theory of probable cause, testing the theory to determine the cause, establishment of a plan of action to resolve the problem, implementation of the solution, verification of full system functionality and implementation of the preventive measures needed and documentation of outcomes.

2.1.10 Question 10: C++ Programming; and Data structure and algorithm

This question had three parts; (a), (b) and (c). The candidates were required to read the following codes and answer the questions that follow:

```
int a[5] = {2, 5, 4, 1, 3}, i, k;
int x;
for (i=0; i<4; i++)
{
for (k=1+i; k<5; k++)
{
if (a [ i ] < a [ k ])
{
x = a[ i ];
a[ i ] = a[ k ];
a[ k ] = temp;
}
}
}
}
```

- How many elements are included in the array “a”?
- What type of sorting algorithm is implemented on the codes above?
- In which order will the array “a” be sorted?
- Which variable will be used as temporary in the codes above? Give a reason.
- Write the codes to display the sorted array “a”.

The analysis of data shows that 35 candidates attempted this question, of which 24 (68.6%) scored from 0 to 2.0 marks, and 6 (17.1%) scored from 2.5 to 3.5 marks. Further data analysis shows that only 5 (14.3%) candidates scored from 4.0 to 6.0 marks. Therefore, the candidates’ performance in this question was poor, as 31.4 percent scored above 2.0 marks. The summary of the candidates’ performance is shown in Figure 6.

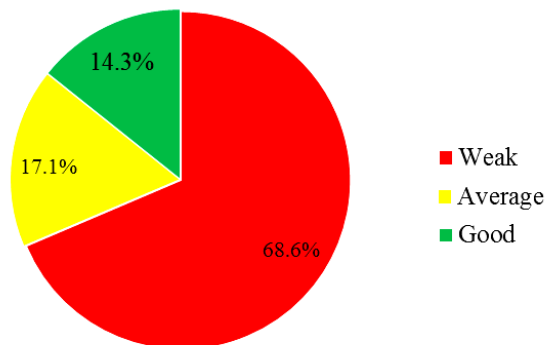


Figure 6: Candidates’ performance in question 10.

The majority of the candidates (68.6%) scored low marks, from 0 to 2.0. The candidates were able to identify the correct number of elements in the given array in part (a) but were not able to write correct answers in other parts. In part (b), some of the candidates managed to identify bubble sort as the type of sorting algorithms, while others wrote incorrect algorithm such as “search” and “quick sorting”. In part (c), most of the candidates wrote “ascending” as the order of sorting array “a” instead of descending. In part (d), the candidates could not identify the temporary variable and wrote, “variable I, n and k” as temporary variables. In part (e) some candidates could not write the correct loop to display the sorted arrays as well as display statement. For example, one of the candidates wrote,

```
for (int j=0; j<4; j++)
    {
        Cout <<x[j];
    }
```

This shows that the candidates had inadequate knowledge of data structure, algorithm and C++ programming concepts. Extract 10.1 demonstrates a sample of incorrect responses.

Extract 10.1: An Example of Incorrect Solutions in Question 10

10	a) 3 elements are included
	b) bubble sort
	c) in ascending order
	d) variable x, i and k
	e)
	Cout << "The sorted array is " << temp << endl;

Some of the candidates who scored average marks from 2.5 to 3.5 were able to answer correctly in part (a) and (b). Furthermore, other candidates managed to identify correctly the sorted order of an array “a” in part (c). Also, they were able

to identify the temporary variable to be used in part (d) but could not provide a correct reason. For example, one of the candidates wrote: “the variable that will be used temporary is x because in this program the value of x is equal to the temporary” instead of writing, variable x is used as a temporary variable during swapping of elements. In part (e), the candidates managed to write a C++ statement to display values but wrote incorrect loop. For example, one of the candidates wrote the following code:

```
for (i=0; i<5; i++)
    { if (a[i]<5)
      { temp= x;
        x=a[i];
        a[i]=temp;
      }
    }
```

Further analysis shows that, few candidates performed well by scoring from 4.0 to 6.0 marks. They were able to identify correctly the total number of elements in a given array; the type of sorting algorithm illustrated and the order the array will be sorted. Some candidates failed to identify the temporary variable that was used for swapping, but managed to write correctly the codes to display the sorted array “a”. For example, one of the candidates wrote the following codes:

```
int n=0;
while(n<5)
{
cout<<a[n];
n++
}
```

These responses show that, the candidates had inadequate knowledge of C++ programming, data structure and algorithm. Extract 10.2 is a sample of incorrect responses.

Extract 10.2: A Sample of Correct Answers to Question 10

10	a, 5 elements are included in array 'a'
	b, Bubble sort algorithm is implemented.
	c, it will be sorted in decreasing order
	d, Variable x, since it holds data temporarily to be swapped in the sorting elements
	e, <pre>for (int i=0; i<5; ++i) { cout << a[i] << " "; }</pre>

2.1.11 Question 11: Website Development

In this question it was given that;

Websites can facilitate communication between manufacturers and consumers. Analyze five advantages and three limitations of a website to manufacturers.

The analysis shows that, the question was attempted by 12 candidates, out of whom 9 (75%) scored between 12.0 and 20.0 marks. Besides, data analysis reveals that 2 (16.5%) candidates scored between 7.0 and 11.5, while 1 (8.5%) candidate scored between 0 to 6.5 marks. The candidates' performance was good because 91.5 percent of the candidates scored above 11.5 marks. Figure 7 is a summary of the performance of the candidates.

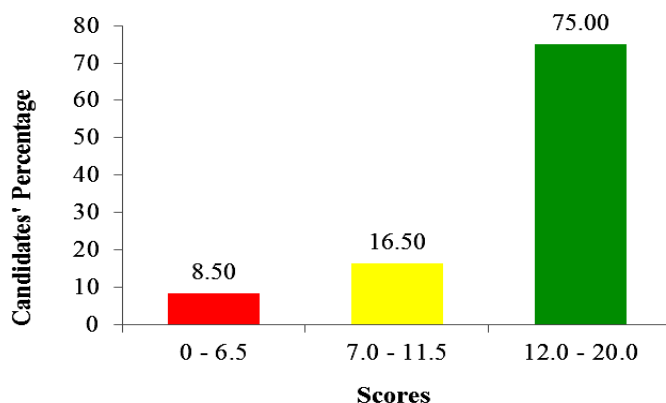


Figure 7: Candidates' performance in question 11.

