THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

STUDENTS' ITEM RESPONSE ANALYSIS REPORT ON THE FORM TWO NATIONAL ASSESSMENT (FTNA) 2022

ELECTRONICS AND COMMUNICATION ENGINEERING

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081 ELECTRONICS AND COMMUNICATION ENGINEERING

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FOREWORD

This report presents Students Items Response Analysis (SIRA) on Form Two National Assessment in Electronics and Communication Engineering subject which was conducted in November 2022. The report aims to provide feedback to all educational stakeholders on the factors that contributed to the students' performance in Electronics and Communication Engineering subject.

The Form Two National Assessment (FTNA) is a formative evaluation, which intends to monitor students' learning in order to provide feedback that teachers, students and other educational stakeholders can use to improve teaching and learning processes. This analysis shows justification for the students' performance in the Electronics and Communication Engineering subject. The students who attained high scores had adequate knowledge of using formulas in calculating and analyzing some facts as asked in this assessment paper. Moreover these students had sufficient basic knowledge in drawing and using different tools, ability to interpret simple diagrams and to explain the asked questions. However, the students who scored low marks faced difficulties in responding to the questions due to their insufficient knowledge on the tested concepts.

This report highlights factors that contributed to the students' performance. These include failure to follow instructions, inability to understand the demands of the questions, poor English language proficiency, inadequate knowledge about the concepts assessed and insufficient skills of drawing and solving numerical problems. It will also help to identify students' strengths and weaknesses to improve learning before sitting for their Certificate of Secondary Education Examination (CSEE). It will also help teachers to identify the challenging areas and take appropriate measures during teaching and learning process.

The National Examinations Council of Tanzania (NECTA) expects that the feedback provided in this report will highlight the challenges for which education stakeholders should take proper measures to improve teaching and learning. Consequently, students will acquire knowledge, skills and competence indicated in the syllabus for better performance in future assessments and examinations.

The Council appreciates the contribution of all those who participated to prepare this report.

Dr. Said A. Mohamed
EXECUTIVE SECRETARY

LIST OF SYMBOLS AND ABBREVIATIONS

mA	Milli Ampere
mV	Milli Volt
%	Percentage
μ	Micro
μF	Micro Farad
C	Capacitor
f	Frequency
FTNA	Form Two National Assessment
H	Henry
Hz	Hertz
ISO	International Standard Organization
JFET	Junction Field Effect Transistor
kΩ	Kilo Ohm
L	Inductance
p.d	Potential Difference
R	Resistor
r.m.s	Root Mean Square
SIRA	Students' Items Response Analysis
V	Volt
W	Watt
β	Beta
Ω	Ohm

1.0 INTRODUCTION

This report presents the analysis of items responses of the students who sat for the subject Electronics and Communication Engineering in Form Two National Assessment (FTNA) in 2022. The Electronics and Communication Engineering paper consisted of three sections namely Section A, B, and C with a total of 10 questions.

Section A consisted of two objective questions from various topics. The students were required to answer all questions from this section. A total of 15 marks were assigned to this section.

Question 1 was a multiple-choice question with 10 items. Each item carried 1 mark, hence a total of 10 marks. The items were set from the topics of *Electronics Engineering Occupational Information, Safety Management and Rules, Drawing Techniques, Introduction on Electricity, Introduction to Measurement and Instrumentation, Electronic Component and Semiconductor Devices.*

Question 2 was a matching items question comprising five items from the topic of *Semiconductor Devices*. Each item weight 1 mark, hence making a total of 5 marks.

Section B consisted of 7 short answer questions from the topics of *Safety Management and Rules, Introduction on Electricity, Electronics Components and Semiconductor Devices.* Each question carried 10 marks, hence a total of 70 marks. The students were required to answer all the questions in this section.

Section C consisted of 1 question on from the topic of *Drawing Technique* carrying of 15 marks.

A total of 338 students sat for the Electronics and Communication Engineering paper in 2022. Among them, 253 (74.85%) students passed while 85 (25.15%) failed. In 2021 a total of 235 students sat for the assessment of which 170 (72.34%) passed. Thus in 2022 the performance has increased by 2.51%. Based on the percentage of students who scored 30 per cent or above of the marks allocated to respective question; the performance is rated as good, average or weak if the percentage lies from 65-100, 30-64 and 0-29 respectively. The categories of students' performance are summarized in Table 1.

Table 1: Categories of the Grade Ranges of the Students' Performance

Range in %	0 - 29	30 - 64	65 – 100
Remark on Performance	Weak	Average	Good

2.0 ANALYSIS OF STUDENTS' RESPONSES TO EACH QUESTION

A detailed analysis and general evaluation of the students' responses to each question is presented in this section to indicate students' strength and challenges faced in responding to each question.

2.1 Section A: Objective Questions

2.1.1 Question 1: Multiple Choice Items

The question comprised of 10 items, numbered (i) – (x) constructed from various topics. The students were required to select the correct answer from the given alternatives by writing the letter of the most correct answer in the box provided. This question had 10 marks and each item weighted 01 mark.

The question was attempted by 338 (100%) students of which 76 (22.5%) scored from 0 to 2 marks, 241 (71.3%) scored from 3 to 6 marks and 21(6.2 %) scored from 7 to 10 marks. The general performance of the students in this question was good since 262 (77.5%) scored average and above. The students' overall performance in this question is summarized in Figure 1.

