THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CANDIDATES' ITEM RESPONSE ANALYSIS REPORT ON THE CERTIFICATE OF SECONDARY EDUCATION EXAMINATIONS (CSEE) 2023

ELECTRONICS DRAUGHTING

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FOREWORD

The Certificate of Secondary Education Examination (CSEE) is administered by the National Examinations Council of Tanzania (NECTA) to mark the end of four years of secondary education. It intends to show the effectiveness of the education system which is a summative evaluation. The National Examinations Council of Tanzania is therefore pleased to issue the Candidates' Item Response Analysis (CIRA) report to give feedback to candidates, teachers, examiners and other education stakeholders on the general performance, specific areas of weakness and recommendations for future improvement.

The report is based on the analysis of responses from candidates' scripts and statistical data processed by NECTA. The candidates' responses for each question have been analysed and the factors which hinder the candidates' good performance have been identified. The analysis done in this report indicates that the general performance of the candidates in 2023 was good, since most of them (89. 85%) passed while few (10.15 %) failed. The factors for such performance include the inability of the candidates to interpret the requirement of the questions, and lack of enough knowledge and skills in various topics. The observed factors have been clarified by using some extracts selected from the candidates' scripts for more illustrations.

It is expected that the feedback provided in this report will be useful to education stakeholders and that, the suggestions and recommendations offered will enable them to take appropriate measures to enhance teaching and learning of Electronics Draughting subject.

The National Examinations Council of Tanzania would like to thank various education stakeholders who devoted their energy and time in providing important inputs that have been used in preparing this report.

Dr. Said Ally Mohamed
EXECUTIVE SECRETARY

1.0 INTRODUCTION

This report presents the analysis of the candidates' responses to the Certificate of Secondary Education Examination (CSEE) 2023 in Electronics Draughting subject.

The paper comprised of sections A, B and C. Section A had one (1) question. Question 1 was a multiple choice question with item (i) to (x) each carried 1 mark, making a total of 10 marks. The items were from the topics of *Drawing offices, Block and Basic diagrams in a circuit development, Pictorial drawing, Similar figures, Logic diagrams, Electronic components schematic symbols, International standard Organization (ISO) sheet layout and sketching.* The candidates were required to answer all items from this question.

Section B of the paper consisted of 6 structured questions, with 10 marks each, making a total of 60 marks. The candidates were required to answer all questions from this section. The questions were set from the topics of *Electronic Components and Schematic Symbols, Similar Figure, Pictorial Drawing* and *Logic Diagrams.*

Section C of the paper consisted of one (1) structured question, with a total of 30 marks. This question was set from the topic of *Block and Basic Diagram in a Circuit Development.*

A total of 197 (100%) candidates sat for the Electronics Draughting paper in the year 2023. Among them, 177 (89.85%) passed while 20 (10.15%) candidates failed. In this report green, yellow and red colour are used to show good, average and weak performances respectively. The performance is considered to be good if a candidate scores from 65-100 marks, average if they score from 30-64 and weak if the scores range from 0 to 29.

Finally, the report provides recommendations for the improvement of candidates' performance in future.

2.0 ANALYSIS OF CANDIDATES' RESPONSES IN EACH QUESTION

This section analyses the performance of the candidates in each question. It covers the type of questions, topic from which the questions were constructed, requirements of the questions as well as the performance of the candidates in each question. The candidates' scores have been termed as weak, average and good depending on the performance.

2.1 SECTION A: OBJECTIVE QUESTIONS

This section comprised of one question with ten multiple-choice items from the general concept on drawing techniques.

2.1.1 Question 1: Multiple Choice Items

In this question the candidates were required to choose the correct response from the given alternatives A to E and write its letter beside the item number in the answer booklet provided.

A total of 197 (100%) candidates attempted this question. Among them, 8 (4.06%) scored from 0 to 2 marks, 143 (72.59%) scored from 3 to 6 marks, and the remaining 46 (23.35%) candidates scored from 7 to 10 marks. The performance of the candidates in this question was good since 189 (95.94%) of the candidates scored above average. This performance is illustrated in Figure 1.

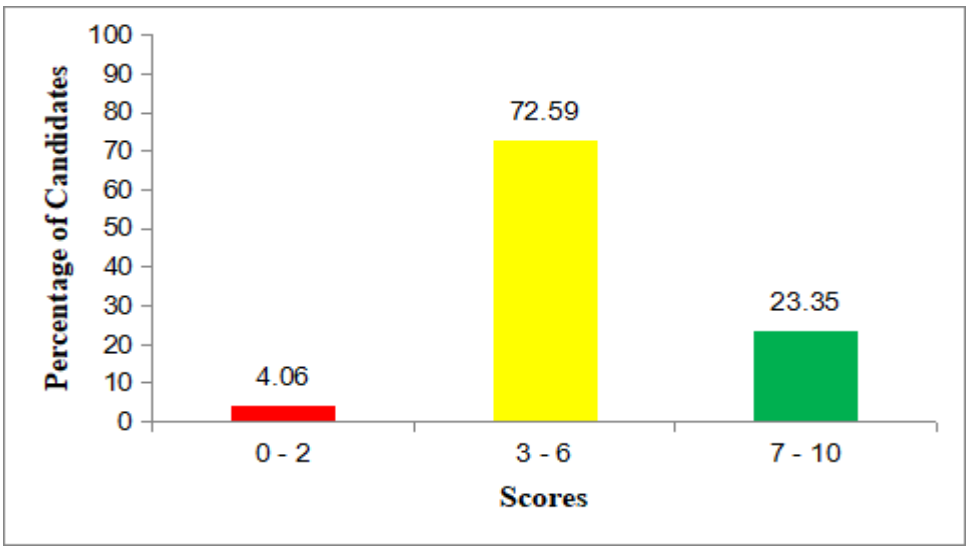


Figure 1: *The Candidates' Performance in Question 1*

The analysis of the candidates' responses to this question shows that 18 (95.94%) of the candidates managed to choose the correct answer in items (i-x). This indicates that the majority of the candidates were aware of the basic concepts of drawing techniques.

In item (i), the candidates were required to state the use of grooves in drawing board while drawing figures. It tested the candidates understanding on the importance parts of drawing board. The question was:

Why is it advised to use the drawing board which is grooved at the back while drawing similar figure?

A It increases softness. *B It is used as working edge.*
C It is more durable. *D It prevents warping.*
E It increase texture surface.

The correct response was alternative D, *It prevents warping.* Most of the candidates selected the correct answer. This response shows that the candidates had enough knowledge of using drawing board in construction of geometric figures. There was no candidate who selected alternative A, *It increases softness* since it is not related to the use of drawing board grooves. Those who selected alternative B, *It is used as working edge* didn't understand that a drawing board is typically used as a working surface for various drawing and drafting tasks, rather than as a working edge. Those who selected alternative C, *It is more durable* they thought that because of durability it will be able to withstand during the working time. Those who opted for alternative E, *It increases texture surface* had no knowledge on the use of grooved drawing board.

In item (ii) the candidates were required to identify the use of instruments in measurements of different scales. It tested the candidates' ability to use instruments in a various way in drawing practice. The question was:

You are required to transfer measurements from the scale to the drawing. Identify the instrument you will use.

A Compass *B Set square* *C Divider*
D Protractor *E French curve*

The correct answer was alternative C, *Divider*. Most candidates selected C, had enough knowledge in drawing instrument and measurement. Those

who selected alternative A, *Compass* confused between the function of divider and compass that compass is used to draw angles and circles and not transferring of measurements. Those who selected D, *Protector* did not understand that protector is used to measure angles and not transfer of measurement from scale to drawing. Those who selected alternative E, *French curve* had no knowledge on which instrument used to transfer measurement from scale drawing.

Item (iii) tested the candidate's competence of drawing block diagrams. The question was:

Which one of the following is a correct logically organized sequence of drawing block diagrams?

A *Draw all horizontal lines, lightly draw a layout, draw all vertical lines, draw arrowheads and circles, determine a box size, and complete lettering.*

B *Draw all vertical lines, draw all horizontal lines, determine box size, draw arrowheads and circles, complete lettering, and lightly draw a layout.*

C *Determine box size, lightly draw a layout, draw all horizontal lines, draw all vertical lines, draw arrowheads and circles, and complete lettering.*

D *Determine box size, lightly draw a layout, draw all vertical lines, draw arrowheads and circles, draw all horizontal lines, and complete lettering.*

E *Draw a lightly layout, determine box size, draw all horizontal lines, draw all vertical lines, draw arrowheads and circles, and complete lettering.*

The correct response was C, *Determine box size, lightly draw a layout, draw all horizontal lines, draw all vertical lines, draw arrowheads and circles, and complete lettering*. Those who selected alternative C had enough knowledge in block diagram drawing. Those who selected alternative A, *Draw all horizontal lines, lightly draw a layout, draw all vertical lines, draw arrowheads and circles, determine a box size, and complete lettering* they forget that determining the box size and lightly draw a layout should start before any other process of drawing blocks. Those who selected alternative B, *Draw all vertical lines, draw all horizontal lines, determine box size, draw arrowheads and circles, complete lettering, and lightly draw a layout*, did not understand sequence of drawing blocks since

blocks are not start with vertical lines. Those who selected alternative D, *Determine box size, lightly draw a layout, draw all vertical lines, draw arrowheads and circles, draw all horizontal lines, and complete lettering* wrongly sequenced at third step draw all vertical line, third step was draw all horizontal lines. Those who opted alternative E, *Draw a lightly layout, determine box size, draw all horizontal lines, draw all vertical lines, draw arrowheads and circles, and complete lettering* interchanged the first two sequences instead of beginning with determine box size they started with draw a lightly layout.

In (iv) required the candidate's understanding on the languages used in orthographic drawing. It tested candidates' ability to understand the meaning of words used in drawing practice. The question was as follows:

In technical drawing language, the principle of orthographic projection is based on the Greek word "ORTHO". What does the word mean?

A	*Draw*	*B*	*Straight*	*C*	*Project*
D	*View*	*E*	*Sketch*		

The correct answer was alternative B, *Straight*. Those who opted had enough knowledge on the language used in technical drawing. Those who selected alternative A, *Draw* thought that this could be correct answer because the subject deals with drawings. Those who opted for D, *View* related with the topic since the topic deals with producing views from different objects. Those who selected alternative E, *Sketch* did not understand that sketch is used when no measurement used during drawing of objects. Those who selected project had no knowledge on orthographic projection.

In item (v), candidates were required to identify different types of figures used in technical drawing. The question was as follows:

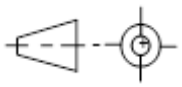
A smartphone has four straight sides bounded together. Which figure does the smartphone resemble?

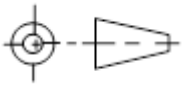
A	*Rhombus*	*B*	*Quadrilateral*	*C*	*Square*
D	*Parallelogram*	*E*	*Trapezoid*		

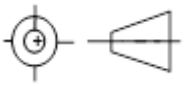
The correct answer was alternative D, *Parallelogram.* Those who opted alternative D had enough knowledge on types of figures. Those who selected alternative A *Rhombus* related smart phone as a four sided figures but a rhombus is a quadrilateral with all four sides of equal length and it is distinguished by its symmetry and the perpendicularity of its diagonals. Those who selected alternative B *Quadrilateral* forget that Quadrilateral can be any four sided figure for example trapezoidal which does not look like smartphone. Those who selected alternative C *Square* and E *Trapezoid* could not relate smartphone shape with other shapes learned in a classroom.

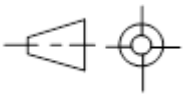
Item (vi) tested the candidates' ability to differentiate systems used to draw orthographic projection by different countries. The question was:

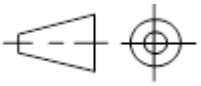
British industry uses first angle orthographic projection while United States of America uses third angle orthographic projection system. Identify the symbol used by the British industry.

A 

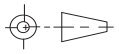
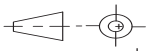
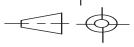
B 

C 

D 

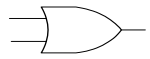
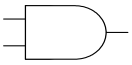
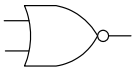
E 

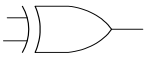
The correct response was alternative E,  . Those who selected this alternative had enough knowledge.

Those who opted for alternative B  selected wrong symbol since this alternative is a symbol of third angle projection. Those who selected alternative A  did not consider the + sign at the center and alternative D  did not consider the circle at the center of circles. Those who selected alternative C were wrong because that is an American symbol for first angle projection.