Further analysis shows that some of the candidates described correctly the advantages of website to manufacturers. They were also able to give the correct introduction and conclusion. However, they could not score full marks because they were unable to analyze all required advantages and limitations in the question. For example, one of the candidates wrote the advantages as follows: “Enable to reach many customers, Ensure faster business, Expand business globally, Reduce cost, motivate manufacturer to produce goods in better quality; Limitations: cause over reliance of website, cause risk of companies”. Likewise, other candidates scored low marks because they explained the advantages and limitations of website to manufacturers but provided incomplete explanations on the introduction and conclusion. This indicates that most of the candidate had clear knowledge about the uses of a website. An example of the correct response is shown in Extract 11.1.

Extract 11.1: A Sample of Correct Answers to Question 11

Q11:	<p>Minimizes cost in seeking feedback from consumers and also in transporting of goods. Before use of website, manufacturers faced a challenge in attaining feedback from consumers since they had to incur cost in conducting interviews, observations and also checking of questionnaires. Also there was a challenge in transport cost to where by due to lack of awareness where one's product one of great demand brought about loss making since a large bulk of products was ^{is} transported to area of low demand. In this case the use of website has helped to minimize cost whereby a manufacturer can receive feedback from the consumer through network without physical movement and also minimization of transport cost since they get to know the ^{the} demands of their products with respect to areas.</p> <p>Provide a wide market to consumer. One of the contributing factor toward growth of market is recognition of the available products or services. Through the recognition people get to know about your products hence increase of more cost</p>
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to know about your products hence increase of more ~~cost~~ customers. Due to ~~advanced~~ advancement in science and technology there have been an increase in number of internet users in the world. In this case use of website enables a manufacturer to reach many people where most of them are ~~to which~~ internet users. This also contributes to provision of wide market due to recognition of manufacturer's product in various areas across the world.

One of the limitation is that the manufacturer can have access to consumers located in areas where network is available. As we all know that website is only applicable or efficient in areas with network, this limits the manufacturer to reach many people as possible. since the only people that he or she can reach is those located in areas where there is network. This hinders to the large extent the development of the manufacturer.

Also the manufacturer can ~~can~~ have access to ~~hence~~ people only. This mainly include those who internet.

Few candidates (16.5%) with an average score, that is 7.0 to 11.5, analysed the advantages of website to manufacturers by writing the advantages with similar meaning. For example "Transfer easily information" and "Provide communication to consumer". Furthermore, one candidate performed poorly by scoring 0.5 mark. This candidate had an idea of website which was explained in introduction part but did not give the advantages and limitations of websites to manufacturers. For example, one candidate wrote: "Reliability, Transformation cost, Quality of manufacture". Also, the candidate gave incorrect explanation in the conclusion part.

2.1.12 Question 12: Data Communication and Networking

In this question the candidates were asked to describe four basic types of physical network topologies with the aid of a diagram, and explain two advantages and two disadvantages of each type.

A total of 32 candidates attempted this question, out of whom 3.1 percent scored from 0 to 6.5 marks, and 21.9 percent scored from 9 to 11.5 marks. Further analysis shows that, 24 (75%) candidates scored from 12 to 20 marks. Therefore,

the performance of candidates in this question was good as 96.9 percent scored above 6.5 marks. The candidates' performance in this question is summarized in Table 5.

Table 5: The Performance of Candidates in Question 12

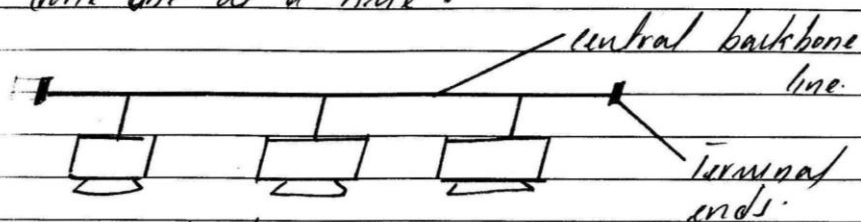
Scores	Candidates' Percentage
0 – 6.5	3.1
7.0– 11.5	21.9
12.0–20.0	75

The analysis shows that, most of the candidates who attempted this question scored above 6.5 marks as they understood the demand of the question and had adequate knowledge on physical network topologies. They explained correctly the types of network topologies. They also correctly drew the diagram and explained the two advantages as well as disadvantages of each physical network topology. Furthermore, the candidates were able to relate the knowledge of physical network topologies with real physical existing objects such as a ring, star, bus and tree structures. Extract 12.1 shows a sample of good responses from one of the candidates.

Extract 12.1: The Response of a Candidate who Provided a Correct Answer to Question 12.

12.	<p>Network topologies refer to how a computer network is arranged either physically for computerized devices (physical topology) or how data is transmitted from one device to another (logical topology). There are few basic types of physical topology and are ring topology, star topology, bus and mesh topology. They refer to how different computer devices are arranged to communicate with each other in a network.</p> <p>The basic types of physical network topology are:</p> <p>Bus network topology. In this</p>
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17 topology, computer devices are connected to a central line or backbone of the network. if a computer wants to send data it broadcasts a message to all computers and the computer with the specified address picks it up, and this is done one at a time.



The advantages of bus topology are; it is cheap to install, since it requires less number of cables compared to mesh topology.

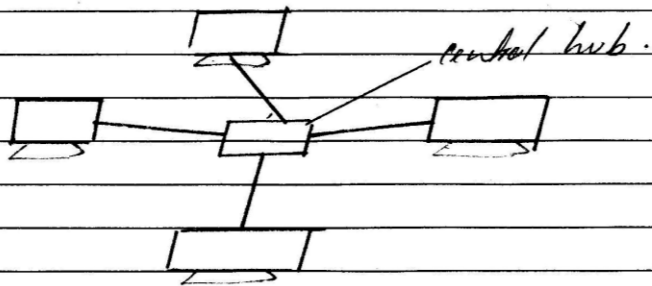
It can be used in small scale networks such as offices, homes and computer labs.

