THE NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

STUDENTS' ITEM RESPONSE ANALYSIS REPORT FOR THE FORM TWO NATIONAL ASSESSMENT (FTNA) 2015

080 ELECTRICAL ENGINEERING

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FOREWORD

The Electrical Engineering Students' Items Response Analysis Report on the Form Two National Assessment (FTNA) for 2015 was written in order to provide feedback to secondary school students and teachers, educational policy makers, and other educational stakeholders, on the students' performance and the challenges faced when attempting questions in this subject.

The examiners have analyzed students' responses for each question and identified some factors including students' inability to interpret the question demand, failure in using correct formulae in solving problems and lack of knowledge and skills in various topics. Each factor is well elaborated by using the attached sample answers that have been extracted from the students' scripts.

The National Examination Council of Tanzania (NECTA) presumes that, the feedback that is provided in this report will enable various educational stakeholders to take appropriate measures in enhancing the students' performance. The report has been concluded with recommendations to secondary school students, teachers, and the Ministry of Education, Science, Technology and Vocational Training.

Moreover, the National Examination Council of Tanzania (NECTA) will appreciate comments and suggestions from teachers, students, parents, and other educational stakeholders, that can be useful in improving future Form Two National Assessments (FTNA).

Finally, the council would like to thank all Examination Officers, Examiners, and all who participated in one way or another to process and analyze the data used in this report.

Dr. Charles E. Msonde
EXECUTIVE SECRETARY

1.0 INTRODUCTION

The Form Two National Assessment (FTNA) 2015 on Electrical Engineering paper consisted of two sections, namely: A and B.

Section A comprised 2 questions which were set from various topics within the syllabus. Question 1 consisted of multiple choice items which comprised of item (i) to (x), while question 2 had parts a, b, c, d and e with short answer items. This question was derived from topics of D.C Circuits, Tools, Magnetism and Electromagnetism and Electrical Symbols. The students were required to answer all questions in section A. Section B consisted of two parts and the students were required to answer all questions in one part depending on the area of their specialization. The first part was based on Electrical Installation and questions in this part were derived from different topics which include: Accessories, Protection, Earthing, Wiring System, Conductor, Insulator and Cables. In the second part of "Electronics, Radio and TV Servicing" the questions were derived from the topics of Electronic Components, Bipolar Junction Transistors, Semiconductors and Power Supplies.

A total of 480 students sat for Form Two National Assessments (FTNA) in Electrical Engineering paper of which 254 students (53%) passed while 226 students (47%) failed.

The analysis of the students' performance in each question was categorized into three grade ranges of scores in percentage-wise as follows: the question was regarded as ***good*** performed if the percentage of students who scored above 30 percent of the total marks allotted, were between 50 – 100 percent. The question was considered to be ***averagely*** performed if the percentage of the students who scored from 30 percent of the total marks and above was between 30 – 49 percent; and ***poorly*** performed if the percentage of those who scored below 30 percent of the total marks were between 0 -29 percent.

The report presents the analysis of the students' item response by indicating the task they were required to do on each question and how they responded. The explanations for the failure of students to perform as expected are given for each question. Some sample answers to the questions have been extracted from the students' scripts and attached to illustrate various responses. On the other hand, the analysis of students' performance on each question was done to illustrate how the students responded in various topics in percentage wise (See appendix) and graphically depicted in Figure 2.

2.0 ANALYSIS OF THE STUDENTS' PERFORMANCE IN EACH QUESTION

2.1 ELECTRICAL ENGINEERING SCIENCE

2.1.1 Question 1: Multiple Choice Items

The question comprised of ten (10) items (i) – (x) extracted from various topics in the prescribed syllabus. Students were required to choose the correct answer from among the given alternatives by writing its letter in the box provided.

A total of 480 students sat for Electrical Engineering paper of which 479 students attempted this question; where by 37 (7.7%) students scored from 0 to 2 out of 10 marks. Another group of 299 (62.3%) students performed averagely as they scored from 3 to 5 marks. The remaining 143 (29.8%) students performed well, in which their score ranged from 6 to 9 marks. However there was one student (0.2%) who did not attempt this question. The general performance of students in this question was good.

The items in which most students failed to select the correct responses were items (iv) and (vii). In item (iv) students were required to choose the correct alternative to the question "Cells are connected in parallel in order to". Most students chose alternative A "increase the voltage available" as the correct answer instead of C "increase the current available". The students failed to differentiate the effect of voltage and current when the cells are connected in series and parallel.

In item (vii) the question was “The combined resistance of two equal resistors connected in parallel is equal to”. The correct answer was alternative A “one half the resistance of one resistor”. Majority chose alternative B “twice the resistance of one resistor” because the word two in the question is the same as twice in alternative B which attracted the students to choose that alternative. The students seemed to lack knowledge on how to calculate the combined resistance of two equal resistors connected in parallel.

On the other hand, other items were moderately answered correctly by the students which indicated that, they had sufficient knowledge on the topics from which the questions were derived. The items that were moderately answered right include (i), (ii), (iii), (v), (vi), (viii) (ix) and (x).

The overall performance on this question is shown in Figure 1.

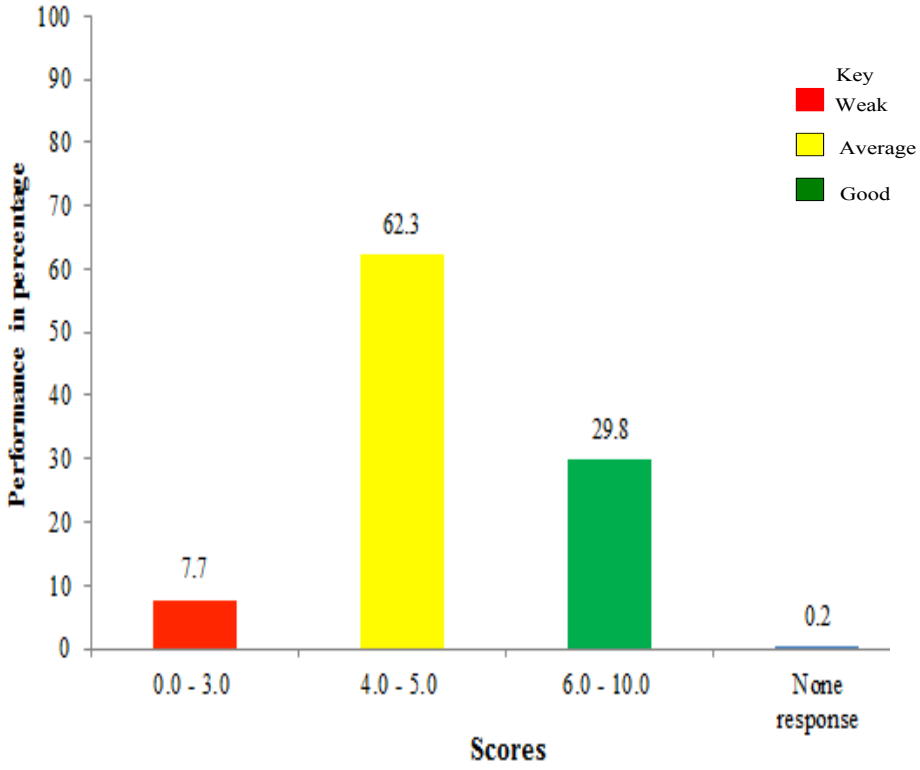
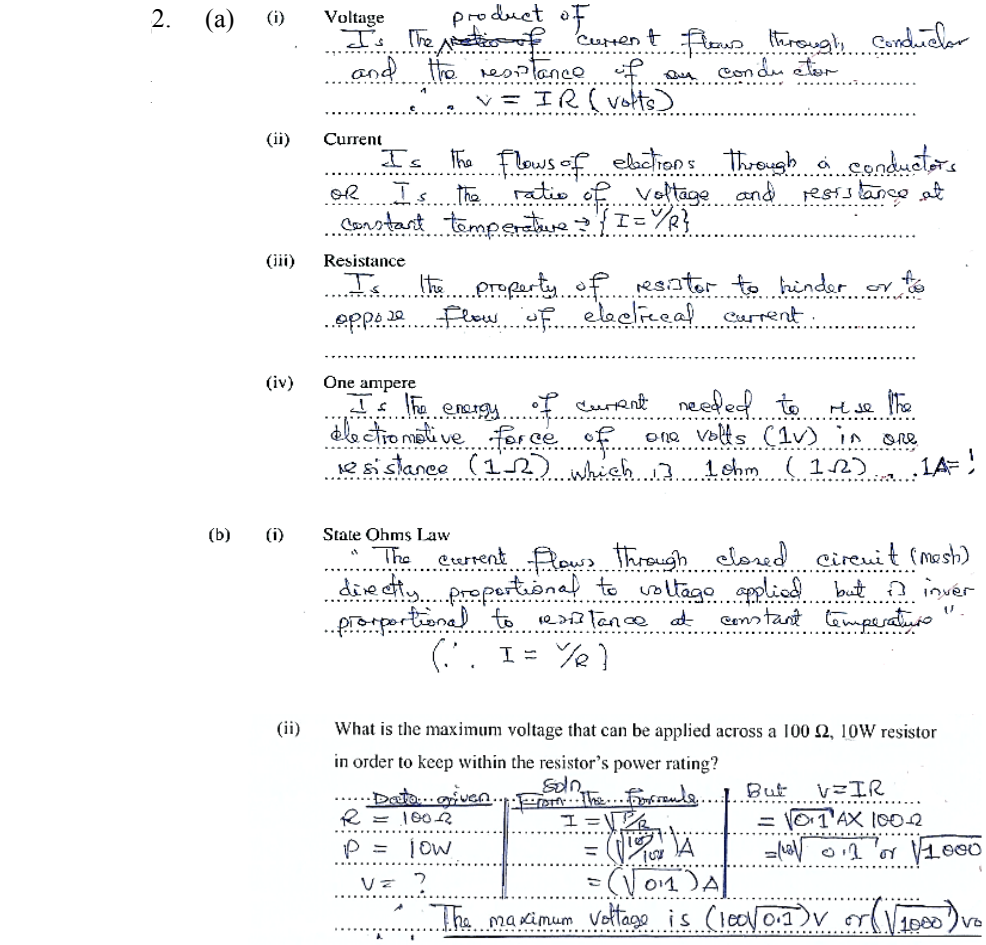