In item (vii) the candidates were required to relate a normal circuit's function with logic gates. The question was as follows:

A student designed a circuit which consists of two switches, a bulb and a battery connected in series. It produces light only if both switches are closed. Which logic gate symbol represents the circuit?

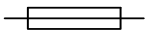
A  B  C 

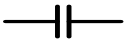
D  E 

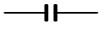
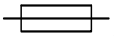
Most of the candidates opted for alternative B,  which was the correct answer. Some of the candidates' wrongly selected wrong alternative A,  they forgot that the logic at alternative A is the same as parallel circuit. Those who selected alternative D,  and C,  did not realize that the round at the end of logic gates will invert the output. Other alternative was not selected because they do not resemble the two switch circuits.

In item (viii) candidates were required to state the function of given electronic components symbols. The question was as follows:

A decoder power which supply circuit is not working. After troubleshooting, it was realized that the component responsible for storing electric charge had damaged. Which symbol represents the component?

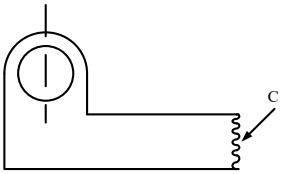
A  B  C 

D  E 

Principally the component which is responsible for storing electric charge is a capacitor. Therefore the correct answer was alternative E,  capacitor. The candidates who opted for this alternative had sufficient knowledge on the electronics component symbols. Some of the candidates selected distractor A,  , a fuse. The candidates failed to realise that function of fuse is to interrupt the flow of electrical current when it exceeds a predetermined level, thereby preventing damage to the circuit components or potential fire hazards. No candidate opted for response B,  transistor since it is obvious that it is used as a switch or amplifier. Few candidates selected alternative D,  a diode which was wrong because it is used for rectification and not storing charge device.

In item (ix) the candidates were required to identify function of different types of line which is used to represent different cuts in engineering drawing. The question was as follows:

In the figure below, line C represents irregular boundaries. Identify the type of the line used.



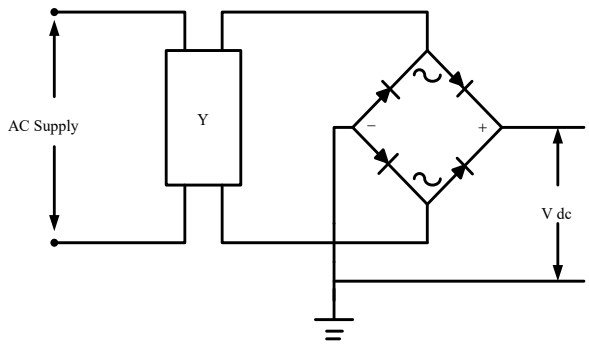
A Continuous thin wavy *B Short zigzag thin* *C Continuous thick*
D Long chain thin *E Margin line*

Most of the candidates selected the correct answer B, *Short zigzag thin.* This reveals that they had sufficient knowledge of the types of drawing lines. Some candidates wrongly opted for alternative C, *Continuous thick*. These lines might denote load-bearing components or major structural features. Those who selected alternative E, *Margin line* had insufficient knowledge on the uses of these lines since margin line is a boundary line that defines the edge of a drawing sheet or the margins within the drawing but not irregular. Few candidates selected alternative A, *Continuous thin wavy* in technical drawing, a continuous thin wavy line typically serves to represent surfaces that are not visible from the current viewpoint or hidden features.

In item (x) candidates were asked to name and locate a correct position of components used in power supply. This question tested the candidates' knowledge on d.c power supply components. The question was:

Unregulated d.c power supply circuit shown in Figure 2 miss one component which is labeled with a letter Y. Name the missing component.

A Inductor *B Capacitor* *C Transformer*
D Regulator *E Fuse*



Most of the candidates chose the correct alternative C, *Transformer* indicating that they were very familiar with the pictorial drawing topic. Some of the candidates opted for A, *Inductor* because symbol of inductor is related to transformer. They failed to grasp a particular type of transformer. Few candidates selected option D, *Regulator* since it resembles regulator symbol but the different is regulator has three legs. Those who opted B, *Capacitor* and E, *Fuse* did not understand circuit components and position.

2.2 SECTION B: STRUCTURED QUESTIONS

2.2.1 Question 2: Electronics Components and Schematic Symbols

In this question, the candidates were provided with a variety of names of electronic components. They were asked to draw basic symbols of components and write its reference designator. The question tested a candidates' ability to draw electronic components with their reference designator from the given names. The question was:

The circuit diagram was constructed by using the following electronic components:

(i) Variable resistor
(ii) Single pole single through switch
(iii) Fuse
(iv) Relay
(v) Integrated circuit (amplifier)
(vi) NPN Transistor
(vii) Capacitor
(viii) Light Emitting Diode (LED)
(ix) Inductor
(x) Transformer

(a) Draw the basic symbol for each component.

(b) Write the correct reference designator of each symbol.

The question was attempted by 197 (100%) candidates who sat for this paper. Their scores were as follows: 12 (6.09%) candidates scored from 0 to 2.5 marks, 168 (85.28%) candidates scored from 3 to 6.5 marks and 17 (8.63%) candidates scored from 7 to 10 marks. The performance of the candidates was good since 185 (93.91%) of the candidates scored above average. Figure 2 summarizes the candidates' performance in Question 2.

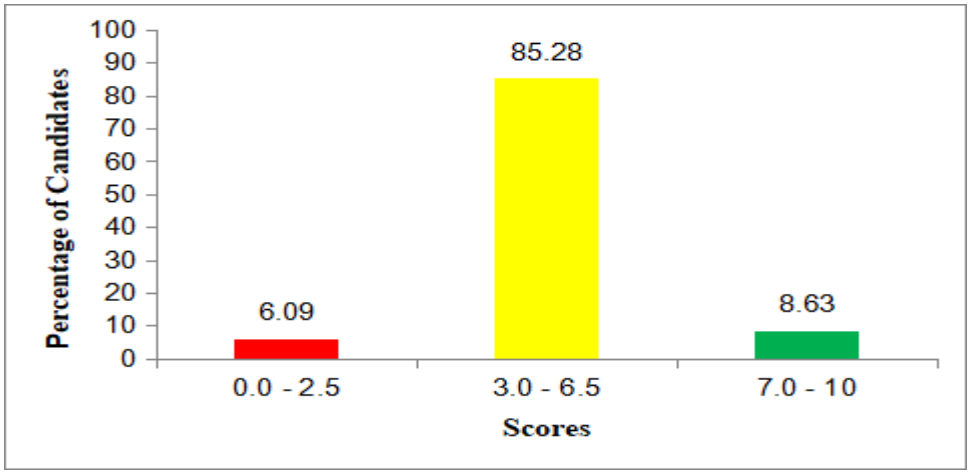
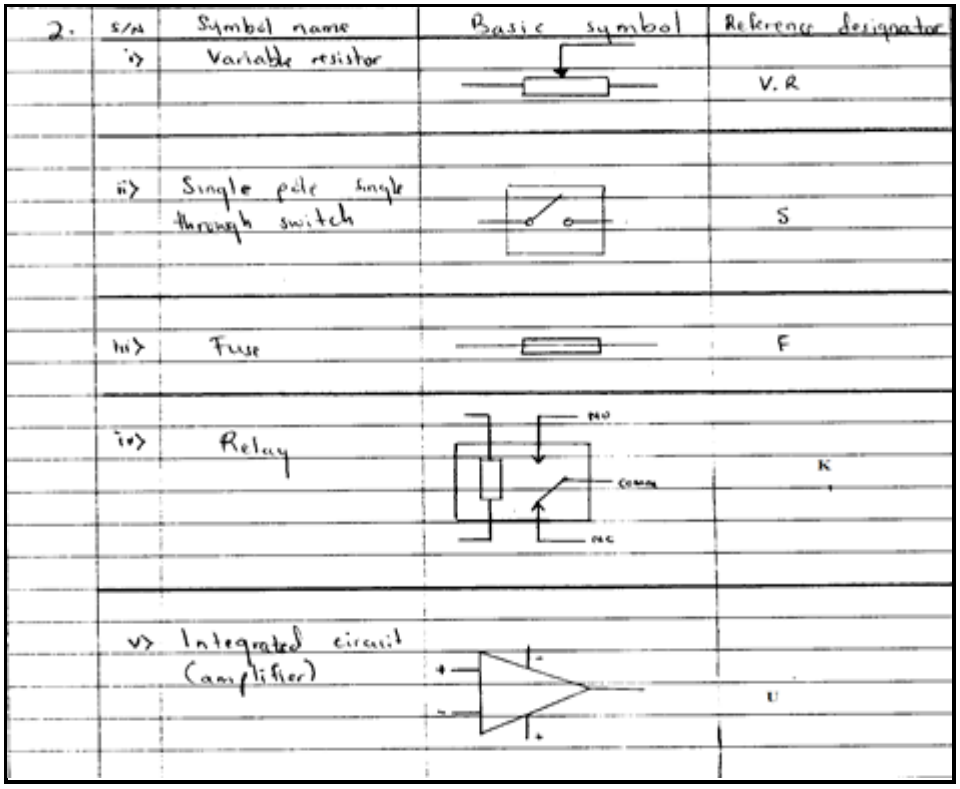
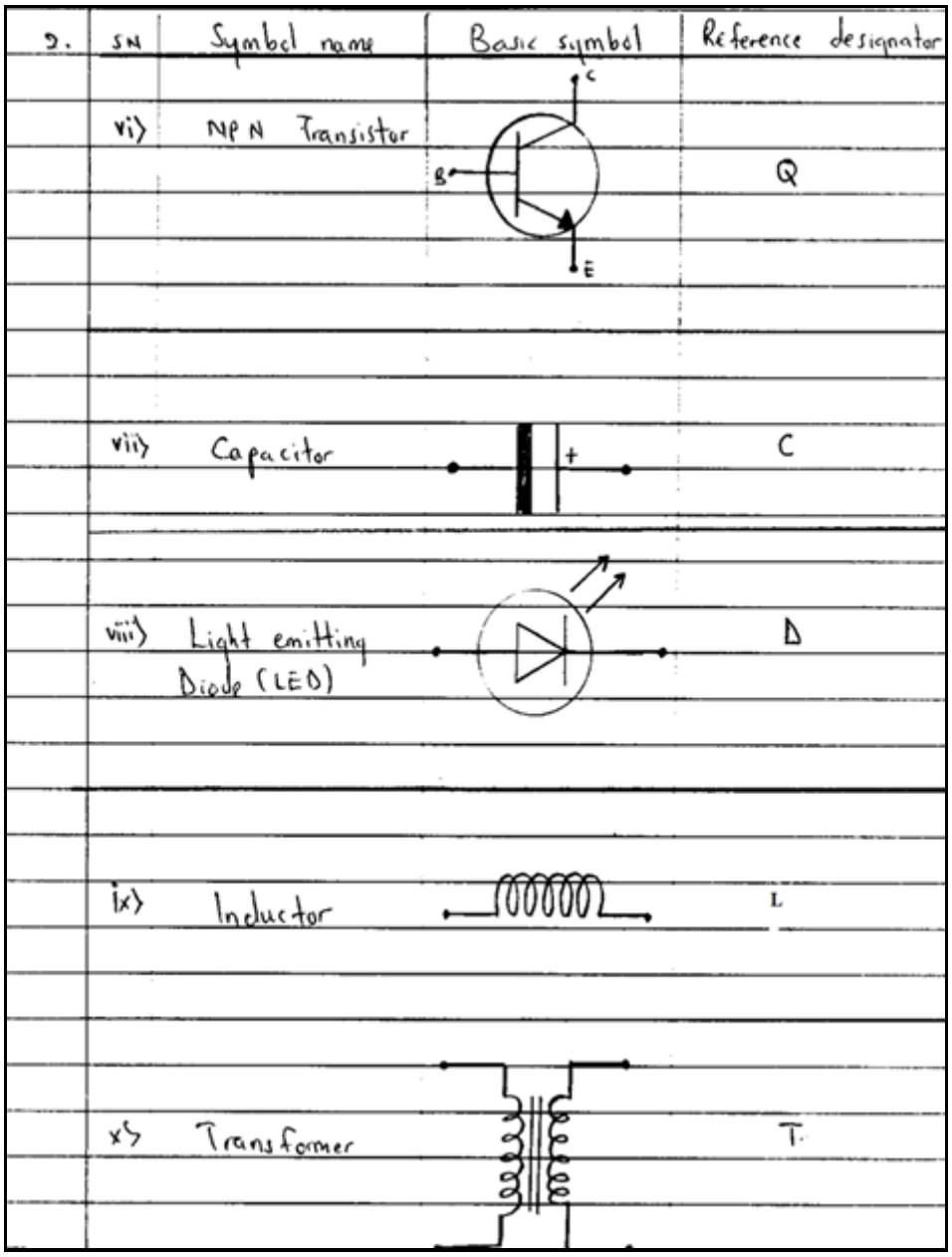


Figure 2: *The Candidates' Performance in Question 2*

The analysis of responses shows that majority of the candidates drew correctly the electronic symbols. This implies that they had sufficient knowledge of electronic components. Extract 2.1 is a sample of good responses from one of the candidates who correctly drew the symbols of electronic components.