The disadvantages of bus topology are; it has a limited number of devices which can connect, a large number of devices will cause transmission problems.

If the central backbone line fails then the whole network is down or also fails.

Star network topology. This is a network topology where every computer or node is connected to a central hub or device. Every computer device has a secured connection to the hub and messages are broadcasted across the

12. network when transferring data



The advantages of star topology are;
it can be easily expanded by increasing the computer connections to the central hub.

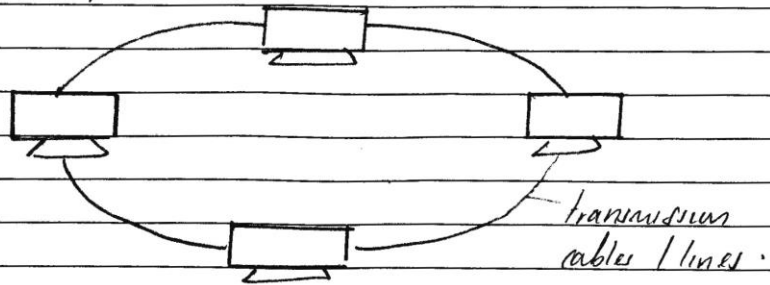
Even if one transmission line fails the computer network will still exist unlike ring topology.

The disadvantages of star topology are;
it is costly. It requires a lot of cables depending on number of computers, to secure connection to the central Hub.

If the central Hub fails then the whole network fails and also is affected by broadcast storms due to transmission of large amount of data simultaneously.

Ring network topology. In this network topology, the computer devices are connected in a circular manner. The data is transferred using ring token, which hold data that is passed from one computer to another the computer with the specified address picks up the token, and the token will be used by another computer for communication.

12.



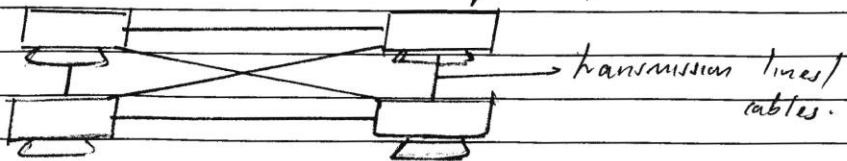
The advantages of ring topology are;
It has no limited number of devices which can connect, using repeaters it can be expanded easily to cover a large area.

Troubleshooting the network to find faults is very easy, as faults can easily be detected.

The disadvantages of ring topology are;
if one transmission line fails then the whole network fails, due to the reliance of connection from one point to another.

If used over a wide area, the efficiency of transmission fails due to attenuation of signals in the transmission lines.

Mesh network topology. This is a network topology which every computer device is connected to another computer device on the network. and it can be half-mesh or full mesh network topology.



The candidates who scored average marks (7.0 to 11.5) explained correctly two to three types of physical network topologies out of four. Some of them explained two advantages and did not explain disadvantages of a particular topology. For example, one candidate wrote, "the advantages of bus topology are; it is easy to

install the cables and computers, it is less cost”, and “the disadvantages are failure of the terminator shut down the whole network, commonly used in both small and wide areas”. This indicates that, the candidate was knowledgeable on the components of bus topology but did not understand the function of a terminator that it is used to avoid signals from bouncing back and forth on the backbone, causing signal distortion.

In addition to that, this candidate did not understand that, the bus topology limits the number of computers that can be connected to the cable. Each computer in this network listens to the cable before it transmits a signal. Furthermore, an increase in the number of computers results in an increased collision as machines compete for transmission. Therefore, it cannot be used in a wide area network.

Moreover, some candidates listed correctly the four network topologies but did not explain them. Others could not distinguish the disadvantages of one physical network topology from another physical network topology. For example, one candidate wrote: “in ring topology failure of a workstation does not affect the operation of the network”. This shows that the candidate understood the types of network topologies but could not differentiate how each of them operates.

2.1.13 Question 13: Computer Security and Privacy

In this question the candidates were asked to:

Describe measures to be taken against unauthorized access and loss of data in a computer. Give four points for each.

This question was attempted by 26 candidates, out of whom 5 (19.2%) scored from 0 to 6.5 marks, 11 (42.3%) scored from 7.0 to 11.5, and 10 (38.5%) scored from 12.0 to 20.0 marks out of the 20 marks allocated for this question. Generally, the performance in this question was good as 80.8 percent of the candidates scored above 6.5 marks. Figure 8 presents a summary of the candidates’ performance in this question.

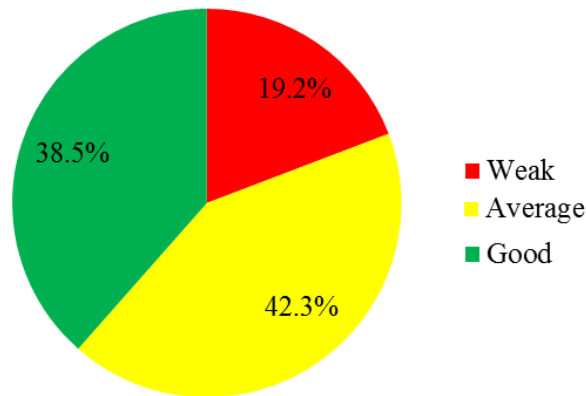


Figure 8: Candidates' performance in question 13.

Most of the candidates who attempted this question scored above 6.5 marks. This analysis shows that the candidates had adequate knowledge on measures taken against unauthorized access and loss of data in a computer. The candidates described correctly four measures. For example, the candidates described the measures such as regular backing up of data, using antivirus, securing computer against theft, use of password and biometric security. Extract 13.1 shows a sample of a good response from one candidate.