Figure 1: Percentage of Students Scores

2.1.2 Question 2: Extracts from Various Topics

This question was set from four different topics which include: D.C Circuit, Tools, Electromagnetism, Transformer and Electronic symbols. The question consisted of six parts in which part (a) required the students to define 'voltage', 'current', 'resistance' and 'one ampere'. Part (b) required the students to state Ohm's Law and to find the voltage when they have been given R=100 Ω, 10 W. In part (c) students were required to state the application of the given tools which are used in electrical works. Those were 'long nose plier', 'side cutter', 'bench vice', 'files' and 'disordering pump'. Part (d) of the question required the students to state laws of magnetism and part (e) required the students to define self and mutual inductance of the coil. Lastly, in part (f) students were required to draw electrical symbols for air-cored inductor and iron cored inductor.

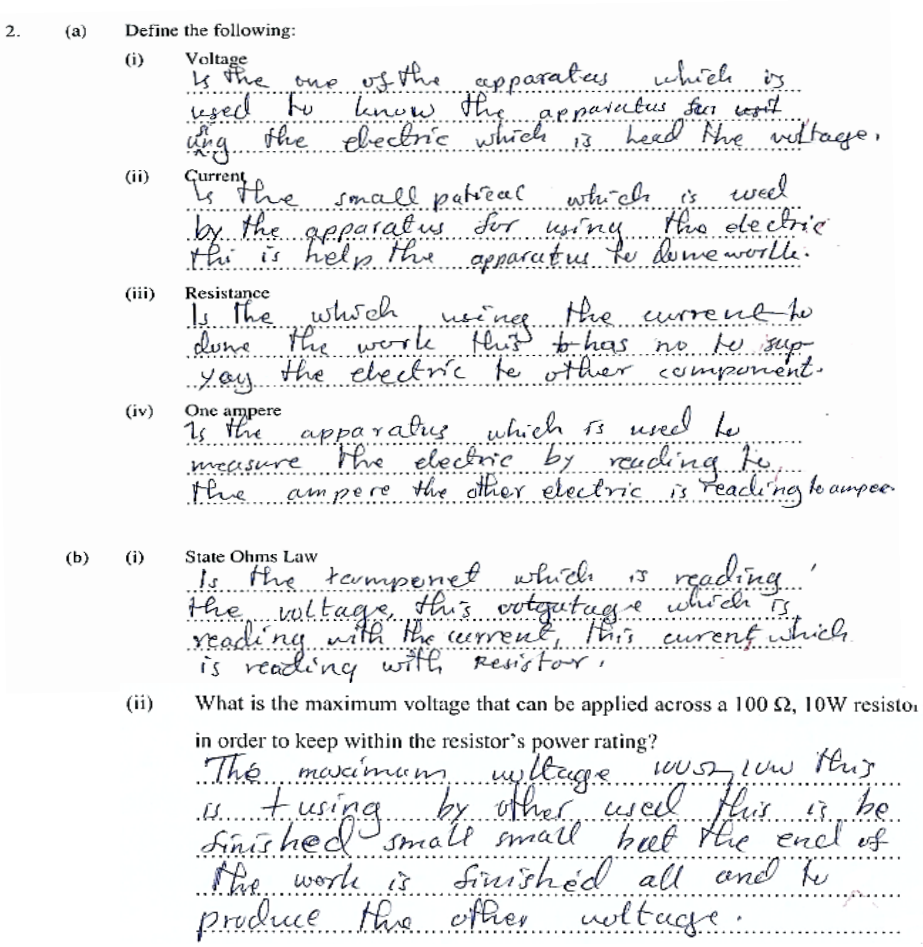
The question was attempted by 479 students of which 182 (37.9.5%) scored from 0 to 11 marks. 177 (36.9%) scored from 12 to 19 marks and the remaining 120 (25.2%) students scored from 20 to 29 marks. Generally, the question was well performed by most of the students (62.1%) because they managed to provide correct answers as they were able to define the given terms and calculate the maximum voltage that can be applied across a 100Ω, 10W resistor in the circuit as per question demand. Extract 2.1 shows a



Extract 2.1 is the sample of good response taken from one of the students' script. The student was able to define the given terms and calculate the maximum voltage that can be applied across a 100 Ω, 10 W resistor in the circuit.

Most of the students who poorly performed applied inappropriate formula for calculating the voltage flowing through the resistor in the circuit. Also some students failed to draw correct electrical symbols for air–cored inductor and iron cored inductor. It seems that, many students lacked knowledge on application of various electric tools and equipment. Extract 2.2 shows a sample of poor response from one of the students' script.

Extract 2.2



2. (a) Define the following:

(i) Voltage
Is the one of the apparatus which is used to know the apparatus for work ing the electric which is lead the voltage.

(ii) Current
Is the small patreac which is used by the apparatus for using the electric this is help the apparatus to done worlle.

(iii) Resistance
Is the which using the current to done the work this to has no to sup yay the electric to other component.

(iv) One ampere
Is the apparatus which is used to measure the electric by reading to. the ampere the other electric is reading to ampere

(b) (i) State Ohms Law
Is the tampenet which is reading the voltage, this voltagtage which is reading with the current, this curent which is reading with resistor.

(ii) What is the maximum voltage that can be applied across a 100 Ω, 10W resisto in order to keep within the resistor's power rating?
The maximum voltage 100Ω 10w this is tusing by other used this is be finished small small heat the end of the work is finished all and to produce the other voltage.

Extract 2.2 is the sample of a poor response from a student who gave wrong definitions of the given terms.

2.2 ELECTRICAL INSTALLATION

2.2.1 Question 3: Cable, Conductors and Insulators, Accessories, Earthing and Wiring Systems

This question had five parts: (a), (b), (c), (d) and (e). The question was set from the topics of Cable, Conductor and Insulator, Accessories, Earthing and Wiring System.

In Part (a) the students were required to: define three categories of material used in electricity and explain in short the major function of insulator; and mention two ways of cable protection used in installation works. In part (b) students were required to explain in short the function of lamp holders and plugs and sockets outlets. Part (c) of the question required the students to explain briefly how to perform the basic test of the installation. Part (d) asked the students to state six points that should be considered in selecting the wiring system for a particular installation. In part (e) the question needed the students to name two common methods of wiring.

The question was attempted by 353 students of which 242 (68.6%) scored from 0 to 8 marks. Among the rest, 95 students which is equal to 26.9 percent scored from 9 to 14 marks, while 116 students (13%) scored from 15 and 19 marks.