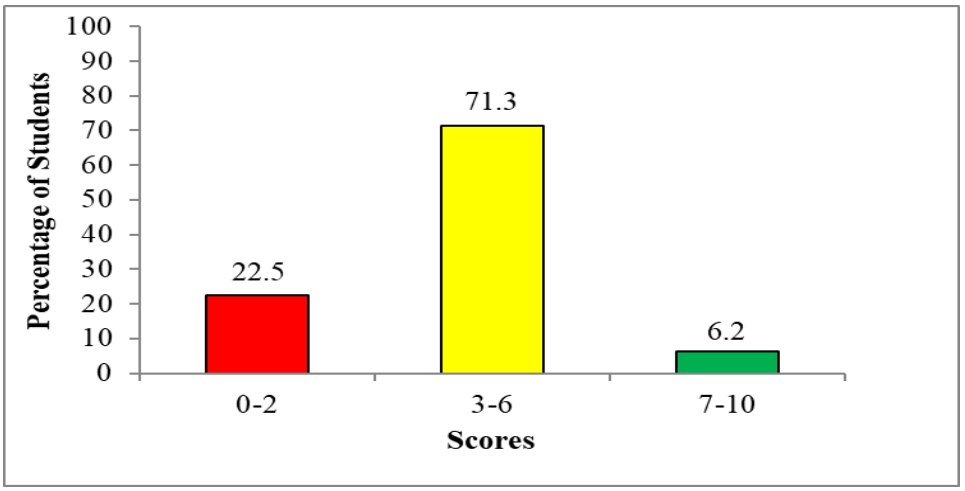


Figure 1: *Students' Performance in Question 1*

The analysis of the students' responses to this question shows that most of the students managed to choose the correct answer in all items set from topics of

Drawing Techniques, Introduction on Electricity, Semiconductor Devices, Introduction to Measurement and Instrumentation Electronics Engineering Occupational Information, Safety Management and Rules, and Electronic Component.

Item (i) required the students to specify the size of technical drawing sheets according to different uses as regards to the ISO standards for the correct measurements of A3 paper sheet size. The question was:

The ISO specifies size of technical drawing sheets according to different uses. Which ISO standards would you use for correct measurements of A3 paper sheet size?

A 494×841 *B* 297×420 *C* 420×494 *D* 491×420

The correct answer was alternative *B* , 297×420. The students who opted for this response had sufficient knowledge of ISO standards size of technical drawing sheets. However, there were students who selected alternatives *C*, 420×494 and *D*, 491×420 because one side of the measurement had correct dimension for A3 paper sheet size. Some students selected alternative *A*, 494×841 which was also an incorrect answer, indicating that they had insufficient knowledge on drawing techniques.

Item (ii) required the students to calculate power consumed by two lamps rated 100 W connected in series across a 200 *V* supply. The question was:

Two lamps rated 100W are connected in series across a 200 V supply. How much will the power be consumed?

A 25 W *B 50 W* *C 100 W* *D 200 W*

The correct answer was alternative *D, 200 W.* The students who managed to select the correct answer demonstrated that they were able to apply Ohms' law in series circuit, which provided the effect of total power consumed. Those students who selected alternative *C,100 W,* confused and thought that any device connected in series circuit has the voltage drop. Some students selected alternatives *A, 25 W* and *B, 50 W,* which were wrong, failed to apply Ohms' Law in series circuit.

Item (iii) required students to pinpoint the component, which behaves like a passive component as JFET applied with small value of drain to source voltage. The question was:

For a small value of drain to source voltage, JFET behaves like a passive component. Which of the components has the same behavior?

A Diode *B Rectifier* *C Inductor* *D ICs*

The correct answer was alternative *C, inductor*. The students who managed to choose the correct answer had sufficient knowledge of behavior of passive and active component in a circuit. Those students who opted for alternative *A, diode* failed to recognize that diode has neither drain nor source, more over those who chose alternative *B, rectifier* did not realize the characteristics operation of diode and its application in a rectifier circuits. Those who opted for alternative D, ICs did not understand that ICs are made with both active and passive components.

Item (iv) required the students to select the correct measuring instrument used by a technician to test the television power cable when supply was off and discovered that it was defective. The question was:

A technician used a measuring instrument to test a television power cable when the supply was off and discovered that it was defective. Select the instrument, which was used to discover the problem.

A An Ammeter *B Voltmeter*
C Ohmmeter *D Signal generator*

In this item the correct answer was alternative *C, Ohmmeter.* The students who opted for correct answer had knowledge and skills of measuring instruments, which enable them to discover that in the given scenario the parameter tested was continuity. However, other students selected alternative *B, voltmeter,* because they confused with the stated problem, which was defective power supply cable, they failed to recall that a voltmeter is used to measure voltage or potential difference. Students who selected wrongly alternative *A, an ammeter* and *D, signal generator,* they did not understand that these measuring instruments are used to measure current and generating A.C signals.

Item (v) required the students to identify the equipment used to measure the amplitude of the output signal waveform. The question was:

A student was asked to measure the amplitude of the output signal wave form. Identify the equipment used in his assignment.