Extract 13.1: The Measures to Be Taken against Unauthorized Access and Loss of Data in a Computer

13	<p>Un authorized data access is the process of trying to get access to a data stored in a computer without being permitted by the administrator or owner of the data. In a computer system, loss of data in a computer is the process where data is deleted or destroyed from a computer from either physical or software causes. There are some measures that can be taken to prevent unauthorized access and loss of data in a computer.</p> <p>Encryption of data. This is the process of changing or encoding of data in a format which can not be easily read or interpreted. This will avoid unauthorized data access as only the person with decryption key can access the data.</p> <p>Use of firewalls. A firewall is a software or hardware</p>
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	<p>that forbidden can all restricts all communication forbidden by the security policy in a computer system. This means all communication that are requested by unauthorised people to the network will be restricted.</p>
13	<p>Use of passwords. To prevent any person who may be unauthorised from accessing data, password may be created so as only those authorised people will use their passwords to access the computer system. Hence unauthorised people who won't have access to the data from those computers.</p> <p>Storing computer systems in a safe location. Computer system should not be placed in a place where anyone can have physical access to the computer system. They should be locked in a room and only those who have access to the room so may have access to the data in those computers.</p> <p>Data backup. This is the process of making a copy of data and storing it in a safe location for the purpose of reuse in case of data loss. If it happens data is lost, the backed up data may be re-used and hence data will not be lost entirely.</p> <p>Use of surge protectors and UPS. This is the use of power management devices to control the amount of power entering a computer system. This prevents the physical damage that may occur to the components of the computer system that may be caused by high voltages.</p> <p>Installation of fire alert system in rooms where computer system are being kept. In case of any fire that might be caused accidentally or from any source, an alert may be produced and the fire may be distinguished before it damages the computer systems hence prevent data loss.</p> <p>Use of antivirus. Some cases of data loss may be caused by malicious software that may delete the</p>

data in a computer system. Use of antivirus software
such as Avast, Avira, Kaspersky may help to
ensure that the computer system is malware free
from malicious software such as virus, trojans etc

The responses of candidates who scored average marks (7.0 to 11.5) provided explanations based on one side of the demands of the question. It is based either on unauthorized access or loss of data measures. Other candidates answered the question repeating the same measures several times. Additionally, some of the candidates did not identify the differences between unauthorized access and loss of data. For example, the candidates described the use of antivirus software and scanning of the storage devices as two different measures. This shows that, these candidates had insufficient knowledge of the measures to be taken against unauthorized access to and loss of data.

On the contrary, 19.2 percent of those who attempted the question were unable to give correct responses. Some of the candidates misunderstood the question. It is because they explained elements of information security instead of measures against unauthorized access and loss of data in a computer as per question demands. For instance, one candidate described confidentiality, integrity, and availability, instead of securing computers against theft, regular back up, antimalware, firewall software, use of password, data encryption, biometric security and others. Thus, the candidates lacked knowledge on measures to be taken against unauthorized access to and loss of data. Extract 13.2 is a sample of poor responses.

Extract 13.2: A Sample of Incorrect Answers to Question 13

Computers are used to store the very sensitive
and private data, in order to stop an authorized
access in the computer some measures are to be
taken which are: (a) logical measures:
Putting password: For putting password in the
computer limits an authorized person to access the

data's which are stored in the computer. This is usually done in for the static data's (data's which are not transferred from one computer to another by means of network sharing).

Using firewall: This is the technique in which the data is written in such a way that can be understood by only sender and receiver, many techniques are used here.

Using Bio-electric detectors (signs); example is finger prints, this helps for the great amount to make the security in the access of data in the computer since everyone has its bio-electric signs and hence only the authorized one can access in the computer.

Using security server: This is by making the special server in the computer to detect for any unauthorized one who access of the data and stop it immediately.

b) Physical measures:

Storing computers in a safe place where no one can detect that there is a computer and even if it is detected, there is the complexity to take it by any means e.g., storing in a bag, etc.

136)	By making guard: may be person for any mechanical illegal one or wants to take the computer he can recognise him first before being inside.
	Using fencing by either electrical wires so as to reduce the risk of either being stolen or being taken by any author- ized one.
	Also:
	Since the important data are stored in the computers, the security must be taken in to consideration.

3.0 ANALYSIS OF CANDIDATES' PERFORMANCE IN EACH QUESTION IN PAPER 2

3.1 136/2 COMPUTER SCIENCE: PRACTICAL

3.1.1 Question 1: C++ Programming

This was a compulsory question, which carried a total of 25 marks. In this question the candidates were asked to:

- (a) Construct a C++ program that will convert the lengths entered by a user to centimeters. The program should prompt a user to enter two integer values, the first value for feet and the second value for inches. The program should display the numbers entered by the user, total number of inches and total centimeters. Use suitable messages to display the output.

Hint:

- One inch is equal to 2.54 centimeters.
 - One foot is equal to 12 inches.
- (b) Use *switch...case* statement and *while loop* to construct a C++ program that reads the letter codes A to Z and prints the corresponding telephone digits. A program should stop when a user keys symbol #. The letter codes and their corresponding telephone digits are given in Table 1.

Table 1: The Letter Codes and Their Corresponding Telephone Digits

Letter Codes				Digits
A	B	C		2
D	E	F		3
G	H	I		4
J	K	L		5
M	N	O		6
P	Q	R	S	7
T	U	V		8
W	X	Y	Z	9

This question was attempted by 35 candidates, out of whom, 4 (11.8%) scored from 0 to 8.5 marks, 6 (17.6%) scored from 9 to 14.5 marks and 24 (70.6%) scored from 15 to 25 marks. Therefore, the performance of the candidates in this question was good because 88.2 percent of the candidates scored above 8.5 marks. Figure 9 shows a summary of the candidates' performance in this question.

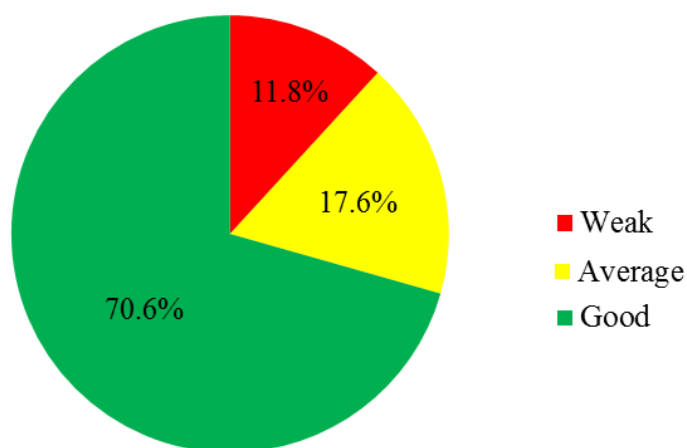


Figure 9: *Candidates' performance in question 1.*

In this question majority of the candidates scored high marks (15.0 to 25.0). In part (a), most of the candidates were able to construct the C++ program which displays the number of inches and feet entered by the user correctly. Moreover, they wrote correct formula to calculate the total number of inches and centimeters. However, some of the candidates declared variable feet and inches as double instead of

integers, which led them to lose some marks. This signifies that the candidates did not understand the demands of the question. A few of the candidates could not write code to freeze console screen by using `system("Pause")`. This shows that the candidates lacked knowledge in the function of the `system("Pause")` to the console screen. Extract 14.1 is a sample of good response provided by one of the candidates.