The general performance of this question was average. Some students failed to provide the correct answers. They were unable to categorize material mainly used in electricity, failed to explain how basic test of the installation is performed and others failed to mention common method of wiring. This shows that, most of them lacked knowledge on earthing and power system. Extract 3.1 is the sample of poor responses.

Extract 3.1

3. (a) (i) Define three categories of materials mainly used in electricity.

Electrician

Engineering

(ii) What is the major function of insulation?

Generation

Transmission

Distribution

Utilization

(iii) Mention two ways of mechanically cable protection used in installation works.

Single core cable

Twin core cable

(b) What is the function of each of the following accessories?

(i) Lamp holders.

bulb in the produce light in the flow of electricity Current

(ii) Plugs and socket-outlets.

(c) Briefly explain how you can perform the basic test of the installation to earth.

wire

Bulb

Electric measurement

Ampere

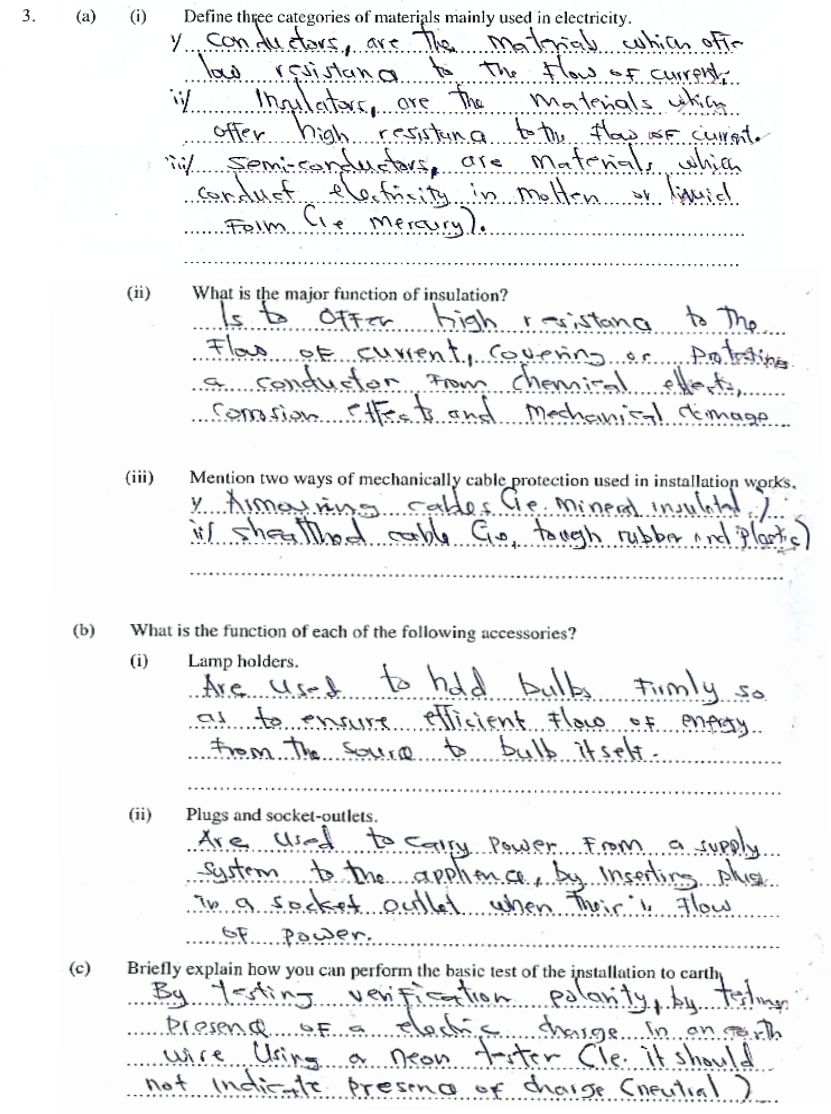
voltage

wet measure

Extract 3.1 shows a sample of a response of a student who failed to answer correctly all parts of the question.

Few students were able to categorize materials that are mainly used in electricity and explained how basic test of the installation is performed as seen in extract 3.2.

Extract 3.2



3. (a) (i) Define three categories of materials mainly used in electricity.

i. Conductors, are the materials which offer low resistance to the flow of current.

ii. Insulators, are the materials which offer high resistance to the flow of current.

iii. Semiconductors, are materials which conduct electricity in molten or liquid form (i.e mercury).

(ii) What is the major function of insulation?

Is to offer high resistance to the flow of current, covering or Putting a conductor from chemical effects, corrosion effects and mechanical damage

(iii) Mention two ways of mechanically cable protection used in installation works.

i. Armouring cables (i.e. Mineral insulated)

ii. Sheathed cable (i.e. tough rubber and plastic)

(b) What is the function of each of the following accessories?

(i) Lamp holders.

Are used to hold bulb firmly so as to ensure efficient flow of energy from the source to bulb itself.

(ii) Plugs and socket-outlets.

Are used to carry power from a supply system to the appliance, by inserting plug in a socket outlet when there is flow of power.

(c) Briefly explain how you can perform the basic test of the installation to earth.

By testing verification polarity, by testing presence of a electric charge in an earth wire using a neon tester (i.e. it should not indicate presence of charge (neutral))

Extract 3.2 is an example of a student's response that was able to categorize materials that are mainly used in electricity and explain how basic test of the installation is performed.

2.2.2 Question 4: Battery and Cells

This question requested the students to: (a) define the term 'Cell' as applied in chemical effects of electrical current, (b) mention two common types of cells, (c) give three advantages of using Le'clanche dry cell and part (d) use the given information to calculate the steady current in the circuit and the potential difference of the cell.

A total of 347 students attempted this question of which 193 (55.6%) scored from 0 to 3 marks, whereas 102 students (29.4%) scored averagely from 4 to 6 marks and the remaining 52 (15%) scored from 7 to 12 marks.

Despite the fact that, the question was clear and based within the scope of the students' level, most of the students did not attempt it satisfactorily. Their major weakness noted was the demonstration of poor computational skills. Average performance in this question suggests that students lacked knowledge and skills in tackling questions related to this topic. Extract 4.1 is a sample of poor response.

Extract 4.1

4. (a) Define "Cell" as applied in chemical effects of electrical current.

Dry ~~cell~~ cell.

(b) Mention two common types of cells.

(i) Dry cell

(ii) Wet cell

(c) Give three advantages of using Laclanhe' cell "dry" type.

(i) To produce e.m.f faster

(ii) Have high qualit

(iii) Can produce high voltage

(d) A La'clanche wet cell, with e.m.f 1.5 V, and internal resistance 1 Ω, supplies current to a single-stroke electric bell of resistance 5 Ω. Calculate the steady current in the circuit and the potentials difference of the cell.

current = volt/Resistance

= 1.5/10 = 15/50 = 15/50 10 = 0.3

∴ Current = 0.3 Amphere

Extract 4.1 is a sample of poor response from a student's script who failed to provide the correct definition of a cell, mention types of cell, give advantages of La'clanche cell and to calculate the steady current and potential difference of the cell as demanded in parts (a), (b), (c) and (d) respectively.

Although most of the students averagely performed in this question, there were few students who managed to provide correct answers as they were able to define the term 'cell', mention two types of cells, and give three advantages of using La'clanche cell as seen in extract 4.2.

Extract 4.2

4. (a) **Define "Cell" as applied in chemical effects of electrical current.**

Cell is the electric device used to convert chemical energy stored on solution to electrical energy.

Example dry cell.

(b) **Mention two common types of cells.**

i. Primary cell and

ii. Secondary cell.

(c) **Give three advantages of using La'clanche cell "dry" type.**

i. Are portable hence can be used at different place such in television cars, torch among others.

ii. Can be rechargable hence can not easy perish.

iii. It easy to be recycled.

Extract 4.2 shows a sample of student's response that was able to define the term "Cell", mention two types of cells and give three advantages of using La'clanche cell.