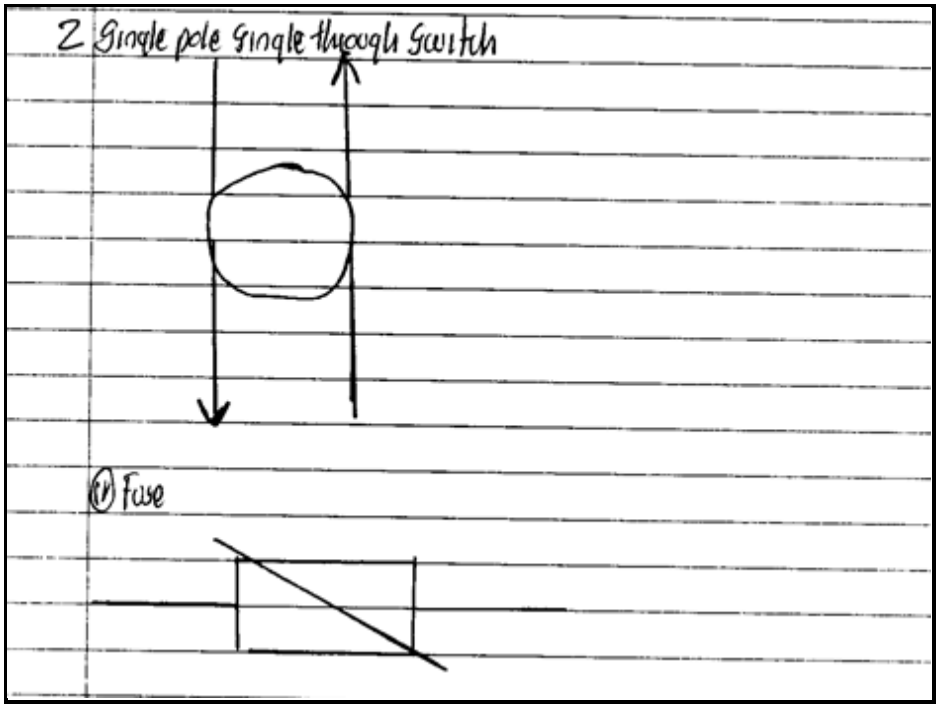


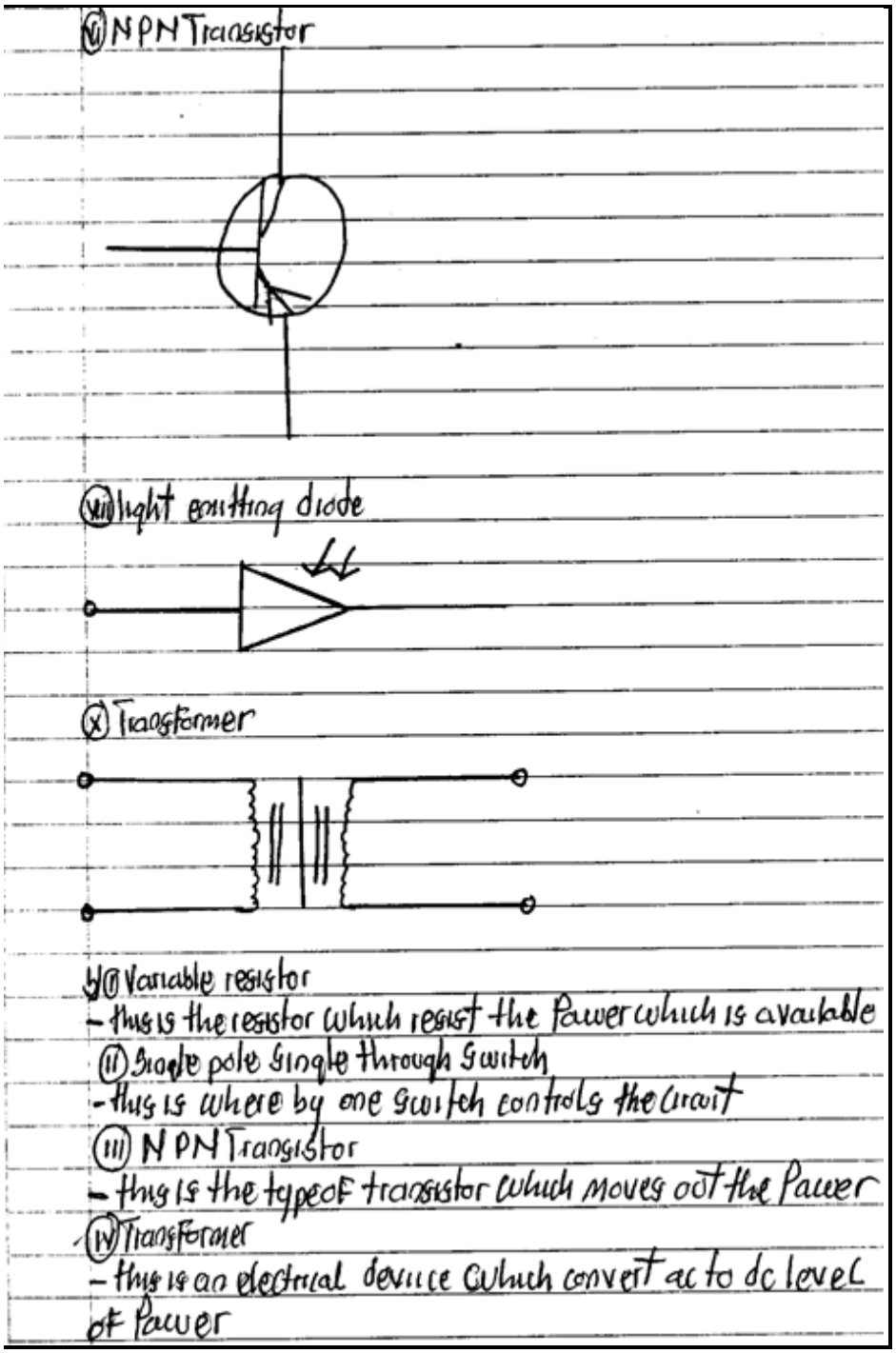
Extract 2.1: A sample of correct responses to Question 2

Extract 2.1 is a sample of good responses from the candidate who correctly drew symbols of electronic components and their correct designator.

Furthermore, the analysis of responses shows that 12 (6.09%) of the candidates failed to draw the symbols of electronic components. In part (a) some candidates drew fixed resistor instead of variable resistor, some drew

inductor symbol instead of relay, some drew PNP transistor instead of NPN transistor, and some drew photo diode instead of light emitting diode (LED). Also there were candidates in a place of inductor they drew transformer. Moreover, in part (b) most of the candidates did not understand designator of the electronics symbols instead they drew other symbols for the same component. This implies that the candidates had insufficient knowledge on electronic symbols and designator. Extract 2.2 illustrates the incorrect response to Question 2.





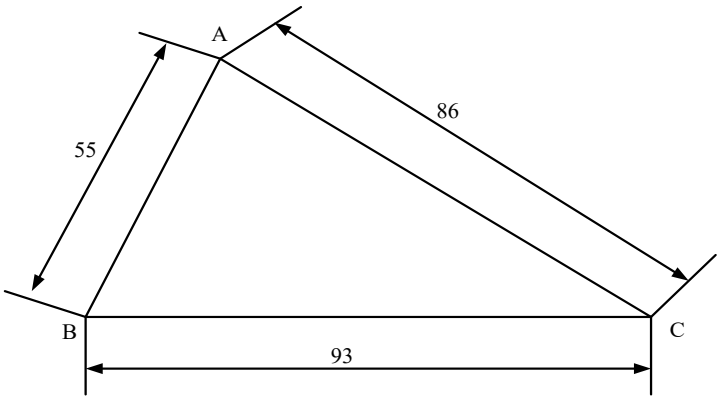
Extract 2.2 A sample of incorrect responses to Question 2.

Extract 2.2 shows incorrect responses from the candidate who drew incorrect symbols and explain incorrectly the function of components instead of writing the reference designator of components.

2.2.2 Question 3: Similar Figures

In this question the candidates were tested the ability to divide figures equally in area using drawing instruments: In this question the candidates were required to demonstrate their ability to divide shapes equally and apply the acquired skills in their real life. The question was:

Sandra wants to divide her plot shown in the figure below equally to her three children. By using the drawing instruments, show how she will divide the plot.



The question was attempted by 197 (100%) candidates, among them 171 (86.80%) scored from 0 to 2.5 marks, 24 (12.18%) scored from 3 to 6.5 marks and 2 (1.02%) scored from 7 to 10 marks. Therefore, the candidates' performance was poor because 171 (86.80%) of the candidates scored below average. Figure 3 summarizes the performance of the candidates in this question.

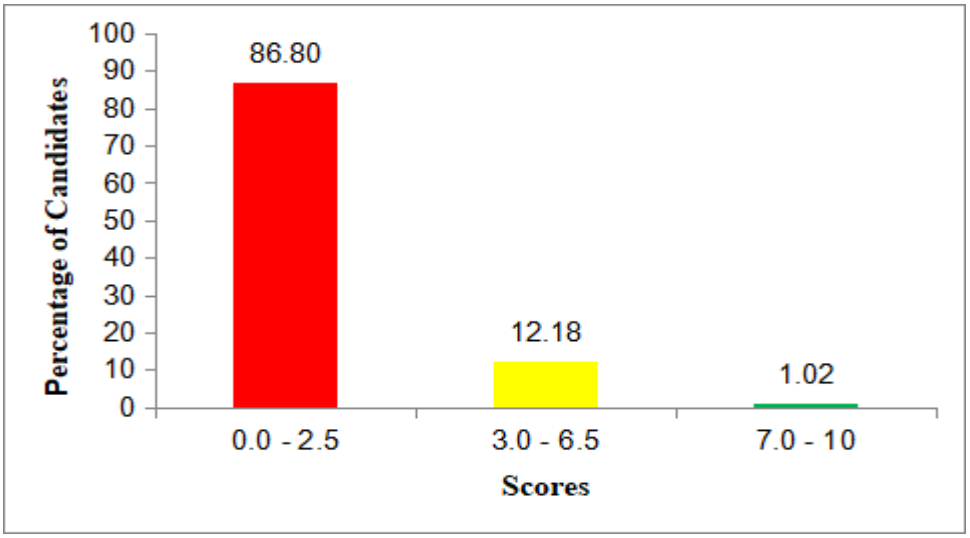
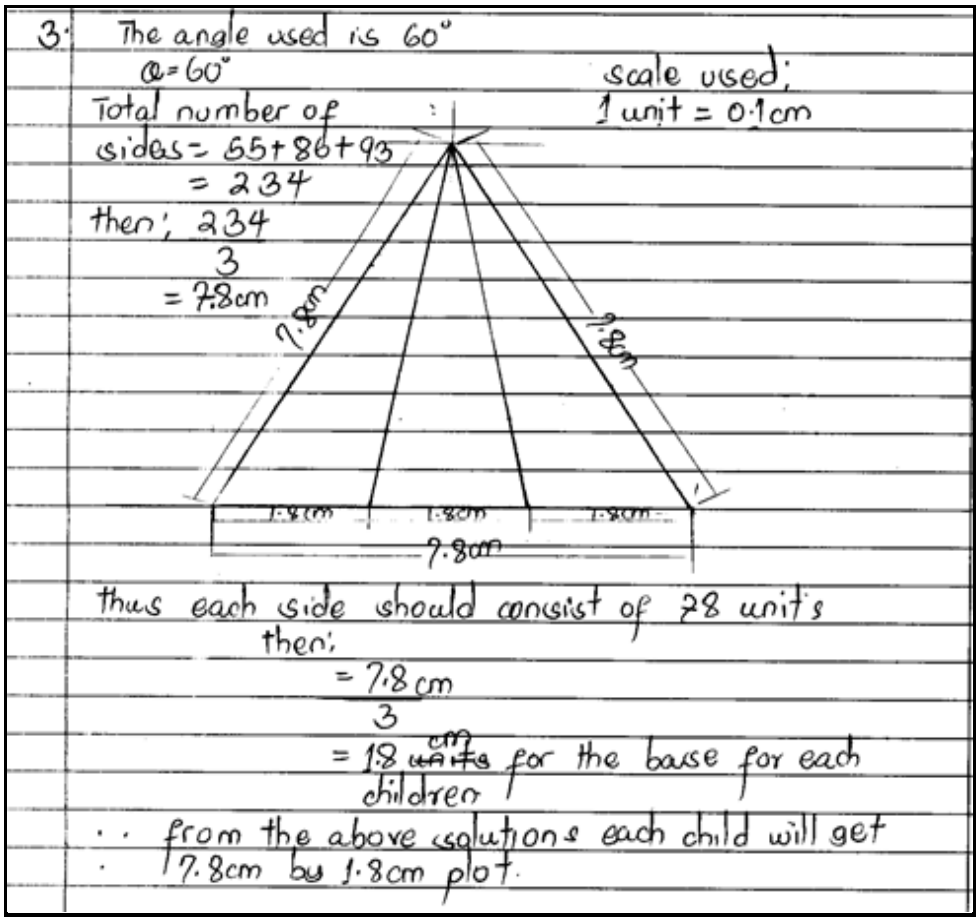