A	*Oscillator*	*B*	*Multimeter*
C	*Signal generator*	*D*	*CRO*

The students who managed to choose alternative *D, CRO* which was the correct answer, had enough knowledge on measuring instruments, since the CRO can be set to measure voltage by its amplitude. Those who opted for alternative *A, oscillator* confused it with Oscilloscope (CRO) since, an oscillator is used to generate frequency. Those who opted for alternative *B multimeter* and *C signal generator,* did not have knowledge and skills of measuring amplitude of signal waveform.

In item (vi) students were required to identify the type of an extrinsic semiconductor obtained by adding pentavalent element in modifying the properties of a pure semiconductor material. The question was:

In modifying the properties of a pure semiconductor material in a certain industry, a pentavalent element is added. Identify the type of extrinsic semiconductor obtained by the industry.

A	*NPN-type*	*B*	*PNP-type*
C	*P-type*	*D*	*N-type*

Students who opted for *D, N-type* which was the correct answer had the knowledge of doping process applied in semiconductor materials. Those who opted for *C, P-type* had inadequate knowledge of pentavalent (electrons) and trivalent (holes). Those who opted for alternative A *(NPN-type)* and *B (PNP-type)* were also wrong because these are types of transistors.

Item (vii) tested the students' knowledge on various activities to take as a first aider. This item specifically testes students they can help a victim who got a minor burn on his hand. The question was:

You have decided to help your friend who got a minor burn on his hand. What will be your first action to casualty?

A	*Call the medical doctor*	*B*	*Flush the burn with cold water*
C	*Cover the burn with a dry dressing*	*D*	*Remove any burnt material from the wound*

The correct answer was alternative *B, flush the burn with cold water*. The students who opted for the correct answer demonstrated to have enough

knowledge on safety management in working places. Those who opted for alternative *A, call the medical doctor,* thought that calling a doctor is a first option since they have no knowledge of first aid procedures. Some students selected alternatives *C, cover the burn with a dry dressing* and *D, remove any burnt material from wound* because they did not consider the nature of the accident. In this case these alternatives could cause more injury and pain.

Item (viii) required the students to explain the outcome if the channel blocks in Figure 1 would be removed. The question was:

What will be the outcome if the channel block in Figure 1 is removed?

Figure 1

A The transmitter will fail to transmit the information
B The information will easily pass to the channel
C The transmitter will cross over the information to the receiver
D Information will not reach to the receiver

The students who opted for alternative *D, information will not reach to the receiver* were correct. They had adequate knowledge of electronics engineering occupational information. The students who opted for alternative *A, the transmitter will fail to transmit the information* confused the function of transmitter and the channel through which the signal will be transmitted but will fail to reach the receiver. Those who opted for *B, the information will easily pass to the channel* and *C, the transmitter will cross over information to the receiver* did not understand well the function of a transmitter, a channel and a receiver in a communication system.

Item (ix) required the students to state the condition of a transistor when it operates in cut-off and saturation. The question was:

What is the status of transistor when it operates in cut-off and saturation condition?

A It behaves like a linear amplifier.
B It acts like a switch.

C It behaves like a variable capacitor.
D It can vary resistance as a variable resistor

Some students opted for alternative *B, it acts like a switch* which was the correct answer. These students proved that, they had enough knowledge of transistor operation. Those who selected alternative *A, it behaves like a linear amplifier,* confused with active region operation of transistor where it acts as an amplifier. Those who opted for alternative *C, it behaves like a variable capacitor* and *D, it can vary resistance as a variable resistor* did not understand the transistor operating regions.

Item (x) required the students to state why a full- wave rectifier has twice the efficiency of a half –wave rectifier. The question was:

Why does a full-wave rectifier has a twice the efficiency of a half-wave rectifier?

A It utilizes both half cycle of the input.
B It uses a center tape transformer.
C It has less an increased ripple factor.
D It has a double output frequency.

The correct alternative was *A, it utilizes both half cycle of the input*. Those students who opted for the correct alternative had sufficient knowledge of semiconductor devices and principle of operations of half and full wave rectifiers in a power supply. Some students opted for alternative *B, it uses a center tape transformer,* which was wrong. These students did not understand the application of center tape transformer for both half and full wave rectifier since it does not have any impact on changes of frequency in a circuit. Those who opted for alternative *C, it has less an increased ripple factor* and *D, it has a doubled output frequency,* lacked knowledge on semiconductor devices and were not familiar with the topic of power supply.

2.1.2 Question 2: Matching Items

The question comprised of five items numbered (i) – (v) constructed from the topic of *Semiconductor Devices*. Each item carried 1 mark, making a total of 5 marks. The students were given five diode characteristics interpretations in List A and were required to match them with corresponding diode characteristics in List, which comprised of eight (8) diode characteristics.