2.2.3 Question 5: Earthing and Protection

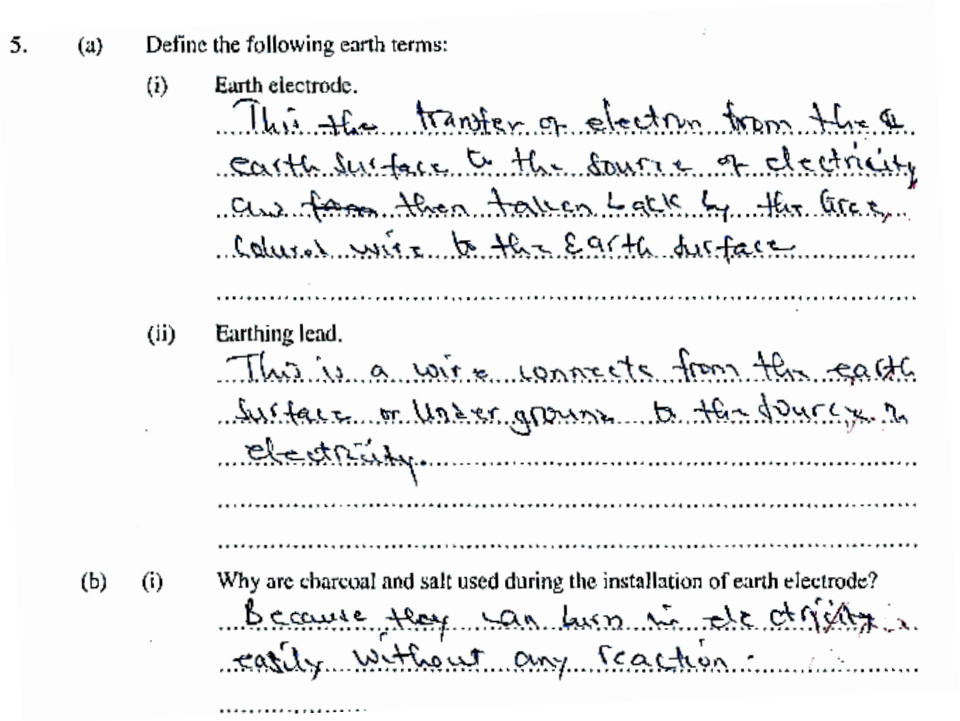
The question consisted of two parts and was set from two topics of earthing and protection. In part (a) the students were required to define 'earth electrode' and 'earthing lead'. In part (b) students were required to (i) give reasons as to why the charcoal and salt are used during the installation of earth electrode, (ii) state two factors that have to be considered in determining the size of a fuse wire in installation and (iii) state two kinds of protection that are offered by a fuse.

Out of 335 students who attempted the question, 249 (74.3%) scored from 0 to 2 marks. 49 (14.6%) students scored from 3 to 5 marks and the remaining 37 (11%) students scored from 6 to 9

marks. This was the most poorly performed question as most of the students who attempted this question scored below average.

Most of them failed to give the correct definitions of the terms asked and state factors to be considered when determining the size of the fuse. Also they could not state the kinds of protection that are offered by a fuse. Extract 5.1 shows a sample of poor response provided by one of the students.

Extract 5.1


5. (a) Define the following earth terms:

(i) Earth electrode.

This the transfer of electron from the earth surface to the source of electricity and from then taken back by the green coloured wire to the earth surface

(ii) Earthing lead.

This is a wire connects from the earth surface or Under ground to the source of electricity.

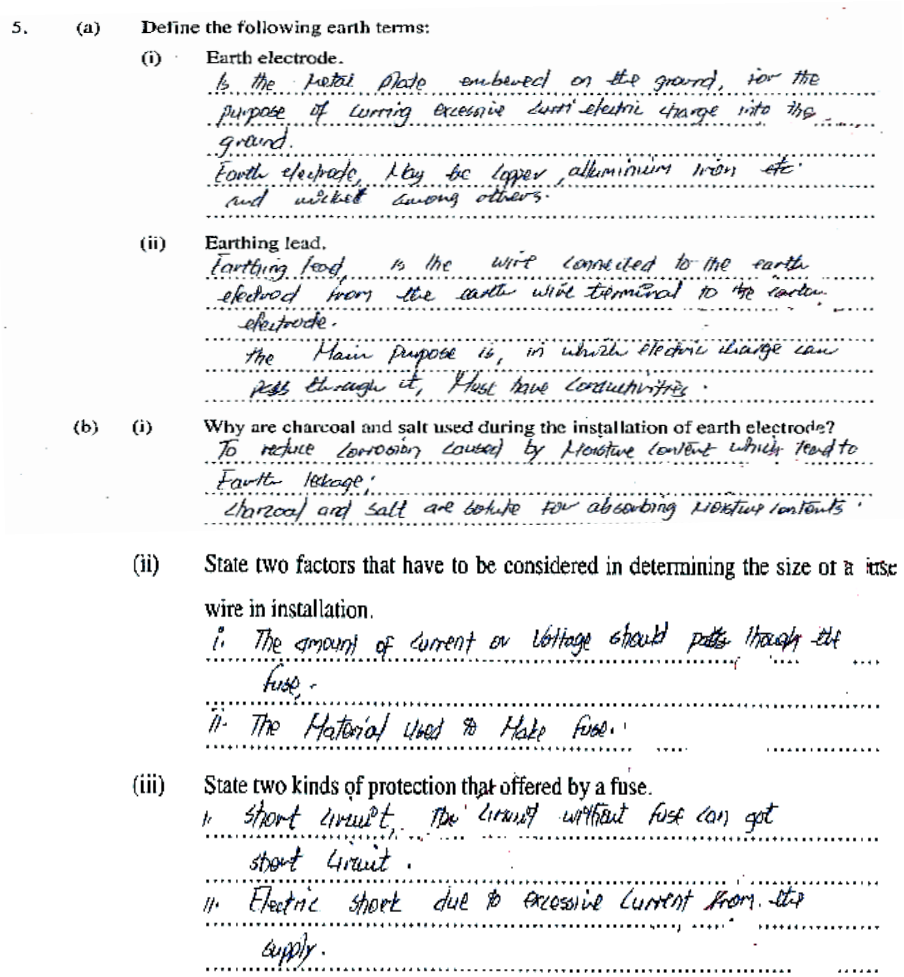
(b) (i) Why are charcoal and salt used during the installation of earth electrode?

Because they can burn in the electricity easily without any reaction.

Extract 5.1 is a sample of a poor response from a script of a student who failed to give the correct definitions of the terms asked.

On the other hand, few students performed well in this question because they were capable of defining clearly most of the given terms as well as giving reasons as to why charcoal and salt are used during the installation of earth electrodes. Extract 5.2 is an example of good response from one of the student's script.

Extract 5.2



5. (a) Define the following earth terms:

(i) Earth electrode.

Is the metal plate embeded on the ground, for the purpose of turning excessive curr electric charge into the ground.

Earth electrode, May be Copper, alluminium iron etc and nickel among others.

(ii) Earthing lead.

Earthing lead, is the wire connected to the earth electrod from the earth wire terminal to the earth electrode.

the Main purpose is, in which electric charge can pass through it, Must have conductivities.

(b) (i) Why are charcoal and salt used during the installation of earth electrode?

To reduce Corrosion caused by Moisture content which lead to Earth leakage.

Charcoal and salt are solute for absorbing Moisture contents.

(ii) State two factors that have to be considered in determining the size of a fuse wire in installation.

i. The amount of current or voltage should pass through the fuse.

ii. The Material used to Make fuse.

(iii) State two kinds of protection that offered by a fuse.

i. short circuit. the circuit without fuse can get short circuit.

ii. Electric short due to excessive current from the supply.

Extract 5.2 is a sample of a response from a script of a student who managed to give the correct definitions of the terms asked, state factors considered to determine the size of the fuse and state two kinds of protection that are offered by a fuse.