Figure 3: *The Candidates' Performance in Question 3*

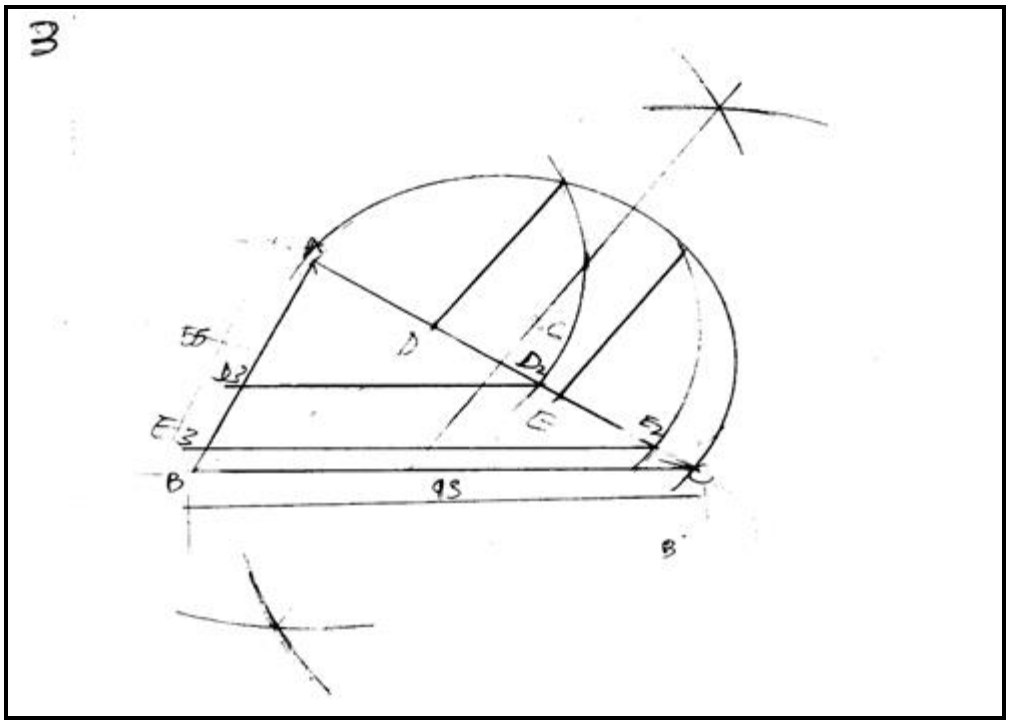
The analysis reveals that majority 171 (86.80%) of the candidates failed to divide correctly the given plot. Some candidates used only ruler to divide the plot, some drew the same figure as it is in question paper instead of using drawing instruments. Some candidates used Pythagoras theorem formula to calculate area rather than using instruments, some used wrong method by bisecting each corners using compass and some drew the figure with divider symbols at the end of each corner. Extract 3.1 is a sample of incorrect responses to the question.



Extract 3.1: A sample of incorrect response to Question 3

Extract 3.1 shows that the candidate used incorrect procedures, he/she calculated and drew wrong triangle ABC and divide it into three parts of equal area from calculations.

However, about 26 (13.20%) of the candidates correctly interpreted the given scenario, hence, they managed to draw the triangle and divide it into three parts of equal area. This implies that the candidates had sufficient knowledge and skills on the topic of similar figures. Extracts 3.2 is a sample of good responses from one of the candidates who correctly responded to the question.



Extract 3.2: A sample of correct responses to Question 3

Extract 3.2 is a sample of correct responses from one of the candidates who managed to draw a triangle ABC into three parts of equal area.

2.2.3 Question 4: Electronic Components Schematic Symbol

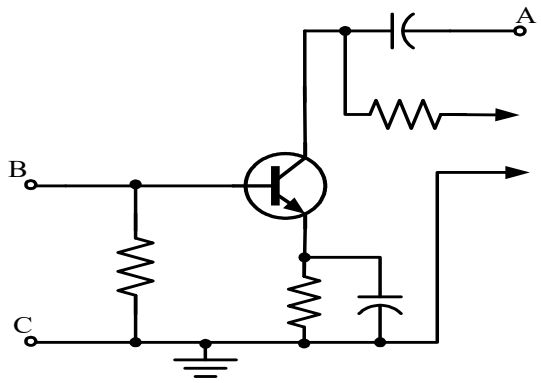
This question comprised of three parts. In part (a) the candidates were tested the ability to recognize the components in a circuit, in part (b) to assign the designator which may help while doing circuit fault finding or troubleshooting and in part (c) to know how input and output ports are represented in a circuit. The question was:

Study the schematic diagram shown in the figure below and answer the questions that follow:

(a) Name three components represented in the schematic diagram.

(b) Redraw the circuit diagram, then assign the correct reference designator on each symbol, number them from left to right and from top to bottom.

(c) What do circles A, B and C at the ends of schematic diagram represent?



A total of 197 candidates, corresponding to 100 per cent attempted the question. The data analysis, shows that 15 (7.62%) candidates scored from 0 to 2.5 marks, 129 (65.48%) scored from 3 to 6.5 whereas 53 (26.90%) candidates scored from 7 to 10 marks. The trend of performance portrays the average performance in this question since 92.39 % of the candidates scored average and above. The candidates' performance in this question is presented in Figure 4.

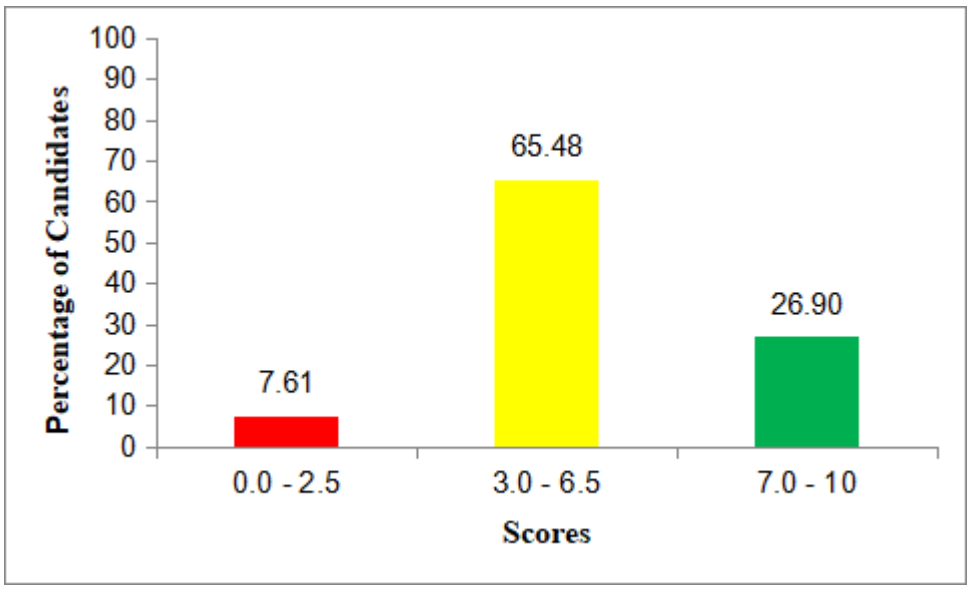
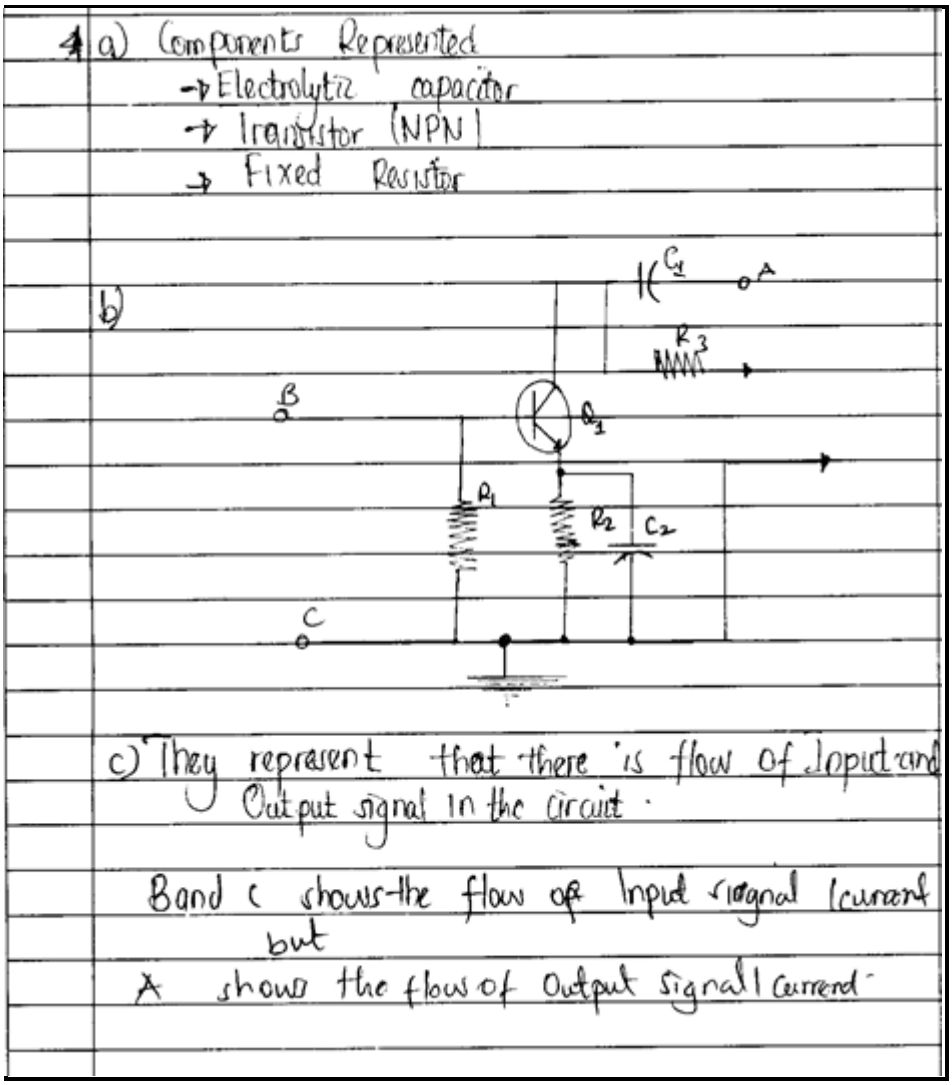


Figure 4: *The Candidates' Performance in Question 4*

The analysis of data shows that, the majority of the candidates 179 (92.39%) performed well. In part (a) the candidates named correctly the components in a schematic diagram. In part (b) they correctly drew the schematic diagram and assign the correct designator. In part (c) correctly mentioned the use of circles at the end of a circuit. This indicates that they

had adequate knowledge of the electronics components schematic diagram. One of the candidates' good responses is illustrated in Extract 4.1.