Extract 14.1: Codes which Display Correctly Total Number of Inches and Total Number of Centimeters

<pre>#include<iostream> using namespace std; using namespace std; int main() { int feet,inches,memoryFeet,memoryInches; double centimetres; cout<<"Enter the value of feet: "; cin>>feet; memoryFeet = feet; cout<<"Enter the value of inches: "; cin>>inches; memoryInches = inches; inches = (feet*12) + inches; centimetres = (inches*2.54); cout<<endl; cout<<"In "<<memoryFeet<<" feet and "<<memoryInches<<" inches"<<endl; cout <<"Total number of inches is: "<<inches<<endl; cout <<"Total number of centimetres is: "<<centimetres<<endl; cout<<endl; cout<<endl; cout<<endl; return main(); }</pre>	<pre>Enter the value of feet: 5 Enter the value of inches: 6 In 5 feet and 6 inches Total number of inches is: 66 Total number of centimetres is: 167.64</pre>
---	---

In part (b), the candidates managed to use *Switch case* and *While loop* to convert letter code A to Z into corresponding telephone digits. However, most of the candidates did not write correct the while loop, for the program to stop when a user click symbol #. For example, one candidate wrote: “while (digit>=2)” instead of while (n!=#). Other candidates could not write conditional statement to limit the user to enter only characters. This made the program to print the telephone digits even when the user enters a number. Extract 14.2 is another sample of good responses provided by some of the candidates.

Extract 14.2: The Correct Codes to Convert a Letter A to Z into Corresponding Telephone Digits

```
#include<iostream>
using namespace std;
int main()
{
    char p,x;
    int i=0;
    while (p!='#')
    {
        cout<<"enter a capitalized letter code\n";
        cin>>p;
        switch (p)
        {
            case 'A':
            case 'B':
            case 'C':
                cout<<"2\n";
                break;
            case 'D':
            case 'E':
            case 'F':
                cout<<"3\n";
                break;
            case 'G':
            case 'H':
            case 'I':
                cout<<"4\n";
                break;
```

The candidates who scored average marks (9.5 to 14.5) constructed the required program to convert the lengths entered by the user into centimeters. They typed the correct input and output syntax (cin and cout) to prompt user to enter and display data in part (a). However, some candidates typed correct formula to display the total number in centimeters, but were unable to type the correct formula to convert length into inches. For example, one candidate wrote a formula to display the total number of inches as $total_inches = feet * 12$; instead of $total_inches = 12 * feet + inches$. Also type a formula to display total number in centimeters as $total_centimeters = feet * 2.54$ instead of $centimeters = 2.54 * total_inches$. This shows that, the candidates lacked skills on applying mathematical formulae in programming.

Conversely, some of the candidates wrote *if conditional* statement instead of *switch case*. Others used *do.....while loop* instead of *while loop* to convert a letter A to Z

into corresponding telephone digits in part (b). This indicates that the candidates did not understand the requirements of the question.

Furthermore, the candidates who scored low marks from 0 to 8.5, managed to type the library preprocessor `#include<iostream>`, `function main()`, and `return 0` only. Additionally, they typed correct input/output syntax (`cin` and `cout`) to prompt user to display entered numbers. Most of these candidates declared `double` or `float` for feet, inches and total inches instead of `int`.

Moreover, some candidates failed to type the correct formula to calculate total number of inches and total number of centimeters. For example, one candidate wrote a formula to display total number of inches as `totalinches=(inches*2.54)`; instead of `total_inches = 12*feet + inches`, also typed a formula to display total number in centimeters as `totalcentimeter=(totalinches*(2.54*30*feet))`; instead of `centimeter = 2.54*totalinches` in part (a). This indicates that, this candidate failed to use the relationship given between feet, inches and centimeters. Extract 14.3 is a sample of poor response provided by one of the candidates.

Extract 14.3: A Sample of Incorrect Answers to Question14

```
#include<iostream>
using namespace std;
int main()
{
    float M,N;
    cout<<"Enter the First value (feet) : ";
    cin>>M;
    cout<<"Enter the Second value (inches) : ";
    cin>>N;
    cout<<endl;

    float D=M*12;
    float G=D*2.54;
    cout<<"For the First value"<<endl;
    cout<<M<<"feet = "<<G<<"centimeters"<<endl;
    cout<<endl;

    float V=N*2.54;
    cout<<"For the Second value"<<endl;
    cout<<N<<"inches = "<<V<<"centimeters"<<endl;

    return 0;
}
```

In part (b), most of the candidates declared a letter as an integer (int) instead of character (char). Furthermore, the candidates could not type a code to stop the program when users press key symbol #. Other candidates initiated a switch case statement without a reading character “letter” within a switch. Also the candidates typed incorrect case conditional statement. For example, one candidates typed Case1: ‘A’|| ‘B’ || ‘C’ = 2 instead of Case ‘A’: ‘B’: ‘C’: cout<<2<<endl;. This indicates that, the candidates lacked knowledge on application of a *switch-case* statement in C++ programming. A few candidates typed a *while loop* with irrelevant conditions to limit the user to enter characters only. Extract 14.4 is a another sample of poor responses provided by one of the candidates.