2.3 ELECTRONICS, RADIO AND TV SERVICING

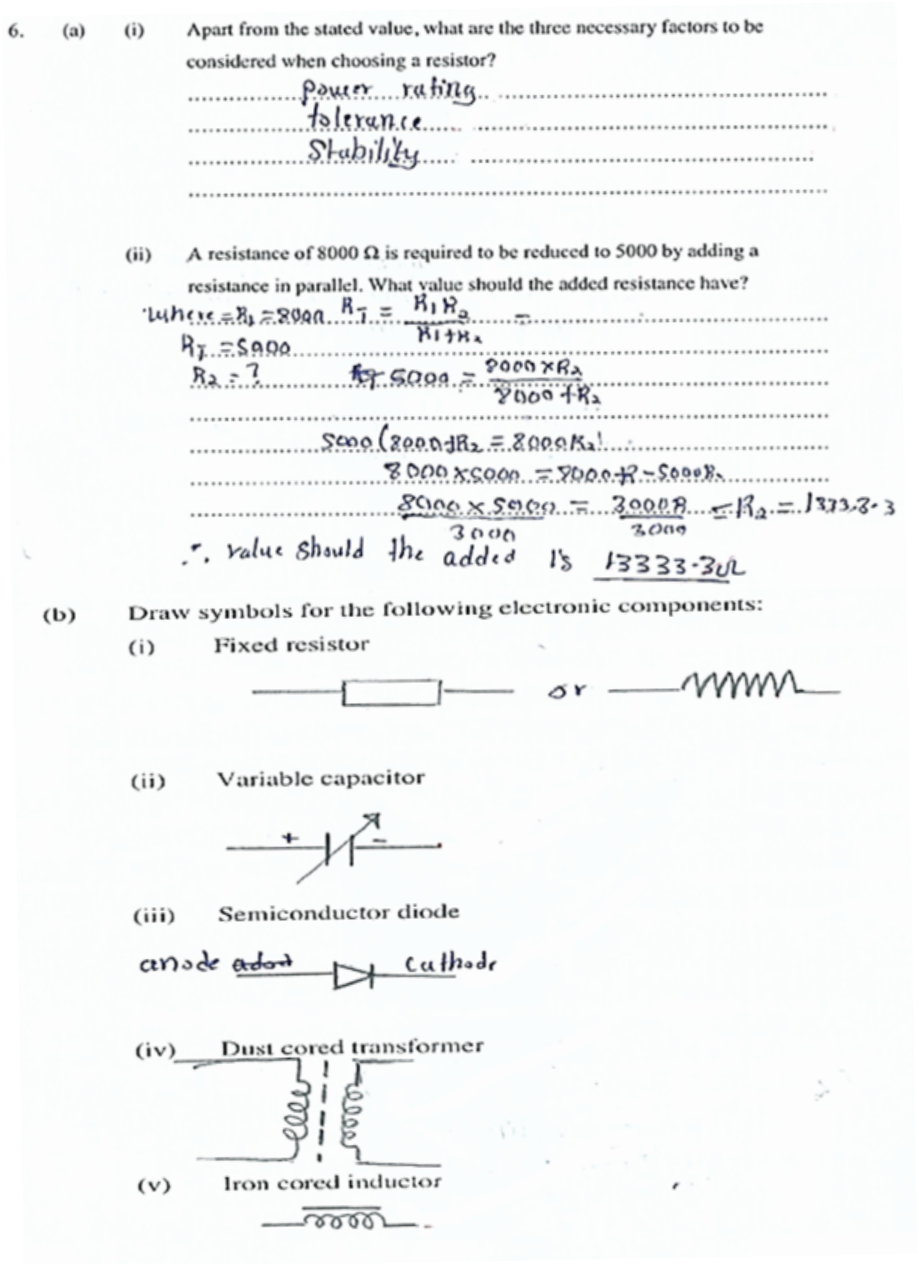
2.3.1 Question 6: Electronic Components

The question was derived from the topic of electronic components. The question consisted of parts (a) and (b). In part (a) the students were required to: (i) mention three necessary factors to be considered when choosing a resistor; (ii) calculate the added resistance when 8000 Ω is required to be reduced to 5000 Ω by adding a resistance in parallel. In part (b) students were required to draw symbols for: (i) fixed resistor (ii) variable resistor (iii) semiconductor diode (iv) dust cored transformer and (v) iron cored inductor.

This question was attempted by 122 students of which 28.7 percent scored 0 to 4 marks, 48.4 percent scored from 5 to 9 marks, other 13.9 percent scored from 10 to 15 marks and the remaining 9 percent scored from 16 to 20 marks.

Generally, the performance for this question was good because 67.2 percent of the students scored above average from 6 to 20 marks out of 20 marks. Most students managed to draw symbols for the given electronic components in part 6 (b). However, there were few students who failed to use the appropriate formula in calculating the value of the resistance that should be added to reduce 8000 Ω to 5000 Ω as requested in part 6 (a) (ii). Extract 6.1 presents a sample of good response from one of the students' script.

Extract 6.1



6. (a) (i) Apart from the stated value, what are the three necessary factors to be considered when choosing a resistor?

power rating
tolerance
Stability

(ii) A resistance of 8000 Ω is required to be reduced to 5000 by adding a resistance in parallel. What value should the added resistance have?

Where $R_1 = 8000$, $R_T = \frac{R_1 R_2}{R_1 + R_2}$
$R_T = 5000$
$R_2 = ?$
$5000 = \frac{8000 \times R_2}{8000 + R_2}$
$5000(8000 + R_2) = 8000R_2$
$8000 \times 5000 = 8000R - 5000R$
$\frac{8000 \times 5000}{3000} = \frac{3000R}{3000} \Rightarrow R_2 = 13333.3$
∴ value should the added is 13333.3Ω

(b) Draw symbols for the following electronic components:

(i) Fixed resistor

or

(ii) Variable capacitor

(iii) Semiconductor diode

anode cathode

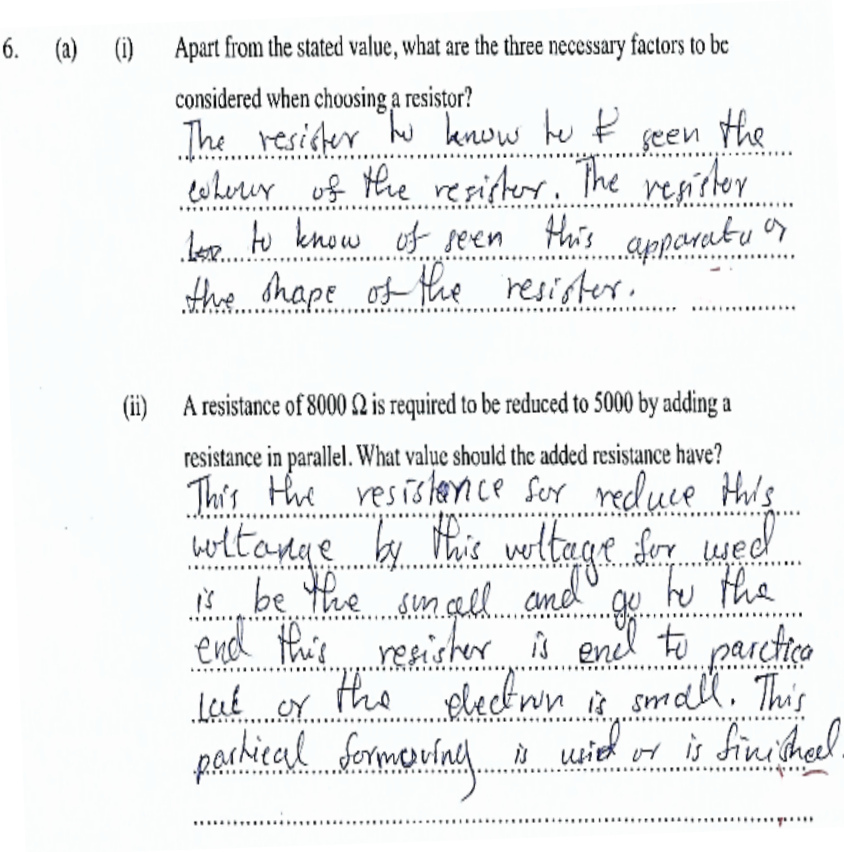
(iv) Dust cored transformer

(v) Iron cored inductor

Extract 6.1 is the sample of a good response from a student's script that was able to use the appropriate formula in calculating the added resistance. The student managed also to draw symbols for the given electronic component.

Most of the students who scored below 5 marks failed to mention three factors to be considered when choosing a resistor as well as to recall and apply the correct formula in calculating the added resistance as required in parts (a) (i) and (ii) of the question respectively. See Extract 6.2.

Extract 6.2



6. (a) (i) Apart from the stated value, what are the three necessary factors to be considered when choosing a resistor?

The resister to know to ₹ seen the colour of the resister. The resister to know of seen this apparatus or the shape of the resister.

(ii) A resistance of 8000 Ω is required to be reduced to 5000 by adding a resistance in parallel. What value should the added resistance have?

This the resistance for reduce this voltage by this voltage for used is be the small and go to the end this resister is end to partica lat or the electron is small. This partical formoving is used or is finished.

Extract 6.2 shows the sample of poor response of a student who failed to: mention three necessary factors to be considered when choosing a resistor and calculate the added resistance.