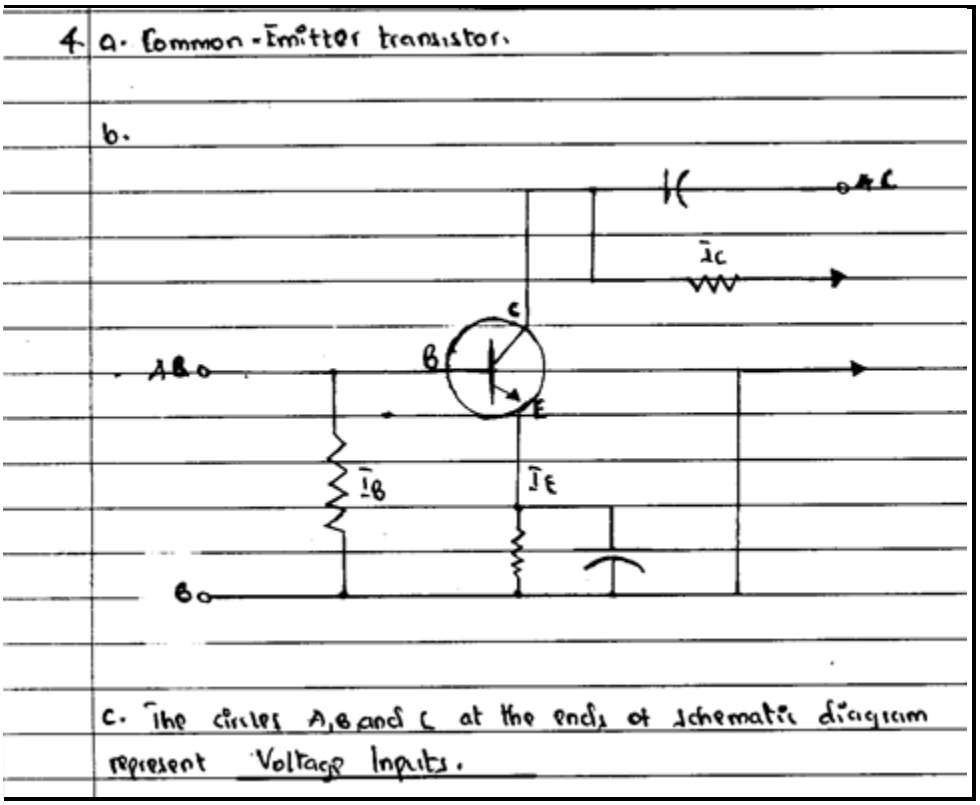


Extract 4.1: A sample of correct response to Question 4.

Extract 4.1 is a sample of good response extracted from one of the candidate's script who managed to identify and labelled symbols and correctly drew the schematic diagram of amplifier.

Further analysis shows that 15 (7.61%) of the candidates performed poorly by scoring 0 to 2.5 marks out of 10 marks allotted to the question. For example, in part (a) some of the candidates wrongly named all three components. For a fixed resistor they named it as an inductor, for NPN transistor they named it PNP transistor and for a polarized capacitor they

just named it as capacitor. In part (b) most of the candidates failed to assign correct designator. 'Q' was supposed to be a transistor but they named it Tr, C was a capacitor but they named it as VrC and R is a resistor but they named it a fixed resistor. In part (c) some of the candidates failed to explain the correct representation of circles A, B and C at the ends of schematic diagram by saying *that it is just to make circuit to look good at its ends*. This response implies that they had little knowledge on the component and schematic diagrams. Extract 4.2 is a sample of incorrect responses from one of the candidates.



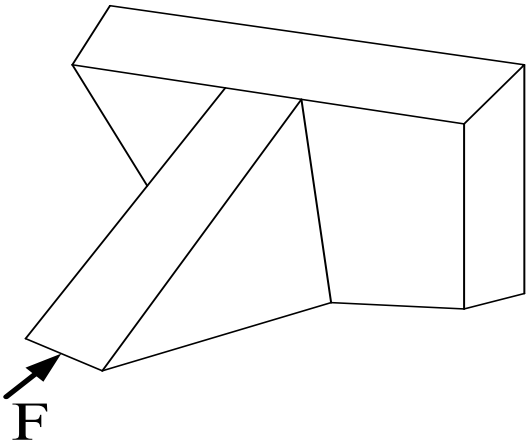
Extract 4.2: A sample of incorrect responses to Question 4

Extract 4.2 shows responses from one of the candidates who failed to identify all components in the circuit and drew an incorrect schematic diagram as well as s/he used wrong symbol to label the resistors, instead the candidates used the current abbreviation.

2.2.4 Question 5: Pictorial Drawing

In this question the candidates were tested their ability to produce views in third angle projection which can assist in interpreting a drawing. The question was:

You have been given one of the school notice boards as shown in the figure below. Produce without dimension front, end, and plan views in the third angle projection in the direction of arrow F.



The question was attempted by 197 (100%) of registered candidates. The data shows that 21 (10.66%) candidates scored low marks from 0 to 2.5 marks, 132 (67.01%) scored from 3 to 6.5 marks, and the remaining 44 (22.34%) candidates scored from 7 to 10 marks. The general candidates' performance in this question was good because 176 (89.35%) of the candidates scored from average and above. Figure 5 summarises the candidates' performance in Question 5.

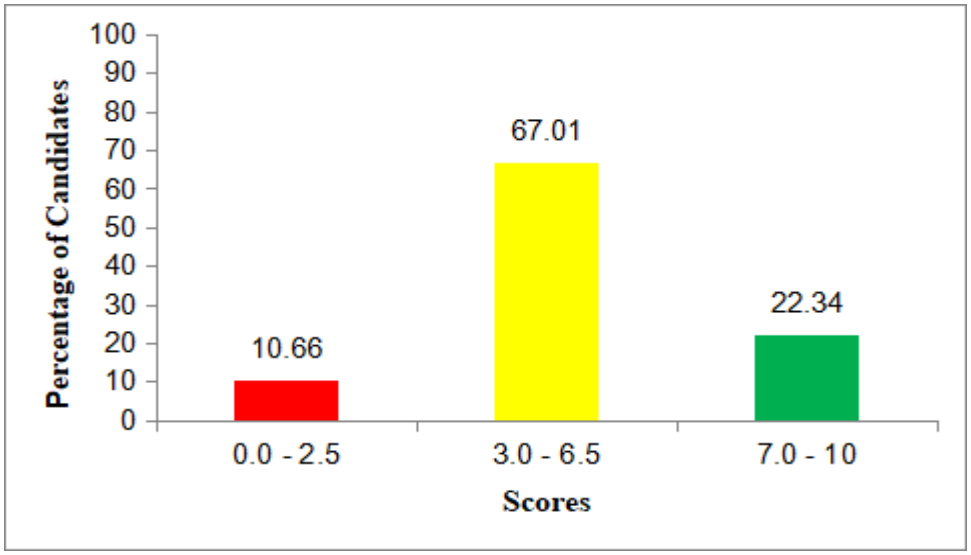
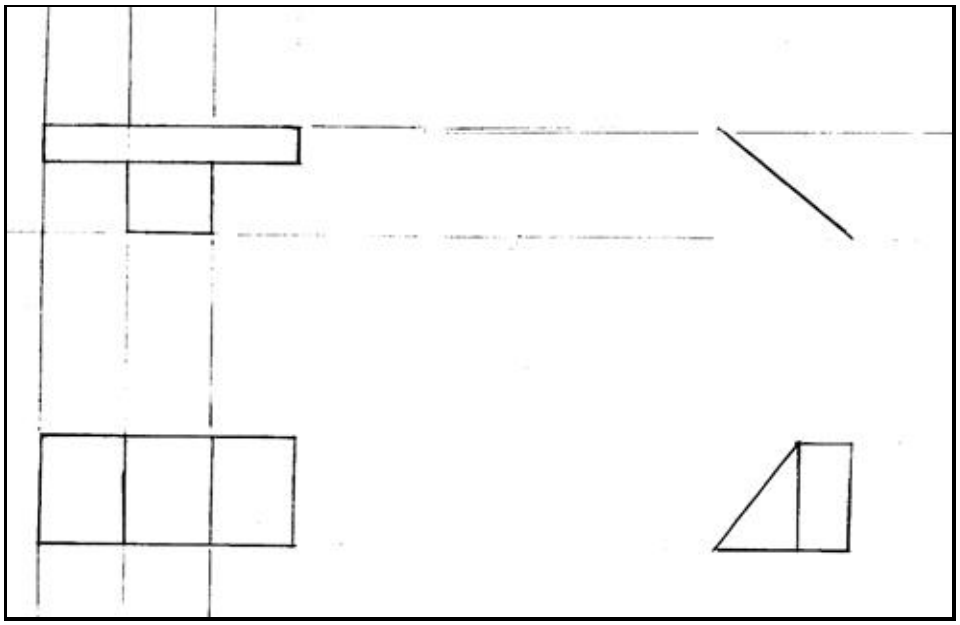


Figure 5: *The Candidates' Performance in Question 5*

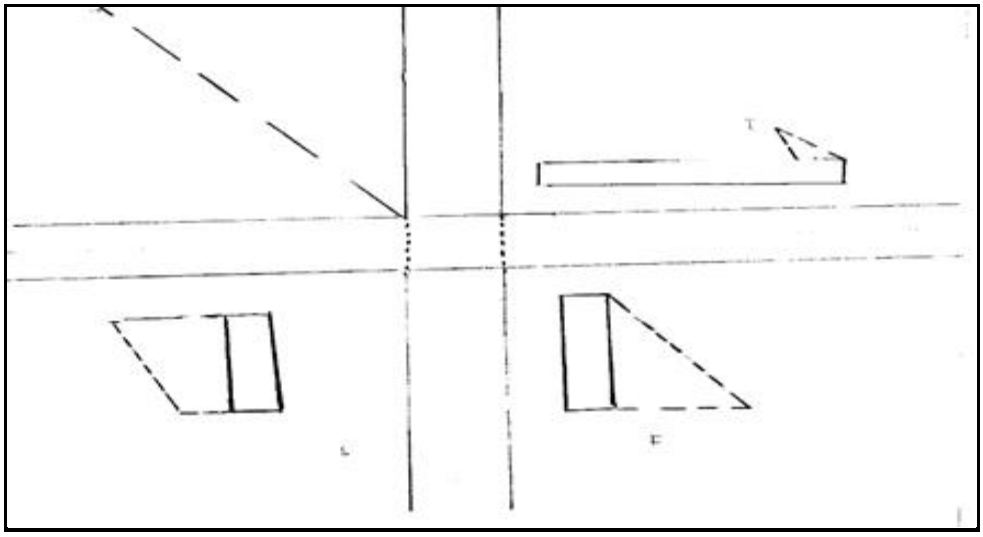
Analysis shows that 132 (67.01%) candidates had average performance in this question as most of them gave partial responses to the question. Majority of the candidates drew incomplete front, end and plan views in the third angle projection. This implies that these candidates had some knowledge about the topic of pictorial drawing. Extract 5.1 illustrates a sample of candidates' good responses to this question.



Extract 5.1: A sample of correct responses to Question 5

Extract 5.1 is a sample from one of the candidates who correctly drew all views in third angle projection.

Those who had weak performance of 21 (10.66%) could not draw all views or some views in third angle projection using the given figure. For example, one of the candidates copied a block as it is seen in a question paper. Other candidates drew views in first angle projection which was not the need of the question since the paper intended to test the skill in third angle projection. These signify that the candidates had inadequate knowledge and skills on the topic of pictorial drawing. Extract 5.2 illustrates a sample of candidates' incorrect responses.



Extract 5.2: A sample of incorrect responses to Question 5

Extract 5.2 is a sample response from one of the candidates who failed to draw the views instead s/he drew some parts of the block.

2.2.5 Question 6: Logic Diagrams

This question was comprised of two parts. In part (a) and (b) candidates were required to design the circuits from the given expressions. It tested the ability of the candidates to use Boolean expression to draw logic circuits. The question was as follows:

After designing, assembling and testing the logic circuit, electronics engineer came up with the expressions in (a) and (b). Design the logic circuit to represent those expressions.