Extract: 14.4: A Sample of Incorrect Responses to Question 14

```
#include<iostream>
using namespace std;
int main()
{
int n,s,alphabet;
char a='#';

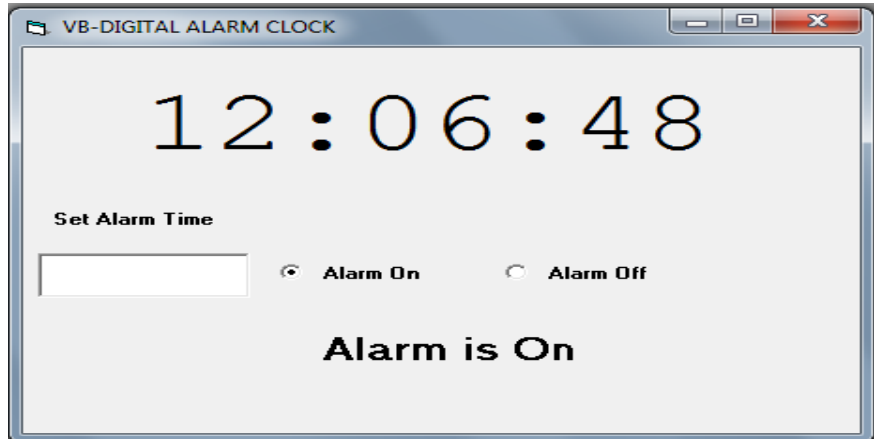
    switch(s);
    {
        case 1: <<"enter a alphabet";
        cin>>alphabet;
        {
            cout<<"2";
            break;
        }
    case 2: <<"enter a lphabet";
    cin>>alphabet;
    if(alphabet="A ||B||C")
    {
        cout<<"3";
        break;
    }
    while (n==a)
    {
        cout<<"press any key to continue or # to stop";
        cin>>n;
    }

    return 0;
}
```

3.1.2 Question 2. Visual Programming

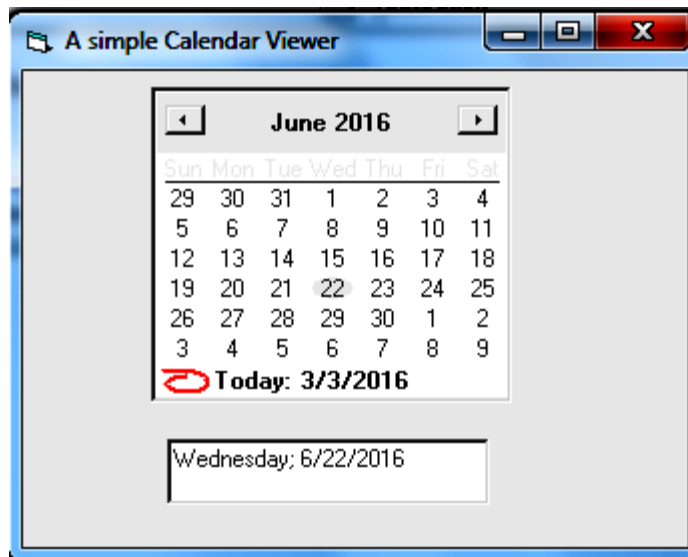
This was an optional question with parts (a) and (b). It carried a total of 25 marks. The candidates were asked to:

- (a) (i) Use Visual Basic program, design and activate the following alarm clock interface:



Interface description:

- The time interval for the clock should be 1 second.
 - The font type and size of the time displayed should be “Courier New” and 48 points respectively.
 - The “Alarm On” or “Alarm Off” message should be displayed on the program with font type “MS Sans Serif”. Font size 18 points and bolded.
- (ii) Write Visual Basic codes which will activate the interface created in part (a) (i) in order to:
- Produce a sound when the “Alarm On” option is selected.
 - Switch off the alarm sound by clicking the “Alarm Off” option.
 - Display a message that informs a user if the alarm is “On” or “Off” after setting an alarm and clicks the desired option button.
- (iii) Save your work as “Vb Alarm”.
- (b) (i) Use Visual Basic program to create the following Calendar viewer interface:



Hint: Use Month View and TextBox controls to display the calendar and the current date.

- (ii) Write Visual Basic codes which will display the date picked/clicked by the user in the text box using the format “MM/DD/YYYY” as shown in part (b) (i).

This question was attempted by only one candidate (2.9%) who scored 8.5 marks. Therefore, the candidates’ performance in this question was poor. This might be influenced by the fact that, Visual Basic is not familiar to students compared to HTML which is well known to them. The summary of the performance is shown in Table 6.

Table 6: Candidates’ Performance in Question 2

Scores	Candidates’ Percentage
0 – 8.5	2.9
9.0 – 14.5	0
15.0 – 25.0	0

In part (a), the candidate designed an active alarm clock, and inserted the label for the text with correct font size and font type. However, the candidate was unable to set alarm time and type the codes to activate “Alarm On” and “Alarm Off”. This indicates that the candidate had insufficient knowledge on visual basic.

In part (a), candidates were required to write the following visual basic codes after creating the interface:

```

Private Sub Form_Load()
Alert.Caption = "Alarm is Off"
End Sub
Private Sub OnButton_Click(Index As Integer)
If (Index = 1) Then
Alert.Caption = "Alarm is On"
Else
Alert.Caption = "Alarm is Off"
End If
End Sub

```

In order to make the alarm sound only when the Alarm On option is selected and the alarm time is reached the following code was to be written:

```

Private Sub Timer1_Timer()
If (Time$ > AlarmSetting.Text And Alert.Caption = "Alarm is On")
Then Beep
Display.Caption = Time$
End Sub
Saving work as myVbAlarm.

```

In part (b), the candidate managed to open VB project, insert new forms, name caption as simple calendar viewer as well as adding a text box control to display date. Furthermore, the candidate was able to type codes to activate “save button” and “print button”. However, the candidate could not write codes to activate simple calendar viewer. Therefore, the program failed to produce the intended output. This shows that the candidates had partial understanding on Visual Basic programming.