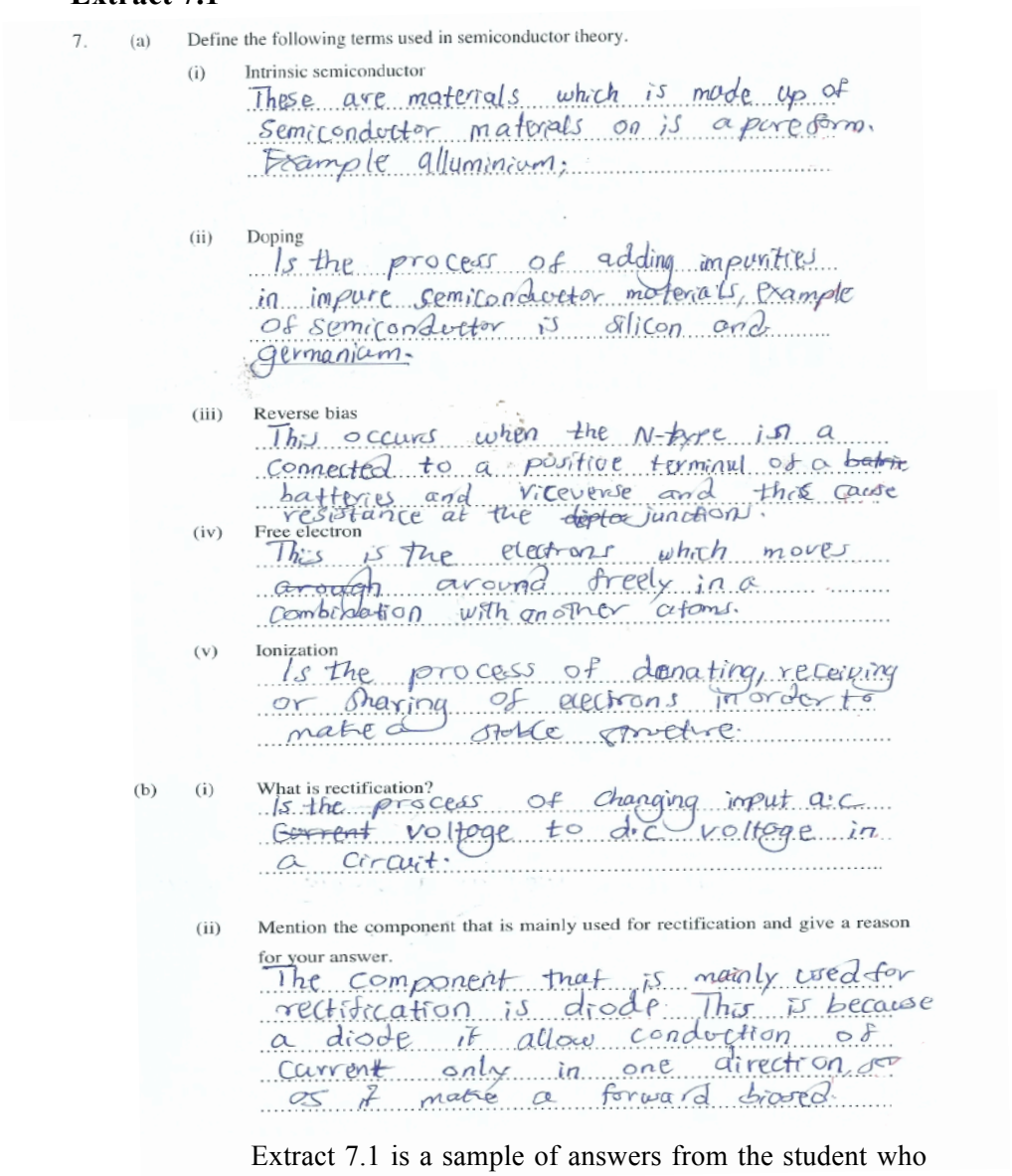
2.3.2 Question 7: Semiconductors

This question consisted of two parts, (a) and (b). In part (a) students were required to define the terms: (i) Intrinsic semiconductor, (ii) Doping (iii) Reverse bias (iv) Free electrons and (v) Ionization, as used in semiconductor theories. In part (b) students were required to give the meaning of "rectification" and mention the component that is mainly used for rectification.

A total of 122 students attempted this question of which 52.5 percent scored from 0 to 5 marks, 35.2 percent scored from 6 to 10 marks and the remaining 12.3 percent scored from 11 to 15 marks. Generally, the performance of this question was average because 47.5 percent of the students scored from 6 to 15 marks out of 16 marks allotted for this question.

Those who scored from11 to15 marks were able to define the given terms as used in semiconductor theories. They were also able to give the meaning of "rectification" and mentioned the component that is mainly used for rectification as seen in extracts 7.1.

Extract 7.1



7. (a) Define the following terms used in semiconductor theory.

(i) Intrinsic semiconductor

These are materials which is made up of semiconductor materials on is a pure form. Example alluminium.

(ii) Doping

Is the process of adding impurities in impure semiconductor materials, example of semiconductor is silicon and germanium.

(iii) Reverse bias

This occurs when the N-type is a connected to a positive terminal of a ~~batte~~ batteries and viceverse and this cause resistance at the ~~diode~~ junction.

(iv) Free electron

This is the electrons which moves ~~arough~~ around freely in a combination with another atoms.

(v) Ionization

Is the process of donating, receiving or sharing of electrons in order to make a stable structure.

(b) (i) What is rectification?

Is the process of changing input a.c ~~Current~~ voltage to d.c voltage in a circuit.

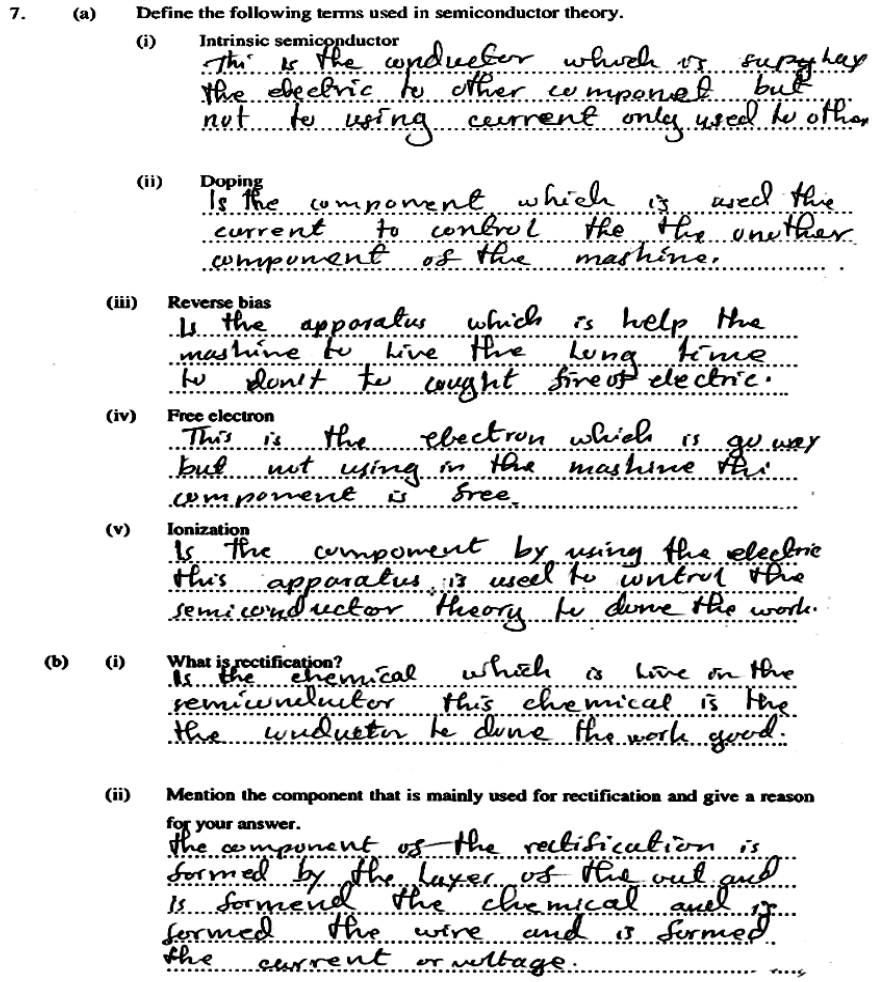
(ii) Mention the component that is mainly used for rectification and give a reason for your answer.

The component that is mainly used for rectification is diode. This is because a diode if allow conduction of current only in one direction, or as if make a forward biased.