(a) $\overline{\overline{A+BC}+\overline{AB}}$

(b) $\overline{C}+(\overline{A}+B)$

A total of 197 (100%) candidates responded to the question and their scores were as follows: 63 (31.98%) candidates scored from 0 to 2.5 marks, 43 (21.83%) scored from 3 to 6.5 marks, and 91 (46.19%) candidates scored from 7 to 10 marks. The candidates' performance in this question was good since 134 (68.02%) of the candidates scored average and above. The data are summarized in Figure 6.

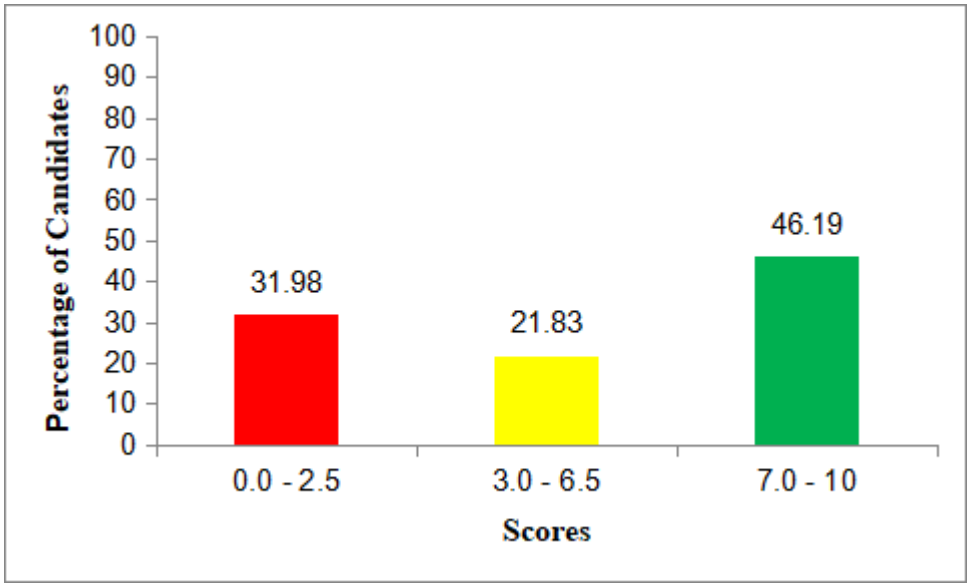
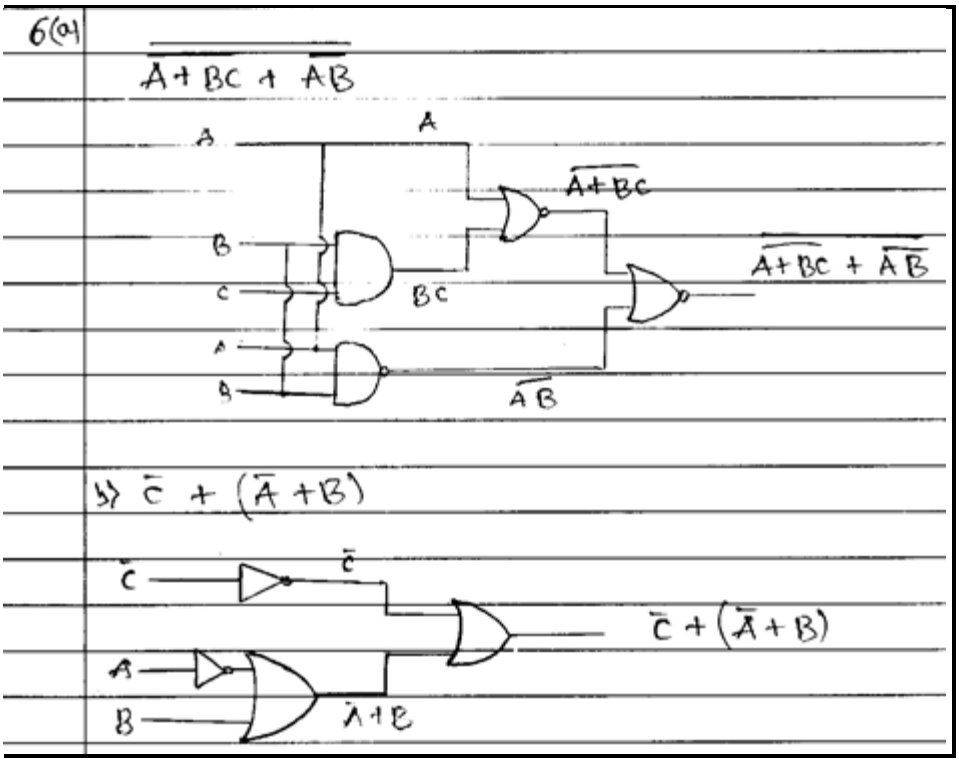


Figure 6: *The Candidates' Performance in Question 6*

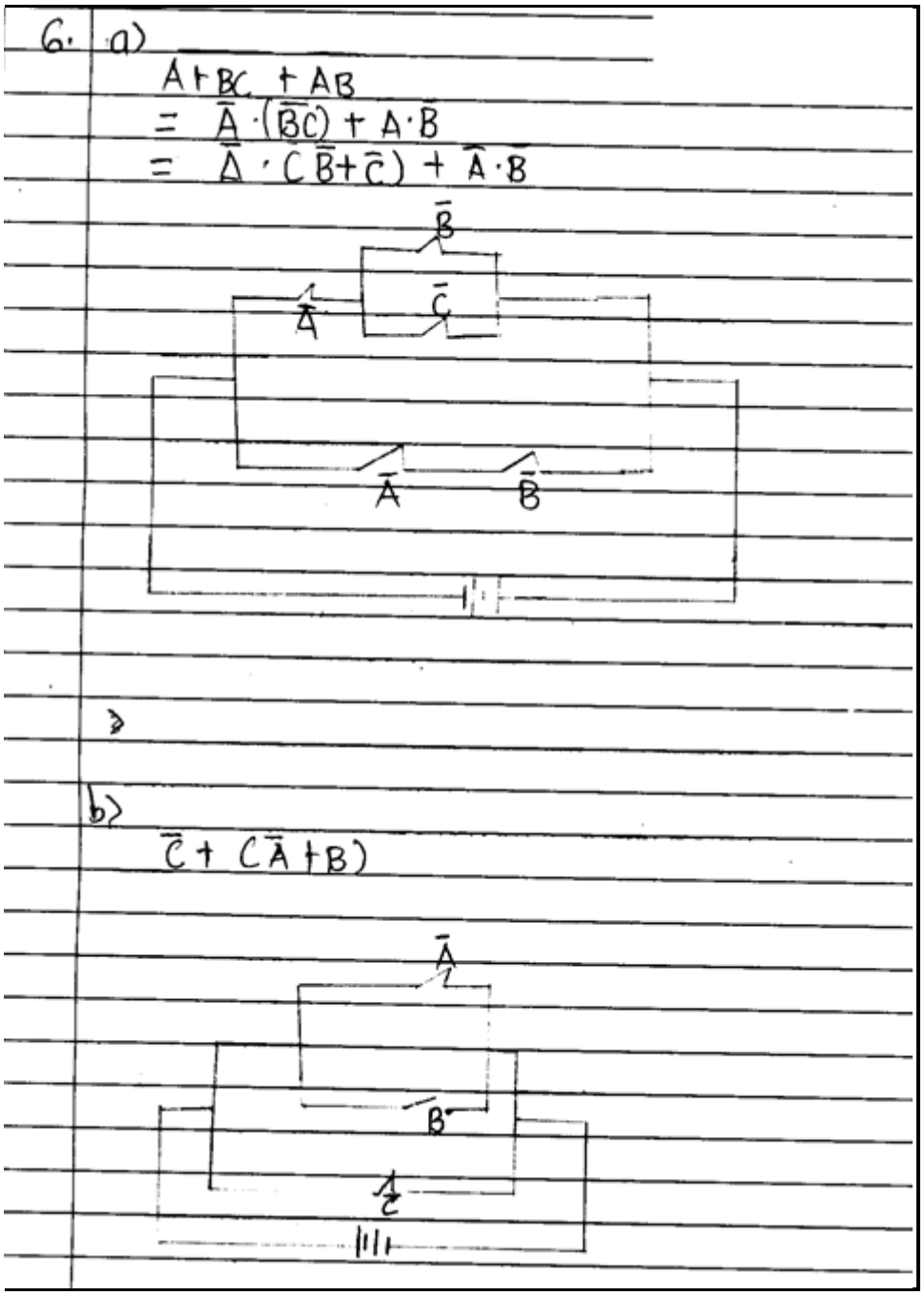
The response analysis shows that 134 (68.02%) of the candidates performed good by scoring high marks which is 7 to 10 marks. These candidates had enough knowledge on Logic diagrams particularly in generating schematic diagrams from Boolean expressions or logic functions. Extract 6.1 illustrates the candidates' correct responses to the question.



Extract 6.1: A sample of correct responses to Question 6

Extract 6.1 is a sample of correct responses extracted from one of the candidates' script who correctly responded to Question 6.

On other hand few candidates 63 (31.98%) could not respond to the question partially or fully as intended by question. Those who had weak performance could not draw the logic circuit. For example, in part (a) one of the candidates drew a circuit with NAND gates instead of NOR gates. He/she used OR gates one tried to simplify function given but failed to get correct answer. In part (b) a candidate drew a circuit without using an inverter (NOT) gate at the beginning of input A and C which lead to wrong output. This signified that the candidates had inadequate knowledge and skills on the topic of logic diagram especially logic gates. Extract 6.2 presents a sample of poor responses to the question.



Extract 6.2: A sample of poor responses to Question 6

Extract 6.2 is a sample of poor responses to question 6 provided by one of the candidates who incorrectly drew logic circuits in part (a) and (b) as s/he used the symbol of switch instead of logic gates.

2.2.6 Question 7: Electronic Components and Schematic Symbols

This question intended to measure the ability of candidates to differentiate passive from active components, draw circuit symbols and their functions. Also candidates were required to show their capability on identifying the damaged components from the TV circuit board. The question was:

(a) Electronics components are divided into two types namely passive and active components. Group the following components into their respective types and sketch their schematic symbols.

(i) Polarized capacitor *(ii) NPN transistor*

(iii) Rectifier diode *(iv) Variable resistor*

(b) A zener diode in a TV receiver is said to be damaged. The damaged component is used for surge suppressor.

(i) Draw a schematic symbol for the damaged component.

(ii) What is the other use of the damaged component?

The analysis shows that 197 (100%) candidates, who sat for this paper, attempted this question and their scores are as follows: 7 (3.55%) candidates scored from 0 to 2.5 marks, 54 (27.41%) candidates scored 3 to 6.5 marks and 136 (69.04%) of the candidates scored from 7 to 10 marks. This data suggests that the performance of the candidates was good since 190 (96.45%) scored average and above. Figure 7 presents the candidates' performance.