The question intended to test the ability of students distinguish different diode working characteristics for daily application. The question was:

*Match the diode characteristics interpretations in **List A** with the corresponding diode characteristics in **List B** by writing the letter of the correct response below the item number in the table provided.*

List A		List B	
(i)	Minimum reverse voltage at which PN junction down fall with sudden rise in reverse current.	A	Maximum forward current.
(ii)	Forward voltage at which the current through the junction start to increase rapidly.	B	Peak inverse voltage.
(iii)	Highest power that can be dissipated at the junction without damage.	C	Peak forward junction current.
(iv)	Maximum reverse voltage that can be applied to PN junction without damaging the junction.	D	Maximum power transfer.
(v)	Highest forward current that a PN junction can conduct without damage to the junction.	E	Minimum power transfer.
		F	Maximum power rating.
		G	Knee voltage.
		H	Break down voltage

This question was attempted by 338 (100%) students. Out of those who attempted 119 (35.2 %) scored from 0 to 1 mark, 147 (43.5 %) scored from 1.5 to 3 marks and 72 (21.3 %) scored from 3.5 to 5 marks. The general performance of the students in this question was good because 219 (64.8 %) students scored average and above average. Thus overall students' performance in this question is summarized in Figure 2.

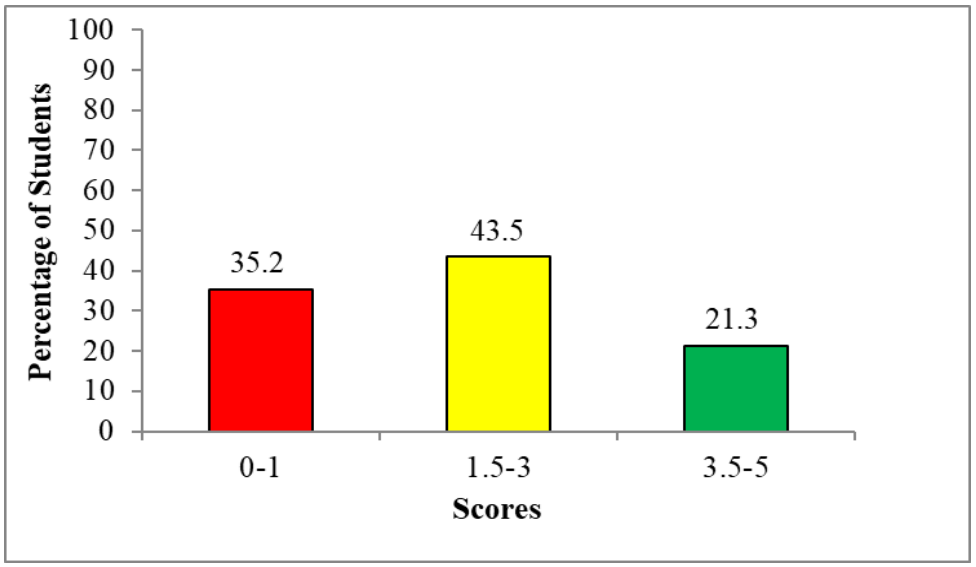


Figure 2: *Students' Performance in Question 2*

The analysis of the students' responses to this question shows that most of the students matched correctly the diode characteristics interpretations with their corresponding diode characteristics. These students had appropriate knowledge of characteristic curve of PN junction diode when operating in forward and reverse condition. However, about one third of the students that is 119 (35.2 %) failed to match the correct responses.

In this question, the students were required to interpret the diode characteristics.

In item (i), the correct answer was alternative *H, Break down voltage*. The students who matched correctly this item, indicated to have adequate knowledge on the topic. Some students matched it with alternative *B, Peak inverse voltage*, these students failed to understand that peak inverse voltage is the maximum reverse voltage tolerated by diode before damaged. Those who matched with other alternatives had insufficient knowledge on the diode characteristics.

In item (ii), the correct answer was alternative *G, Knee voltage.* The students who selected alternative G had enough knowledge on diode characteristic. The students who incorrectly matched with alternative, *A maximum forward* current and alternative *C, Peak forward junction current* were attracted with the words "forward current" which appeared in the item premises. This shows that they were just guessing the answer. Those selected other alternative had in adequate knowledge on tested characteristics.

In item (iii) the correct response was F, *Maximum power rating.* The students who correctly selected this item had sufficient knowledge on maximum power rating of the diode. Some selected alternative D, *maximum power transfer* these had misconception of the concepts related to maximum power rating. They forget that maximum power transfer occurs when the resistive value of the load is equal in value to that of the voltage sources, which allow maximum power to be supplied. Those who selected other alternatives had insufficient knowledge on subject matter.

In item (iv), most of the students opted the correct response *B, Peak inverse voltage*. Some students incorrectly matched this item by selecting alternative *H, break down voltage.* These students failed to understand that the breakdown voltage is the voltage at which a device breaks down and conducts current, while the peak inverse voltage is the maximum voltage that a device can withstand in the reverse-bias direction without breaking down. However, some of the students selected alternatives *G, Knee voltage.* These students had insufficient knowledge on subject matter.

In item (v), the correct alternative was *A, maximum forward current*. Those who correctly matched them had sufficient knowledge on subject matter. Some students wrongly selected alternative *C, peak forward junction current.* They failed to realize that maximum forward current is the maximum current that a device can handle continuously, whereas peak forward junction current is the maximum current that a device can handle for a very short period of time.

2.2 Section B: Short Answer Questions

2.2.1 Question 3: Electronic Components

The question comprised of three parts (a), (b), and (c). The question intended a student to calculate the number of turns of transformer, primary and

secondary current and presenting a schematic symbol of transformer. The question was*:*

A transformer with voltage rate of 240 V to 12 V failed to operate in a certain power system. You are assigned to reconstruct the specified transformer by using 800 turns primary winding,

(a) calculate the number of turns for its secondary winding,
(b) estimate the secondary and primary current when the transformer supplies a 12V,12W system and
(c) represent the transformer you constructed by its schematic symbol.