Likewise, in part (b), the candidate had to write the following visual basic codes after creating the interface:

```

Private Sub MonthView1_DateClick(ByVal DateClicked As Date)
Dim theDate As String
Dim Day, theDay As String
Day = MonthView1.DayOfWeek
theDate = MonthView1.Value
If Day = 1 Then
theDay = "Sunday"
End If
If Day = 2 Then
theDay = "Monday"
End If
If Day = 3 Then
theDay = "Tuesday"
End If

```

```

If Day = 4 Then
theDay = "Wednesday"
End If
If Day = 5 Then
theDay = "Thursday"
End If
If Day = 6 Then
theDay = "Friday"
End If
If Day = 7 Then
theDay = "Saturday"
End If
Text1.Text = theDay & "; " & theDate
End Sub

```

3.1.3 Question 3: Web Development

This was an optional question. The question consisted of two parts: (a) and (b). The question wanted the candidates to:

- (a) Design the following webpage using basic HTML. Save a page as signup.html.

The screenshot shows a registration form with the following elements:

- Title:** Fill the following form to Signup
- Fields:**
 - Full Name: [Text Input]
 - Email: [Text Input]
 - Gender: Male Female
 - Username: [Text Input]
 - Password: [Text Input]
 - Confirm Password: [Text Input]
 - Nationality: [Dropdown Menu] (Options: Tanzania, Angola, Burundi, Kenya, Rwanda, Tanzania, Uganda)
- Buttons:** Show Password, Clear, Register

HINT: Use a table aligned at center to create a webpage.

Page Descriptions:

- Table width and height should be 400 and 300 respectively.
- Use an image of your choice from picture gallery available in your computer as the background of the registration form.

- Font color for the texts should be white.
- (b) Use Java Script codes to validate the input form created in part (a) as follows:
- Use onBlur event to validate an e-mail provided if it contains the “@” and “.” characters. If an e-mail is invalid alert the user with a message “Invalid e-mail address!” and return mouse focus to an e-mail input box.
 - Use onBlur event to check if the password entered matches with the password confirmed. In case they do not match a corresponding alert message should be displayed and mouse focus must be returned to the password input box.
 - The password entered should be displayed through an alert box when a user clicks “show password” button.
 - Display an alert message “Congratulation an account for “username” is created successfully!! when a “Register” button is clicked. **HINT:** (Username refers to the username provided during registration).

This question was attempted by 34 candidates, out of whom 7 (20.6%) candidates scored from 0 to 8.5 marks, 15 (44.1%) candidates scored from 9.0 to 14.5 marks, while 12 (35.3%) candidates scored from 15.0 to 25.0 marks. The analysis shows that the performance of the candidates in this question was good because 21 (79.4%) candidates scored above 8.5 out of 25 marks. Figure 10 shows a summary of the candidates’ performance in this question.

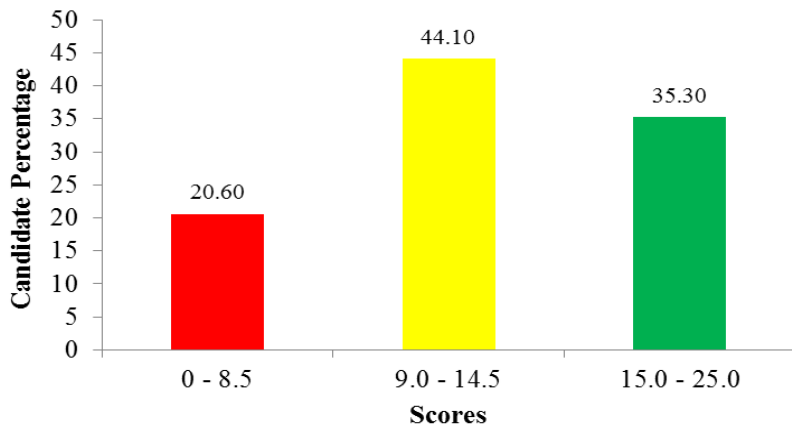


Figure 10: *Candidates’ performance in question 3.*

In this question there were only 11(33.3%) candidates who scored above 14.5 marks. The candidates showed adequate knowledge of designing webpages using the basic HTML codes and activating the page using JavaScript codes. They managed to validate e-mail, compare entered passwords, declare and assign variables as required. However, most of the candidates could not type JavaScript codes that will return mouse focus to the e-mail input box and password input box. Further analysis shows that some candidates were unable to write codes to display “Tanzania” as selected option. Extract 16.1 is a sample of poor responses from one of the candidates.

Extract 16.1; Example of an Incorrect Response in Question 16

Fill the following form to Signup

Full name:

Email:

Gender: Male Female

Username:

Password:

Confirm Password:

Nationality: ▼

```

<html>
<head>
<title>my necta day</title>
<script type="text/javascript">
function show()
{
var y=document.getElementById("p").value;
alert(" your password is " + y)
}
function val()
{
var x=document.getElementById("e").value;
var y=document.getElementById("p").value;
var z=document.getElementById("cp").value;
var a=document.getElementById("u").value;

if(x.indexOf("@")==-1|| x.indexOf(".")==-1)
{
alert("invalid email adress")
}

if(z!=y)
{
alert("password mismatch")
}

return -1;
}
function clic()
{
var a=document.getElementById("u").value;
alert("congrtulation an account for " + a + " is created successfull!!!")
}
</script>

```



```

<form>
<table border="0"align="center" width="400" height="300">
<tr><td colspan="2"><h2 valign="bottom"><center>fill the following form to signup</center></h2>
</tr>
<tr><td>full Name:</td>
<td><input type="text"></td></tr>
<tr><td>Email:</td><td><input type="text" id="e"></td></tr>
<tr><td>Gender:</td>
<td><input type="radio" name="gender" >male<input type="radio" name="gender" >male</td></tr>
<tr><td>Username:</td><td><input type="text" id="u"></td></tr>
<tr><td>Password:</td><td><input type="password" id="p"></td></tr>
<tr><td>Confirm password:</td>
<td><input type="password" id="cp"></td>
</tr>
<tr><td></td>
<td><button onclick="show()"> show password</button> </td>
</tr>
<tr>
<td>Nationality:</td>
<td><select>
<option 1>Angola</option>
<option 2>Burundi</option>
<option 3>Kenya</option>
<option 4 selected>Tanzania</option>
<option 5>Uganda</option>
</select>
</td>
</tr>

```

Furthermore, 15 (44.1%) candidates who scored from 9 to 14.5 marks managed to use HTML codes to design a signup form. Also, they typed correct JavaScript codes to declare function name, declare characters, and validate the e-mail which contains the “@” and “.” characters. However, most of the candidates were unable to activate the “register” button, to check throughout the form, and deliver a message when the user clicks it. Some candidates could not use JavaScript codes to match the passwords entered in “password” text box with password entered in “confirm password” text box using *onBlur* event. Others validated e-mail by using HTML codes instead of JavaScript codes. For example, one candidate typed `<input type= “e-mail”>`. This indicates that, the candidate did not understand the requirement of the question.