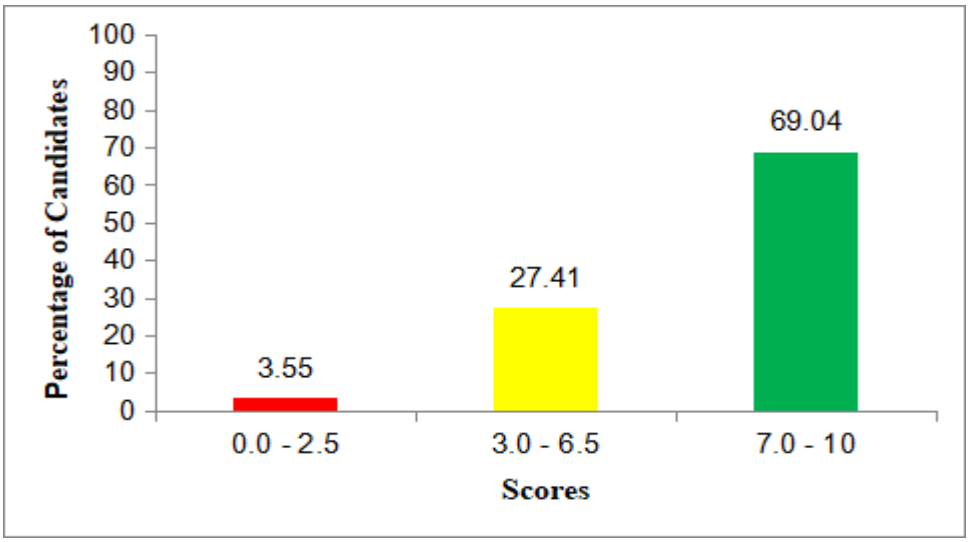
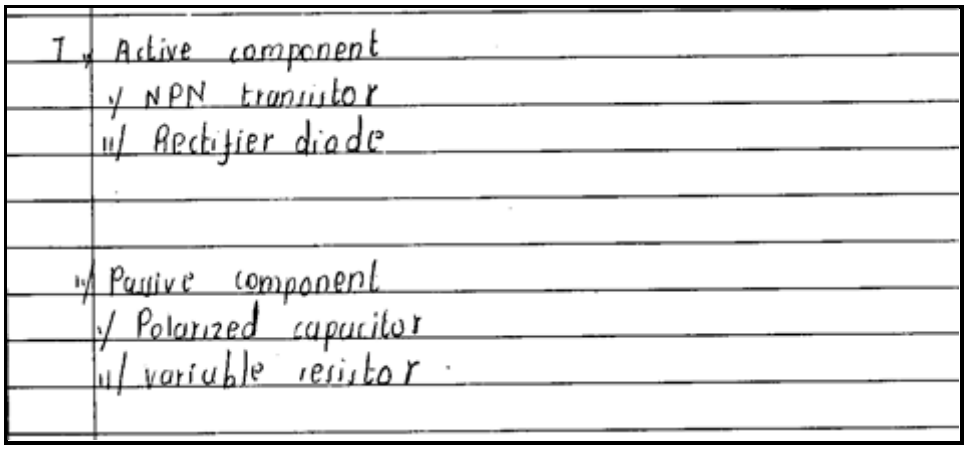
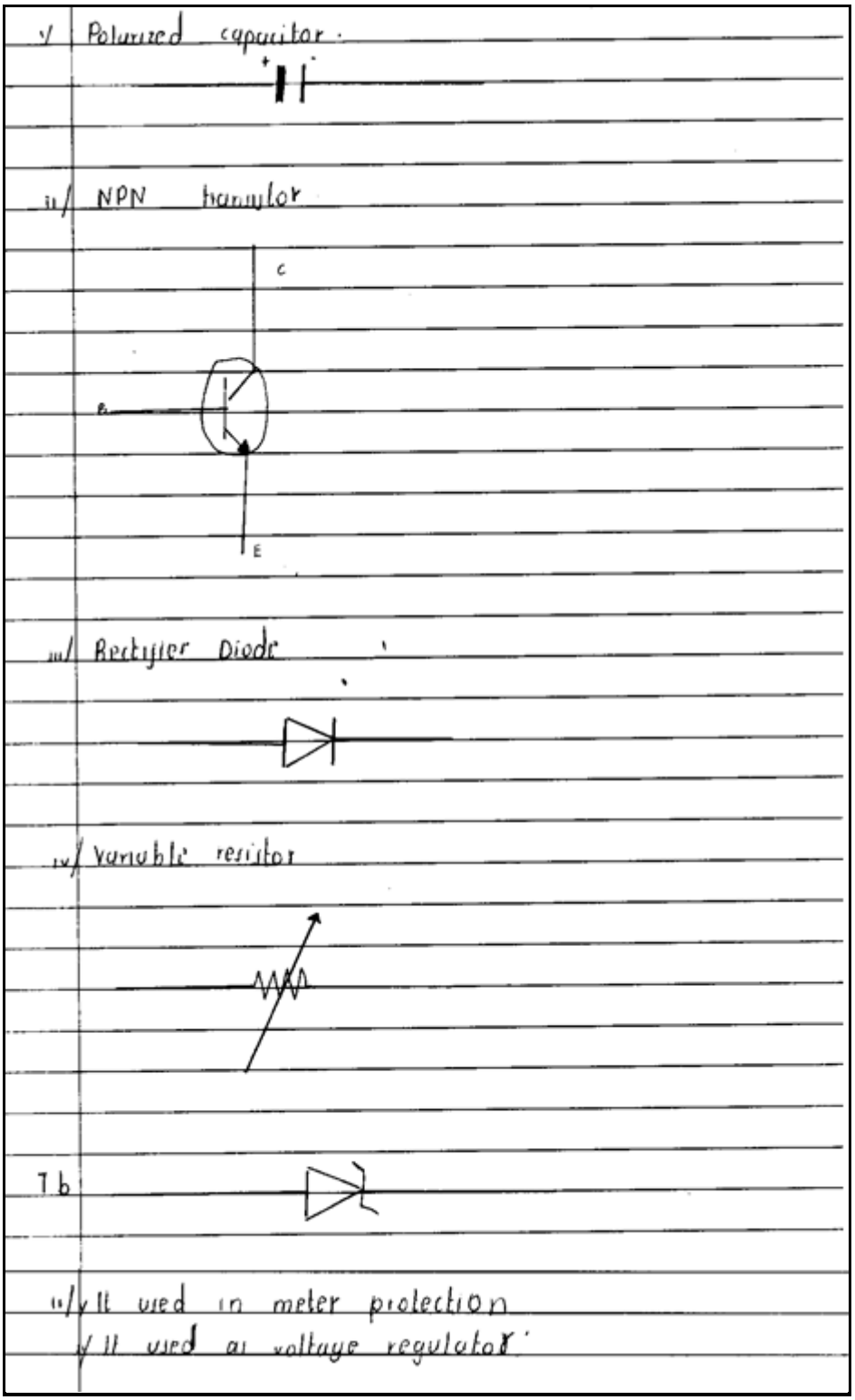


Figure 7: *The Candidates' Performance in Question 7*

The analysis reveals that 136 (69.04%) of the candidates performed well by scoring from 7 to 10 marks out of 10 marks allotted to the question. The candidates correctly identified the component grouped the passive and active components in part (a). They also correctly drew symbols of the damaged components and provided their functions in part (b). Extract 7.1 presents a sample of good responses from the candidate who correctly grouped the component drew their symbols and the damaged components as well as explained use of damaged components.

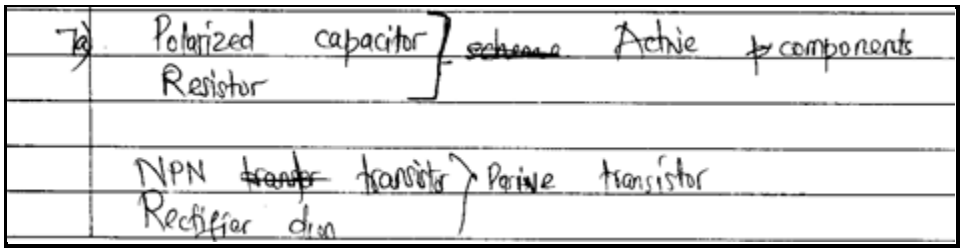


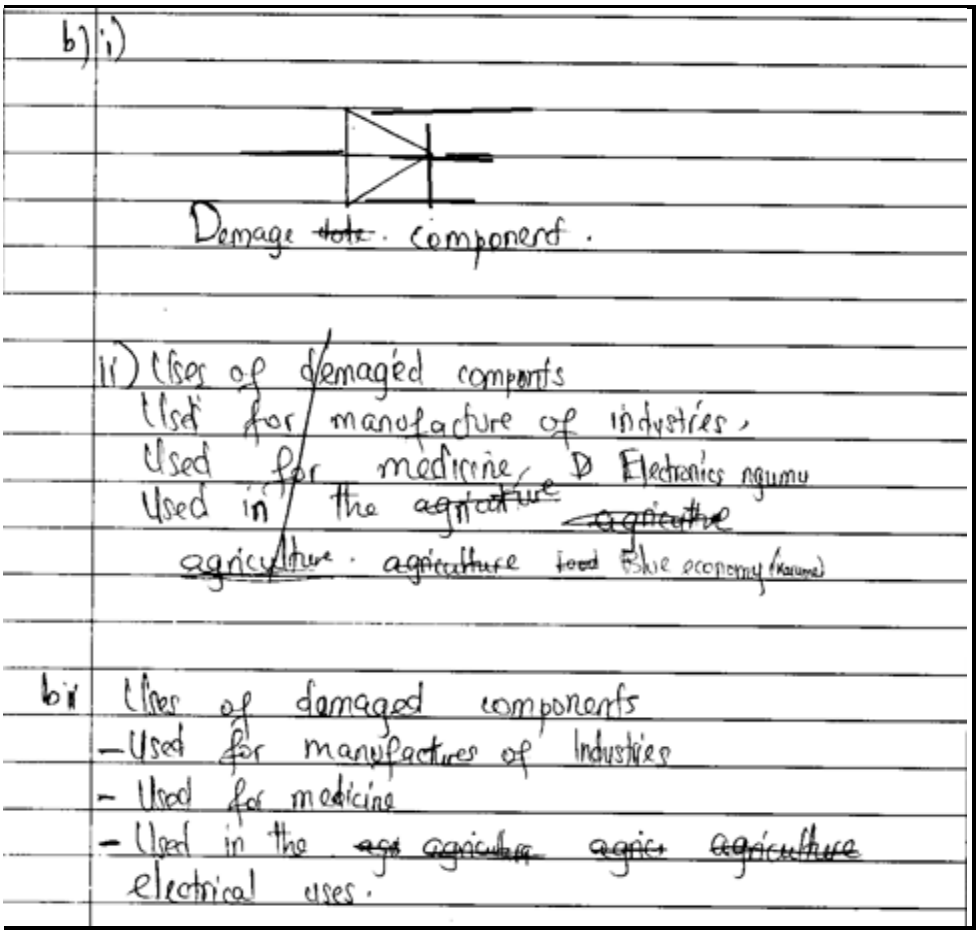


Extract 7.1: A sample of correct responses to Question 7.

Extract 7.1 shows responses from one of the candidates' who correctly grouped the components, drew symbols of the active, passive and damaged components and was able to provide functions of the damaged components.

Despite the overall good performance in this question 7 (3.55%) of the candidates performed poorly. In part (a) candidates failed to know which components are passive and which one are active as a result they interchanged in a place of passive they placed active and vice versa. For example, one candidate wrote capacitor as active component and transistor as passive component. This indicates that the candidate lacked some skills about the topic of electronics components. In part (b) some of the candidates incorrectly drew symbols of the damaged component and failed to state its use. Others drew PN junction diode instead of zener diode. Other candidates drew a varactor diode instead of zener diode and gave wrong use of the damaged component. For instance, one candidate explained that a zener diode is used as a rectifier instead of regulator. Some of the candidates copied some words from the question and use them as responses which imply that they did not understand the question may be due to language barrier. Extract 7.2 shows responses from a candidate who incorrectly grouped the components in (a) and drew incorrect symbols of the damaged component in (b).





Extract 7.2: A sample of incorrect responses to Question 7

Extract 7.2 shows responses from one of the candidates who failed to group the components, incorrectly drew symbols of the damaged component and failed to provide the use of the damaged components.

2.3 SECTION C: STRUCTURED QUESTION

2.3.1 Question 8: Block and Basic Diagrams in Circuit Development

This question intended to asses' candidates' ability to identify the device used to keep steady voltage from fluctuating and how to draw its circuit. The question was:

An electronic system got damaged due to unstable power supply. A technician noticed that the system used electric source direct from TANESCO.

(a) (i) Which device should be used to maintain the stability of the power supply from TANESCO.

(ii) *Draw a labeled circuit diagram of device in (a) showing all of its important elements.*

(b) (i) *Draw a labeled block diagram of a device used in (a).*

(ii) *Explain the function of each block element in (b)(i).*

The analysis shows that 197 (100%) candidates, who sat for this paper, attempted this question and their scores are as follows: 46 (23.35%) candidates scored from 0 to 8.5 marks, 91 (46.19%) candidates scored 9 to 19 marks and 60 (30.46%) of the candidates scored from 19.5 to 30 marks. This data suggests that the performance of the candidates was good since 151 (76.65%) scored average and above. Figure 8 presents the candidates' performance.