The question was attempted by 338 (100 %) students. Out of those who attempted 126 (37.3 %) students scored from 0 to 3 marks, 96 (28.4 %) scored from 3.5 to 6 marks, and 116 (34.3 %) scored from 6.5 to 10 marks. The general performance of the students in this question was good. The students' overall performance in this question is summarized in Figure 3.

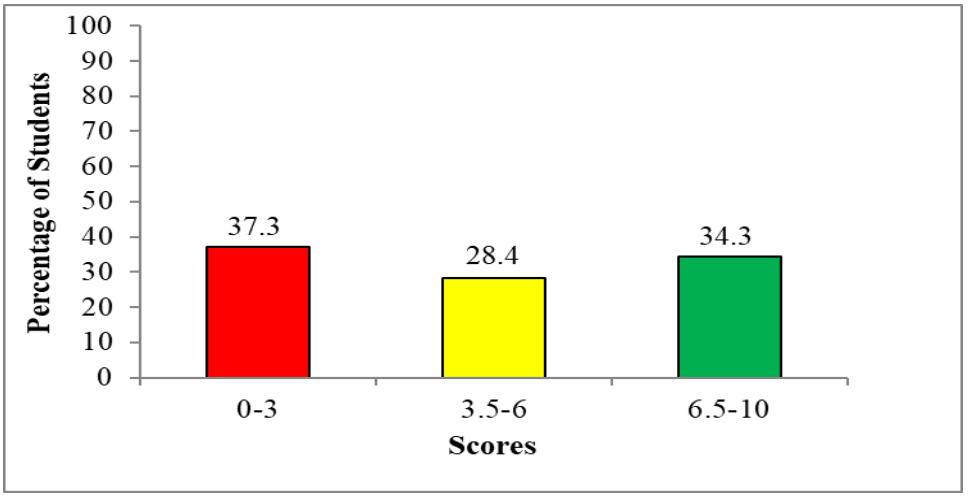


Figure 3: *Students' Performance in Question 3*

The general performance of this question was good since 212 (62.7 %) students scored average and above. The performance suggests that majority of the students had sufficient knowledge and skills on electronic components, since they were capable of calculating number of turns in secondary winding, primary and secondary current and representing the constructed schematic symbol. Extract 3.1 is a sample of correct responses from a student who correctly calculated secondary turns of transformer, estimated primary and secondary current and represented the transformer schematic symbol.

3 Transformer with voltage rate of 240 V to 12 V failed to operate in a certain power system. You are assigned to reconstruct the specified transformer by using 800 turns primary winding.

(a) What will be the number of turns for its secondary winding?

Data:
$V_p = 240V$
$V_s = 12V$
$N_p = 800$ turns.
Soln
$\frac{V_s}{V_p} = \frac{N_s}{N_p}$
$\frac{12}{240} \times \frac{N_s}{800}$
$240 N_s = 12 \times 800$
$\frac{240}{240}$
$N_s = \frac{12 \times 800}{240}$
$N_s = \frac{12 \times 800}{240}$
$N_s = \frac{1 \times 800}{20}$
$N_s = 40$ turns.
Number of turns in secondary winding = 40 turns

(b) Estimate the secondary and primary current when the transformer supplies a 12 V, 12 W system.

Data: $V_s = 12V$.
Power = 12W.
Soln.
From
Power in primary coil = Power in secondary coil
Power in primary = $V_p \times I_p$
$12 = 240 \times I_p$
$\frac{12}{240} = I_p$
$\frac{1}{20} = I_p$
$I_p = 0.05A$
Primary current = 0.05A
Power in secondary = $V_s \times I_s$
$12 = 12 \times I_s$
$\frac{12}{12} = I_s$
$1A = I_s$
Secondary current = 1A

(c) Represent the transformer you constructed by its schematic symbol.

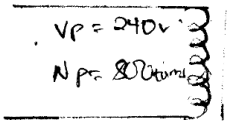


fig: A schematic symbol of a transformer.

Extract 3.1: A sample of correct responses to Question 3

Extract 3.1 shows a response from a student who correctly calculated secondary number of turns of transformer, estimated primary and secondary current and represented the transformer in a schematic symbol.

On other hand, few 126 (37.3 %) students failed to calculate the number of turns, which suggests that they had inadequate knowledge and skills on the topic of electronic components. Some students used a wrong formula to calculate the estimated current and consequently obtained incorrect answers. For example, some students multiplied number of turns with 12 V, some added the answers of part (a) with 12 W of part (b) which is a wrong approach. Moreover, others performed calculations, which did not relate to the requirement of the question. In part (a), one student calculated the sum of voltage and power and subtracted voltage and power at the end he/she divided the sum and obtained the number of turns of secondary windings.

In part (b) the student wrongly multiplied by 10 the input voltage and power given in a circuit. In part (c) some of the students presented a transformer by using the symbol of a transformer in series and batteries in series and also he/she drew the transistor instead of a transformer schematic symbol which was incorrect. This shows that this student had little knowledge of using formula to calculate different parameters in the transformer. Extract 3.2 shows an example of a wrong response provided by a student who gave incorrect answer to all three parts of the question.