Many candidates (20.6%) who performed poorly created correctly a webpage using basic HTML tags and saved it as `signup.html`. However, in part (a), some of the candidates faced difficulty in typing the tags that selected Tanzania as the default nationality. Also, the candidates inserted a background colour to the webpage instead of image.

The analysis shows that, some of the candidates typed “text” as the input type of the password instead of “password”. For that case, the password text box could not hide the password entered by the user. This suggests that the candidates did not understand the correct codes to display password text box. Furthermore, it was observed that, some of the candidates could not distinguish a button from a text

box. These candidates typed tags which displays a text box “Show Password” instead of displaying a button.

In part (b), most of the candidates were unable to use JavaScript codes to validate the input form created in part (a). The candidates could not type codes to validate an e-mail if it contains @ and “.”. Furthermore, they were not able to display the message “Invalid e-mail address” if the e-mail is invalid.

Additionally, the candidates could not use JavaScript codes to compare password entered to the “password” and “Confirm Password” text box. Likewise, these candidates failed to activate “register” button to display an alert message when clicked. This indicated that, the candidates lacked skills on JavaScript codes in creating an interactive webpage. Extract 16.12 is a sample of poor responses.

Extract 16.2: A Sample of Incorrect Responses in Question 3



Fill the following form to Signup

Full Name:

Email:

Gender:

Username: Password: Confirm Password: show password Nationality:

```
<html>
<head><script>
function form(maria98@gmail.com);
maria98@gmail.com.split.return validate form();
console.log(return form())
console.log(invalid email address)
console.log()
alert(congratulation an account for "username" is created successfully!!)
</script>
<title>
</title>
</head>
```

```
<body background="">
<table width="400" height="300" table background=>

<form background="koala.jpg" fontcolor="white"><font="text" font color="white">
<h1 align="center">Fill the following form to Signup</h1>
Full Name:<input type="text"><br>
Email:<input type="text"><br>
Gender:<radio="circle">
<option value="Male">
<option value="Female"></radio><br>
Username:<input type="text"><br>
Password:<input type="password"><br>
Confirm Password:<input type="password" event="onblur" value="password"><br>
<button >show password</button>
```

```
<button >show password</button>
<input type="submit" value="Show password"><br>
Nationality:<select option>
<option value="Uganda"/><br>
<option value="Tanzania"checked><br>
<option value="Rwanda"><br>
<option value="Kenya"><br>
<option value="Burundi"><br>
<option value="Angola"></select><br>
<input type="submit" value="Clear">

<input type="reset" value="Register"><br>

</font>
</form>
```

4.0 CANDIDATES' PERFORMANCE IN EACH TOPIC

In this examination, the questions were composed from 11 topics. The analysis of the candidates' responses shows that the performance was good in the topics of *Data Communication and Networking* (91.1%), *IT Environment* (88.6%), *System Development* (88.6%), *Data Presentation* (88.2%) and *Website Development* (85.5%). The good performance was a result of correct interpretation of the questions and candidates' good practical skills.

Moreover, the candidates had average performance in the topics of *C++ Programming* (59.8%), *Computer Security* (46.1%), *Problem Solving* (45.7%) and *Computer Basics* (36.4%). This performance was a result of inadequate knowledge on basic computer-related concepts.

However, the candidates performed poorly in the topics of *Visual Programming* (11.8%) and *Information System* (11.4%). This is because the candidates lacked practical skills in the Visual Basic programming language. The performance of the candidates in each topic is shown in the Appendix.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

In this examination the majority of the candidates answered most of the questions correctly. The analysis of candidates' performance on each question shows that the candidates' performance in Paper 1 was good in questions 1, 2, 6, 8, 11, 12 and 13 while it was average in questions 4 and 5. On the other hand, it was weak in question 3, 7, 9 and 10. In Paper 2, the performance was good in question 1 and 3, while it was weak in question 2.

The analysis on the 11 topics which were examined shows that 5 topics had good performance, 4 topics had average, and the remaining 2 topics had weak performance. Therefore, the overall performance in Computer Science Examination in 2019 was good. The reasons for the good performance include sufficient knowledge of and skills in the examined concepts. Moreover, it was due to the candidates' ability to recall, explain, and make analysis in answering the questions.

The analysis of the candidates' performance in each topic indicates that the candidates had difficulties in answering questions from the topics of *Visual Programming* and *Information System*. The weak performance in the two topics is attributed to the candidates' insufficient knowledge and skills. They lacked knowledge on the given concepts, and interpreted wrongly the given information.

5.2 RECOMMENDATIONS

In order to improve the candidates' performance in future Computer Science examinations, the following should be done:

- (a) Teachers should provide more exercises, tests, and examinations to enhance their students' mastery of theoretical concepts, and improve their practical skills.
- (b) Other education stakeholders, such as the government, parents and school managers should ensure that schools have well equipped ICT laboratories. Such laboratories will improve teaching and learning activities.
- (c) Students should be encouraged to learn English Language effectively in order to enable them acquire confidence in answering questions involving long descriptions such as essay questions.

APPENDIX**Analysis of Candidates' Performance in each Topic**

S/N	Topic	ACSEE 2019		
		No. of Question(s)	Percentage of Candidates who Scored Average of 35% or more	Remarks
1	Data Communication and Networking	2	91.1	Good
2	IT Environment	1	88.6	Good
3	System Development	2	88.6	Good
4	Data Presentation	1	88.2	Good
5	Website Development	2	85.5	Good
6	C++ Programming	2	59.8	Average
7	Computer Security	2	46.1	Average
8	Problem Solving	1	45.7	Average
9	Computer Basics	1	36.4	Average
10	Visual Programming	1	11.8	Weak
11	Information Systems	1	11.4	Weak