Extract 7.1 is a sample of answers from the student who was able to provide correct definitions for the given terms used in semiconductor theories. The student managed also to give the meaning of "rectification" and mention the component that is mainly used for

On the other hand, students who scored from 0 to 5 failed to provide the correct definitions for the given terms. They also failed to give the correct meaning of the term rectification and mention the component that is mainly used for 'rectification'. Those students lacked knowledge on semiconductors. Extract 7.2 illustrates this case.

Extract 7.2



7. (a) Define the following terms used in semiconductor theory.

(i) Intrinsic semiconductor
This is the conductor which is supply the electric to other component but not to using current only used to oth...

(ii) Doping
Is the component which is used the current to control the the onether component of the machine.

(iii) Reverse bias
Is the apparatus which is help the machine to live the long time to donot to caught fire of electric.

(iv) Free electron
This is the electron which is go way but not using in the machine the component is free.

(v) Ionization
Is the component by using the electric this apparatus is used to control the semiconductor theory to done the work.

(b) (i) What is rectification?
Is the chemical which is live on the semiconductor this chemical is the the conductor to done the work good.

(ii) Mention the component that is mainly used for rectification and give a reason for your answer.
the component of the rectification is formed by the layer of the coil and is formed the chemical and is formed the wire and is formed the current or voltage.

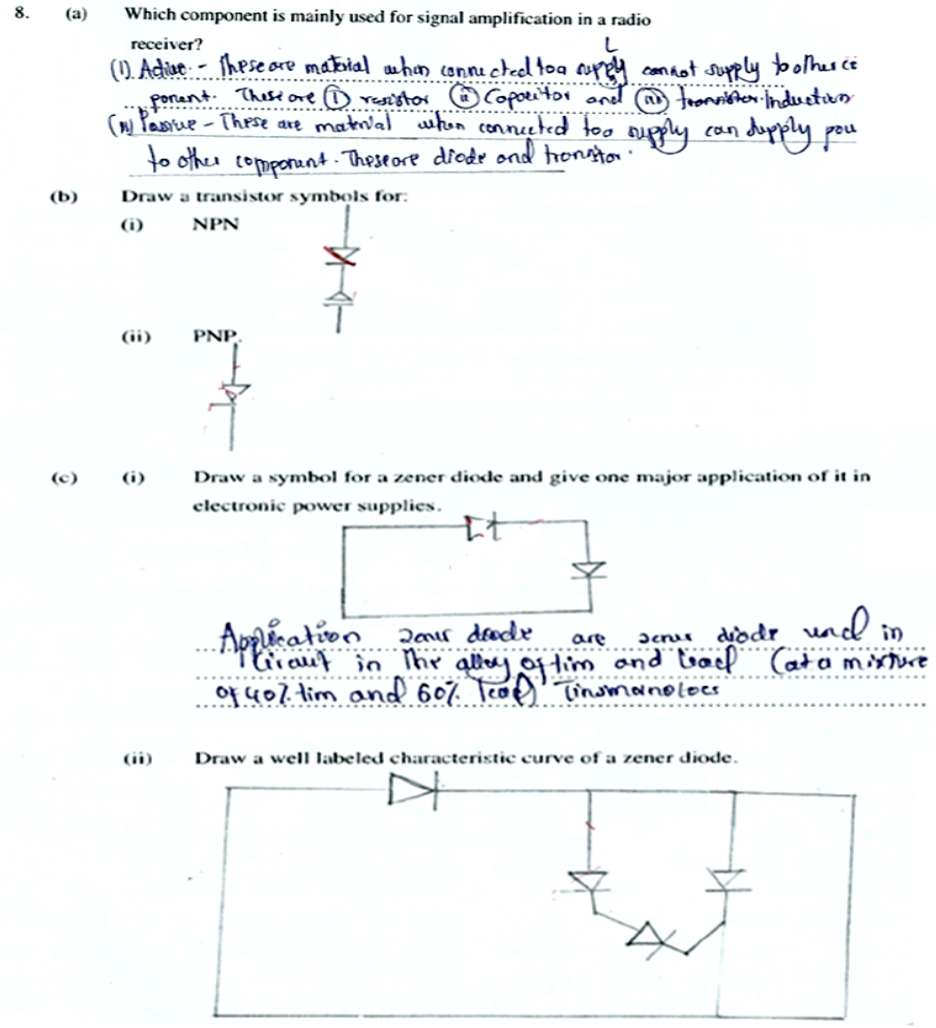
Extract 7.2 is a sample of a poor response from a student's script that was not able to provide correct definitions of the given terms. The student failed also to give the correct meaning of the term "rectification" as well as mentioning the component that is mainly used for rectification.

2.3.3 Question 8: Bipolar Junction Transistors (BJTs) and Power Supplies

This question comprised of three parts namely: (a), (b) and (c). In part (a) the question required the students to mention the mainly used component for signal amplification in a radio receiver. In part (b) students were required to draw transistor symbols for NPN and PNP. In part (c) students were required to draw a symbol for Zener diode and give its major application in electronic power suppliers and finally draw a well labeled characteristics curve of a Zener diode.

The question was attempted by 120 students of which 52.5 percent scored from 0 to 4 marks; 33.3 percent scored from 5 to 8 marks; and the rest 14.2 percent scored from 9 to 12 marks. This question was averagely performed because 47.5 percent of the students who attempted it managed to score from 5 to 12 out of 14 marks. Students who poorly performed failed to mention the component which is mainly used for signal amplification in a radio receiver, and draw the correct transistor symbols for NPN and PNP and a symbol for Zener diode. They also failed to give a major application of Zener diode in electronic power supplies. Extract 8.1 illustrates the situation.

Extract 8.1


8. (a) Which component is mainly used for signal amplification in a radio receiver?

(I) Active - These are material when connected too supply cannot supply to other component. These are (i) resistor (ii) Capacitor and (iii) transistor. Inductor

(II) Passive - These are material when connected too supply can supply pow to other copponent. These are diode and transistor.

(b) Draw a transistor symbols for:

(i) NPN

(ii) PNP

(c) (i) Draw a symbol for a zener diode and give one major application of it in electronic power supplies.

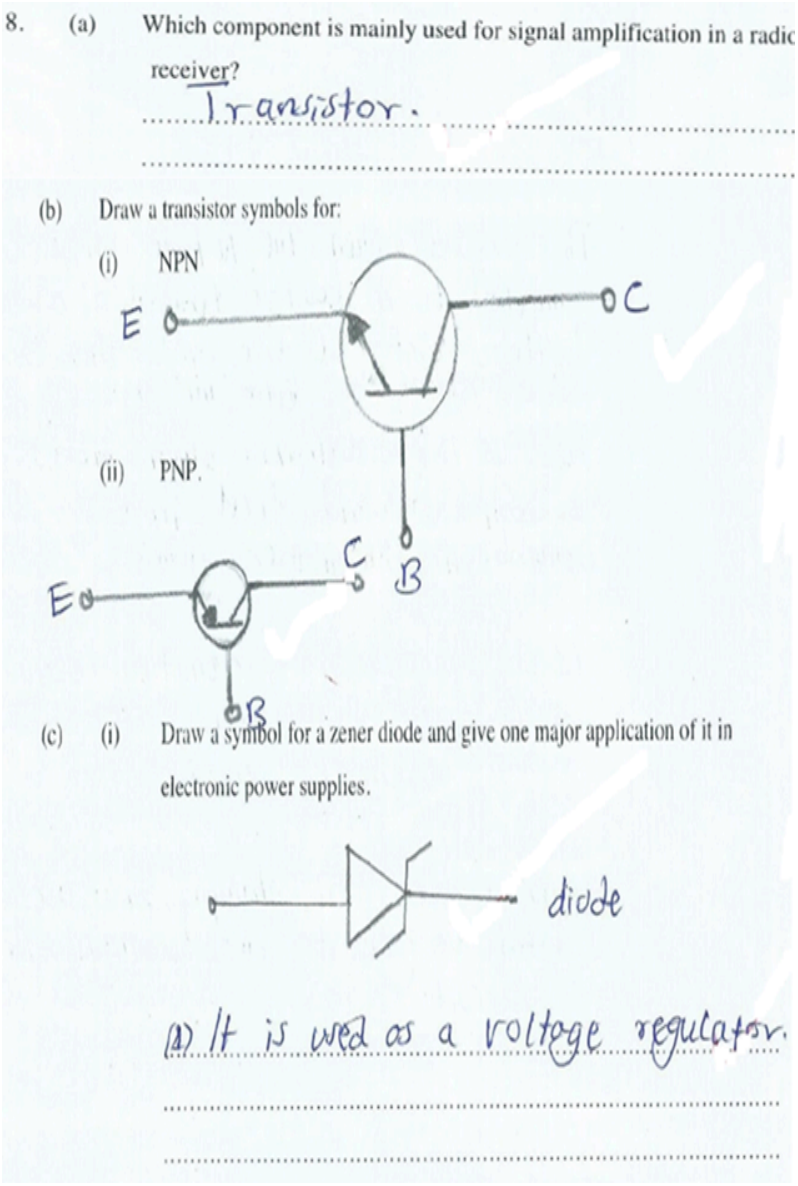
Application Zener diode are zener diode used in circuit in the alloy of tin and lead (at a mixture of 40% tin and 60% lead) tinsmanolocs

(ii) Draw a well labeled characteristic curve of a zener diode.