3 Transformer with voltage rate of 240 V to 12 V failed to operate in a certain power system. You are assigned to reconstruct the specified transformer by using 800 turns primary winding.

(a) What will be the number of turns for its secondary winding?

soln {240V} or {12V}

V=240 V to 12V or V=240÷12V = 800t

V=240V÷12 = 800t V=252=800t.

V=240−12=800t $\frac{252}{800} = \frac{800t}{800}$

V=228 = 800t

$V = \frac{228}{800} = \frac{800t}{800}$ V = 0.315t

V = 0.285t

number of turns for secondary winding is 0.285t or V = 0.315t

(b) Estimate the secondary and primary current when the transformer supplies a 12 V, 12 W system.

Data given

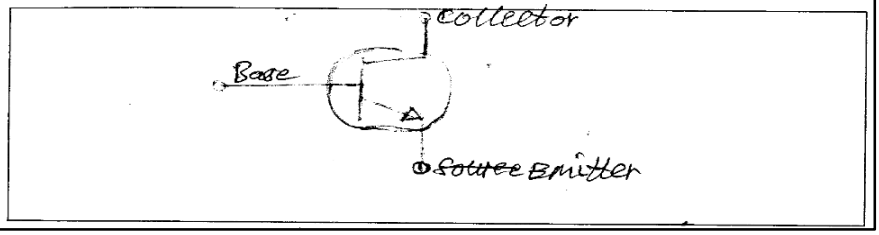
12V, 12W {12V} or {12W}

12x12 = 144W

$\frac{12V.12W}{10\ 10} = \frac{144}{100} = 12W$.

12V 12W = 12W Answer

(c) Represent the transformer you constructed by its schematic symbol.



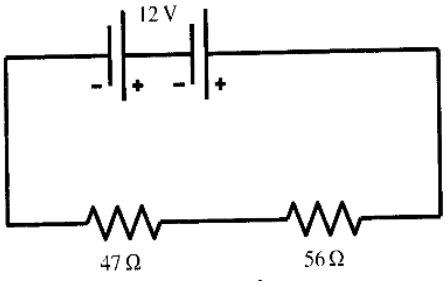
Extract 3.2: A sample of an incorrect response to Question 3

In Extract 3.2, a student incorrectly calculated secondary turns of a transformer, estimated primary and secondary current and incorrectly drew a transistor symbol instead of transformer schematic symbol.

2.2.2 Question 4: Introduction on Electricity

The question consisted of three parts namely (a), (b) and (c). The question intended to measure the ability of the students to calculate the electrical quantity flowing in a circuit. The question was:

Electrical quantities in a circuit can be measured by using measuring instruments or calculations. Study the figure below carefully and then answer the questions that follow.



(a) calculate the total current flowing in the circuit.
(b) calculate the p.d across each resistor.
(c) calculate the sum of the p.d

The question was attempted by 338 (100 %) students. Out of those who attempted 68 (20.1 %) scored from 0 to 3 marks, 52 (15.4 %) scored from 3.5 to 6 marks, and 218 (64.5%) scored from 6.5 to 10 marks. The students' performance is summarized in Figure 4.

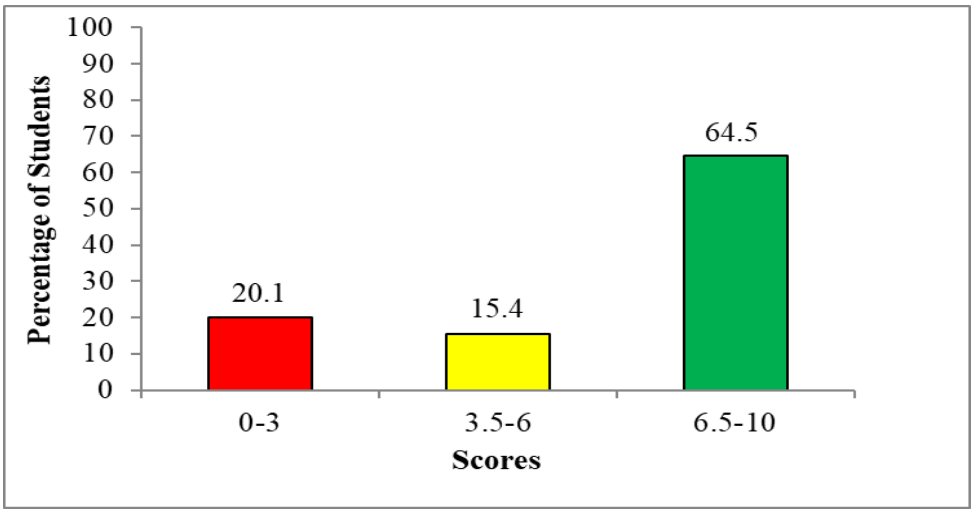


Figure 4: *Students' Performance in Question 4*

The general performance of this question was good since 284 (84.3%) students scored average and above marks. This reveals that majority of the students had sufficient knowledge and skills on introduction to electricity. Extract 4.1 is a sample of correct responses from a student who correctly calculated total current, p.d across resistors and sum of p.ds.

4. Electrical quantities in a circuit can be measured by using measuring instruments or calculations. Study Figure 2 carefully and then answer the questions that follow.