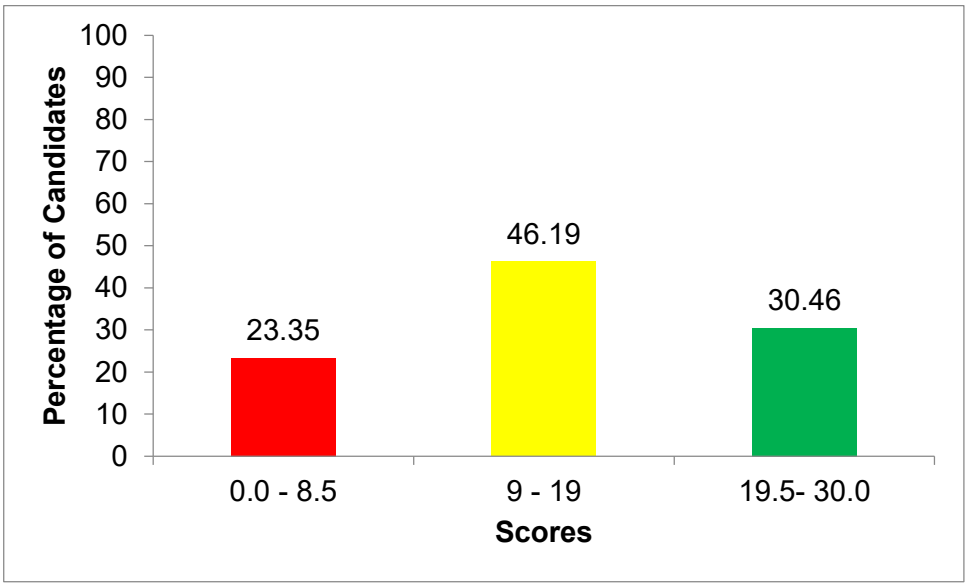
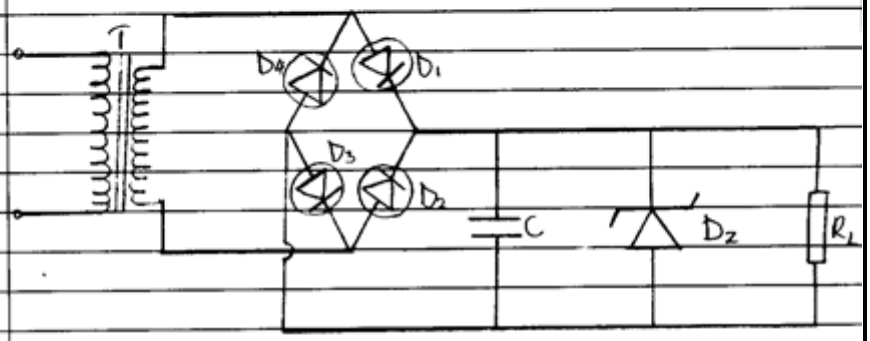


Figure 8: *The Candidates' Performance in Question 8*

The analysis reveals that 60 (30.46%) of the candidates performed well by scoring from 19.5 to 30 marks out of 30 marks allotted to the question. The candidates correctly named the device used to regulate voltage fluctuation and well drew a labelled circuit diagram showing all components in part (a). They also correctly drew the block diagram of the device and provided their functions in each part in part (b). Extract 7.1 presents a sample of good responses from the candidate who correctly named the device, drew the circuit and block diagram and explained their functions.

8. (a)(i) Device that should be used to maintain the power supply from TANESCO is called a DC POWER SUPPLY

(ii) Circuit diagram for device in (a)(i) above is as follow:



input Output

Where

T is transformer

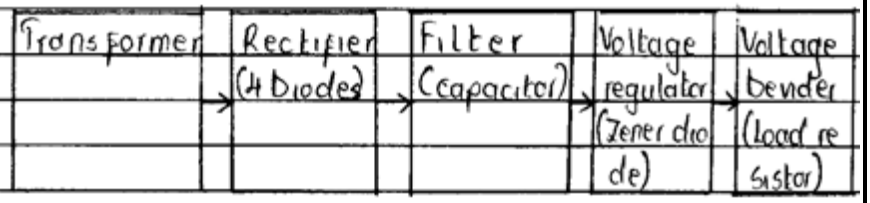
D_1, D_2, D_3 and D_4 are both diodes.

C is a capacitor

D_z is a Zener diode

R_L is a load resistor.

8. b) i) Block diagram of device used in (a) above



(ii) Block of transformer

This block consist of step down transformer which is used to step down AC power from TANESCO supply

(ii) Block of rectifier

This block consist of four diode which are used to change the AC power from ~~TANI~~ transformer to DC power which has small/little flactuation (ripple).

iii) Block of filter

This block consist of capacitor that is used to remove ripples from rectifier output so as to produce steady current.

iv) Stage of voltage regulator

This block consist of zener diode which is used to regulate voltage required for components.

v) Block of voltage devider.

This block consist of load resistor which is used to devide voltage to each component in the system.

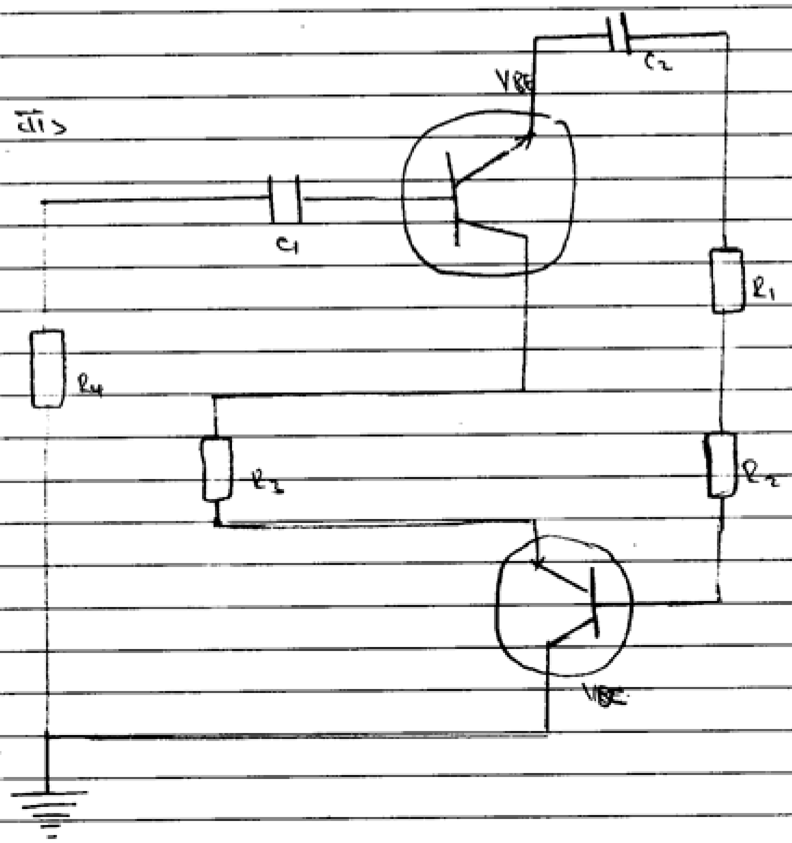
Extract 8.1: A sample of correct responses to Question 8.

Extract 8.1 shows responses from one of the candidates' who correctly named the devices, correctly drew circuit of the device and drew its block diagram and was able to provide functions of the parts of the block diagram.

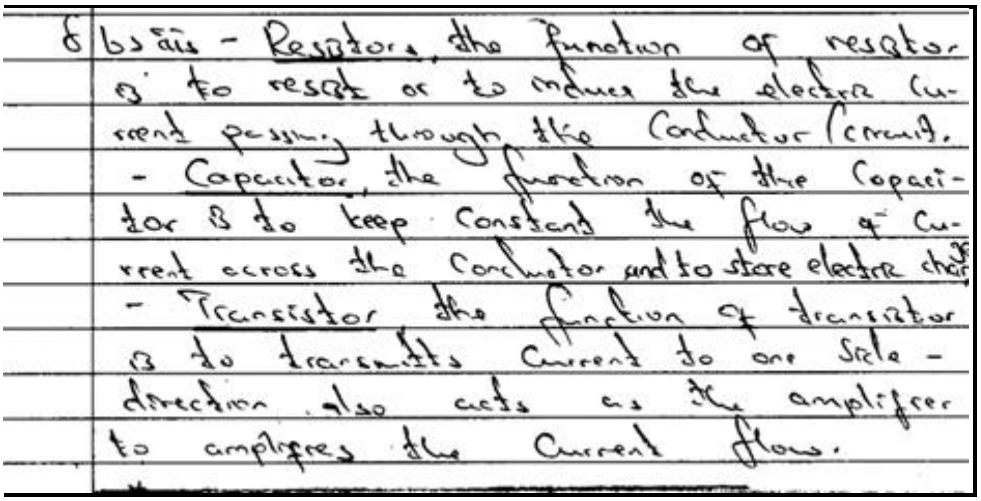
Despite the overall good performance in this question 46 (23.35%) of the candidates performed poorly. These candidates failed to name the device used to regulate the voltage fluctuation. In part (a) the candidates failed to differentiate between device and component used to regulate voltage as result some of them named it as a zener diode instead of regulated power supply. Some candidates drew the bridge rectifier diodes in opposite direction which makes the circuit to behave off state condition. Other candidates drew a zener diode in opposite direction as PN junction diode.
In part (b) candidates interchanged position of blocks in place of rectifier they placed filter. For instance, one candidate explained wrongly the function of filter as he/she said it keep voltage constant instead of removing ripples. Some of the candidates copied some words from the question and use them as their responses. Extract 8.2 shows responses from a candidate who incorrectly grouped the components in (a) and drew incorrect symbols of the damaged component in (b).

8 as is Device used to maintain the stability of the power supply from TANESCO is Multistage Amplifier.

iis



iv R1 - Resistor 1. VBE - Transistor with Common Base Emitter
R2 - Resistor 2
R3 - Resistor 3
R4 - Resistor 4
C1 - Capacitor 1. VBE - Common Base Collector.
C2 - Capacitor 2.



Extract 8.2: A sample of incorrect responses to Question 8

Extract 8.2 shows responses from one of the candidates who failed to draw a circuit diagram of the device and the components, incorrectly explained the function of each block of the device. This implies that the candidate had insufficient knowledge of the application of D.C supplies and amplifiers.

3.0 ANALYSIS OF CANDIDATES' PERFORMANCE PER TOPIC

The analysis of performance in the topics which were assessed in Electronics Draughting subject for the year 2023 indicates that candidates performed well in four topics, and weak in one topic.

The topics that were performed well include *Electronics components schematic symbols (94.25%), Pictorial drawing (89.34%), Block and Basic Diagram in a Circuit Development (76.65%)* and *Logic Diagram (68.02%)*. The good performance in these topics signifies that the candidates had enough knowledge, skills and competence on the concepts tested. Nevertheless, the candidates performed poorly in the sub-topic of *Similar Figures* (13.20%).

The summary of the candidate's performance in each topic is shown in the Appendix.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The performance of the candidates in the Electronics Draughting examination in the year 2023 was generally good. Out of 197 candidates who sat for the paper 177 (89.95%) passed while 20 (10.15%) failed.

The analysis of the candidates' responses depicted a few challenges the candidates faced when responding to the questions. These include the candidates' lack of adequate knowledge in responding to some of the questions and lack of skills on drawing figures. Another weakness observed was the inability of some of the candidates to understand the requirements of the questions which led them to provide irrelevant responses, especially in the question concerning assembled and schematic diagrams.

4.2 Recommendations

In order to improve the performance of the candidates, it is recommended that;

(i) Candidates should do enough exercise and tests, especially on areas of consumer diagrams and mechanical drawings (bolt, nuts and threads). This will strengthen their abilities in those areas.

(ii) Teachers should practice a "competency-based" mode of material delivery in various topics and should ensure that candidates have practical skills. This is important because "practice makes perfect".

(iii) The candidates should be well oriented in the common terms used in composing questions. This will enable them to understand the requirements of the questions.

Appendix

A Summary of Candidates' Performance per Topic in Electronics Draughting Subject in the Year 2023

S/n	Topic	Qn. Number	Percentage of Candidates who scored 30% and above per each Level of performance	Remarks
1	Electronics Components and Schematic Symbols	7	96.45	Good
2	Drawing offices, Block and Basic diagrams in a circuit development, Pictorial drawing, Similar figures, Logic diagrams, Electronic components schematic symbols, International standard Organization (ISO) sheet layout and sketching	1	95.94	Good
3	Electronics Components and Schematic Symbols	2	93.91	Good
4	Electronics Components Schematic Symbols	4	92.39	Good
5	Pictorial Drawing	5	89.34	Good
6	Block and Basic diagrams	8	76.65	Good
7	Logic diagrams	6	68.02	Good
8	Similar Figures	3	13.20	Weak