Extract 8.1 is a sample of the student's poor response who mentioned wrong electronic component which is mainly used for signal amplification in a radio receiver, also drew incorrectly the symbols for NPN and PNP transistors as well as Zener diode.

However, there were students who were capable of providing good responses as per question's demand. Most of the students were able to mention the electronic component which is mainly used for signal amplification in a radio receiver, drew symbols for NPN and PNP transistors as well as symbol for a Zener diode with its major application in electronic works as seen in extract 8.2.

Extract 8.2



Extract 8.2 is a sample of the student's good response who managed to mention the electronic component which is mainly used for signal amplification in a radio receiver, and draw symbols for NPN and PNP transistors as well as symbol for a Zener diode with its major application in electronic works.

3.0 SUMMARY ON THE STUDENTS' PERFORMANCE IN EACH TOPIC

Analysis of topics which were assessed in Electrical Engineering paper 2015 was clearly done. The analysis revealed that most of students were able to perform well in various topics within the paper. However, there were some topics on which s were either performed averagely or poorly.

The analysis of the students' items response shows that, **three** questions had good performance, **four** questions had average performance and **one** question was poorly performed. The students had good performance in question 1, 2, and 6. Question one and two were set from *various topics* while question six was set from the topic of *"Electronic Components"*. The averagely done questions include 3, 4, 7 and 8 which were set from the topics of *"Cable, Conductor and Insulator, Accessories, Earthing and Wiring System", "Battery and Cells", "Semiconductors"* and *"Bipolar Junction Transistors and Power Supplies"* respectively. The poor performance of students was observed in question 5. The question was set from the topic of *"Earthing and Protection"* **(See Appendix)**.

The topic wise performance of Electrical Engineering paper for the year 2015 indicated that, either some of the topics were not well covered by subject teachers or candidates lacked enough exercises and revision on the topics from which the questions were set.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 CONCLUSION

The general performance of the students in Electrical Engineering paper for Form Two National Assessment (FTNA) for the year 2015 was average. Out of 480 students who sat for the paper, 254 students (53%) passed while the remaining 226 (47%) failed.

The assessments of students' items response in each question showed that, most of students performed well in answering questions. Despite the fact that the overall performance of students was average, the analysis revealed that, some of them lacked knowledge and skills on the concepts of topics from which the questions were asked. The students also presented poor computational skills which hindered them to arrive at final answer.

It is expected that, the feedback provided in this report will enable all educational stakeholders to take the necessary measure in order to improve the students' performance in electrical engineering paper in the future.

5.0 RECOMMENDATIONS

5.1 Recommendations to Students

The students should:

(a) read the questions carefully in order to understand the requirements of the questions.

(b) follow the given instructions properly on each section and individual question as well, so as to avoid the possibility of working out of rubric.

(c) undertake comprehensive preparations before the assessments and not only base on the certain topics or past papers.

5.2 Recommendations to Teachers

(a) Teachers should provide enough exercises and tests to the students in order to reinforce their ability to answer questions, and for better coverage of the topics within the syllabus.

(b) All kind of assessments given to the students should comply with the NECTA assessment format.

(c) More practical works should be provided to the students so as to help them relate practical skills with theories.

5.3 Recommendations to the Ministry of Education, Science, Technology and Vocational Training

(a) The Ministry should make an effort to provide technical text books to secondary schools which covers the whole syllabus for the required study materials.

(b) The Ministry should ensure that all technical secondary schools are well equipped with necessary tools and equipment to enhance learning. This will arouse students' interest in practical works which leads to better understanding of the subject contents.

(c) Technical school teachers should be given in-service courses in order to improve their teaching styles and equip them with new skills. The Ministry should also strategically plan for the recruitment of new technical school teachers with sufficient knowledge and skills that are required in teaching.

APPENDIX

Analysis of Students' Performance Question-wise in Electrical Engineering Paper

S/N	Topic	Question Number	Percentage of Students who Scored 30 Percent or More	Remarks
1	Various Topics	1	92.1	Good
2	Electronic Components	6	71.3	Good
3	D.C Circuit, Tools, Electromagnetism, Transformer and Electronic Symbols	2	62.1	Good
4	Semiconductors	7	47.5	Average
5	Bipolar Junction Transistors (BJT) and Power Supplies	8	47.5	Average
6	Battery and Cells	4	44.4	Average
7	Cable, Conductor and Insulator, Accessories, Earthing, Wiring System	3	39.9	Average
8	Earthing and Protection	5	25.6	Weak

Graphical Representation of Students' Performance

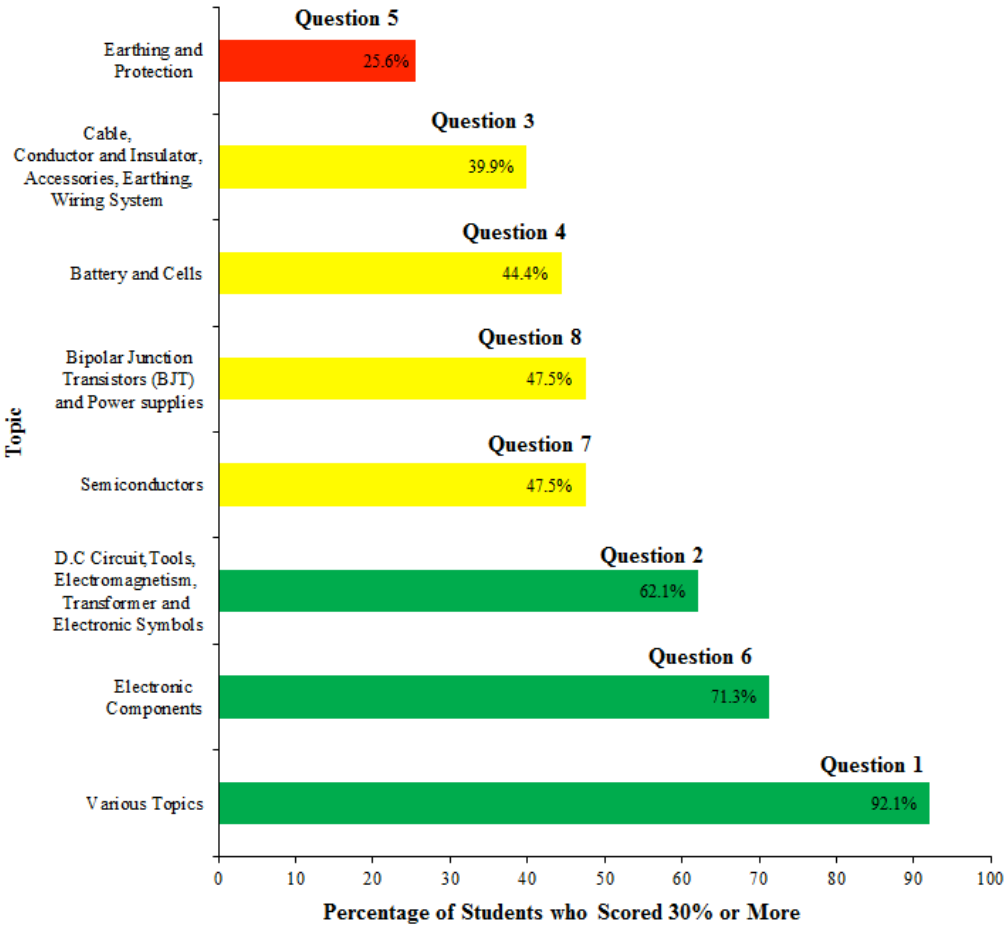


Figure 2: Analysis of Students' Performance Question-wise in Electrical Engineering Paper