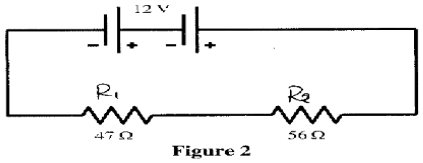


Figure 2

(a) Calculate the total current flowing in the circuit.

Solu

Data given

$V_T = 12V$

$R_T = R_1 + R_2$

$= (47 + 56)\Omega$

$R_T = 103\Omega$

$I_T = ?$

From ohm's law

$V = IR$

$I = \frac{V}{R}$

$= \frac{12V}{103\Omega} = 0.116A$

$I = 0.12A$

∴ The total current flowing in the circuit is 0.12A.

(b) Calculate the p.d across each resistor.

Data given

$I_T = 0.12A$

$R_T = 103\Omega$

$V_T = 12V$

But voltage across each resistor

$V = IR$

Since the current is constant

For $V_1 = IR_1$

$= (0.12A \times 47\Omega)$

$V_1 = 5.64V$

Also for $V_2 = IR_2$

$= 0.12A \times 56\Omega$

$V_2 = 6.72$

∴ Voltage (V_1) across $R_1 = 5.64V$

Voltage (V_2) across $R_2 = 6.72V$

(c) Calculate the sum of the p.d.

$V_T = V_1 + V_2$

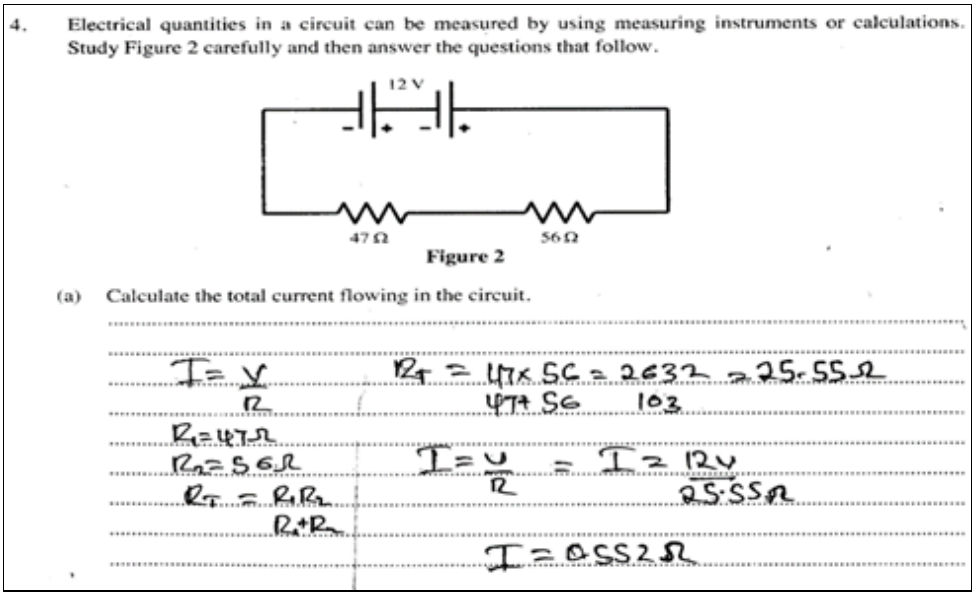
$= (5.64 + 6.72)V$

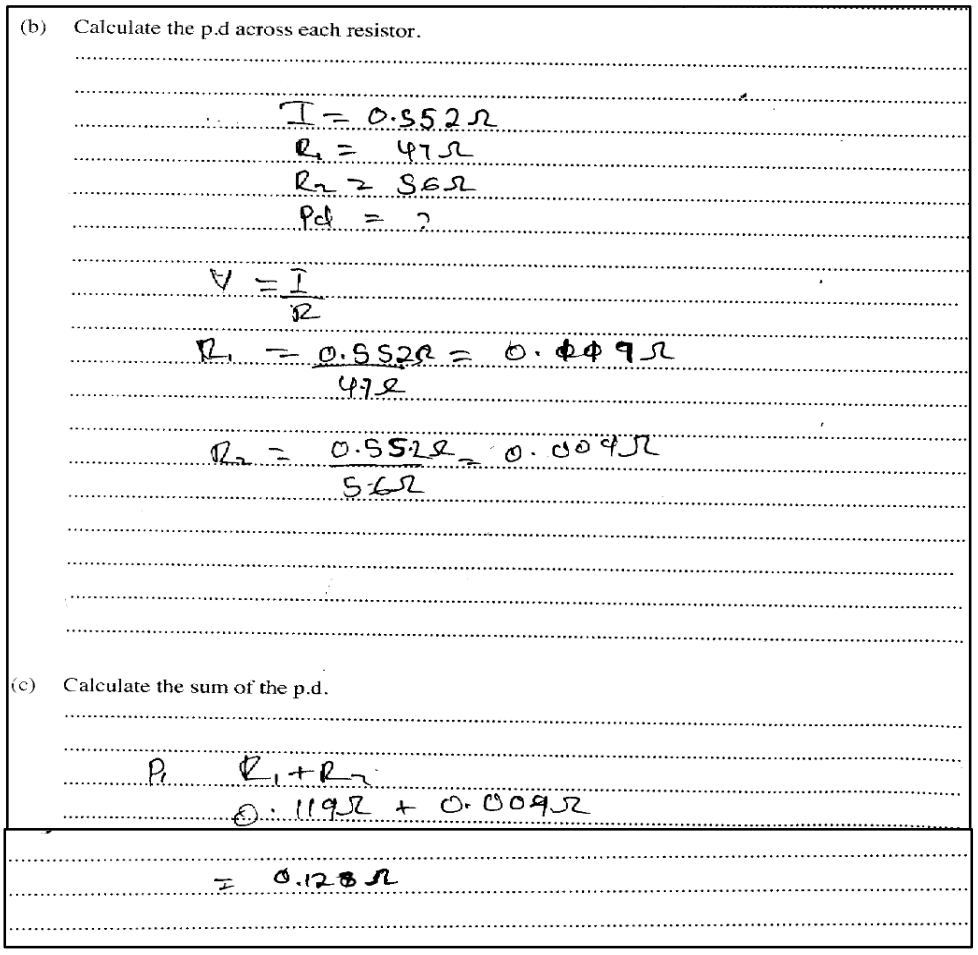
$= 12.36$

Extract 4.1: A sample of correct responses to Question 4

In Extract 4.1, a student correctly applied the Ohms' law and calculated the current flowing in a circuit. In part (b) and (c) the student managed to calculate the potential difference across each resistor in the given circuit, and the sum of potential difference between two series resistor found in the circuit.

On the contrary, few (20.1%) students failed to calculate the current flowing, p.d across each resistor and the sum of p.d in a given series circuit. For example, in part (a) one of the students used a formula to calculate the current flowing in a parallel circuit in a place of series circuit, which resulted in a wrong answer. In part (b), the students misinterpreted p.d as potential difference thinking that it is a power dissipated in a circuit $p.d = I \times V$ as a result they got wrong answer. In part (b) also students failed to use Ohms law formula and applied wrong formula $V = \frac{I}{R}$ instead of $I = \frac{V}{R}$ which led to an incorrect answer. In part (c) a student found the sum of two resistances in series circuit instead of sum of potential difference (p.d) between two resistors. This justifies that the student was incompetent in the topic of introduction to electricity. Extract 4.1 is a sample of incorrect responses from a student who incorrectly calculated total current, p.d across resistors and sum of p.ds.





Extract 4.2: A sample of incorrect responses to Question 4

In Extract 4.2, a student stated well the Ohms law theory but calculated total resistance in parallel circuit instead of total resistance series circuit.

2.2.3 Question 5: Semiconductor Devices

This question comprised of two parts: (a) and (b); which required the students to calculate and analyses input and output parameters of the amplifier so as to make it work properly. The question was:

(a) You are required to construct a common emitter amplifier with an input resistance of 2.5 k Ω and a voltage gain of 200. The input signal voltage is 5 mV and the value of β is 350. You have realized that your circuit will not operate properly because some important parameters are missing. Calculate the following missed parameters in order to accomplish the circuit requirements.

(i) Base current
(ii) Collector current
(iii) Power gain

(b) Why the common emitter amplifier is commonly used rather than common base and common collector amplifiers? Give three reasons.

This question was attempted by 338 (100%) students. Out of those who attempted 321 (95.0%) scored from 0 to 3 marks, 15 (4.4 %) scored from 3.5 to 6 marks, and 2 (0.6 %) scored from 6.5 to 10 marks. The overall students' performance in this question is summarized in Figure 5.

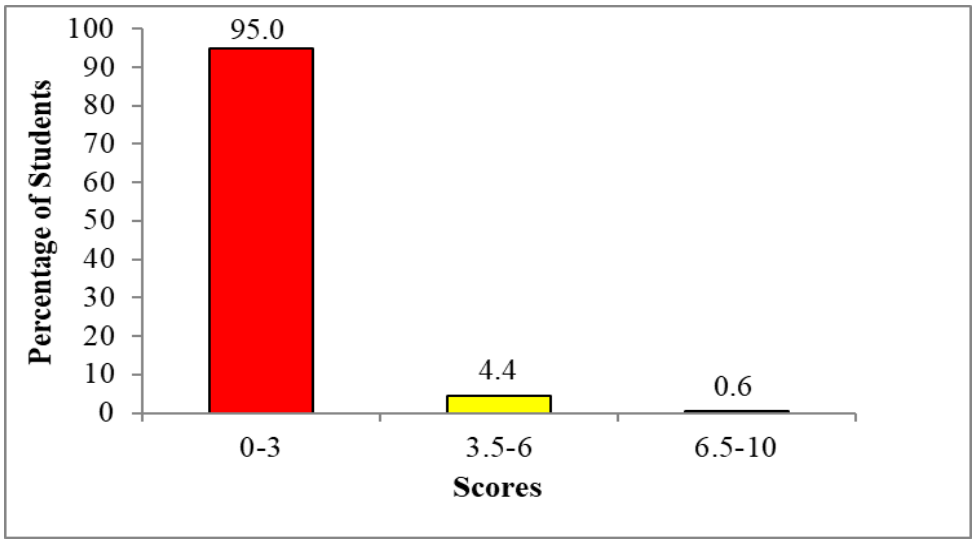
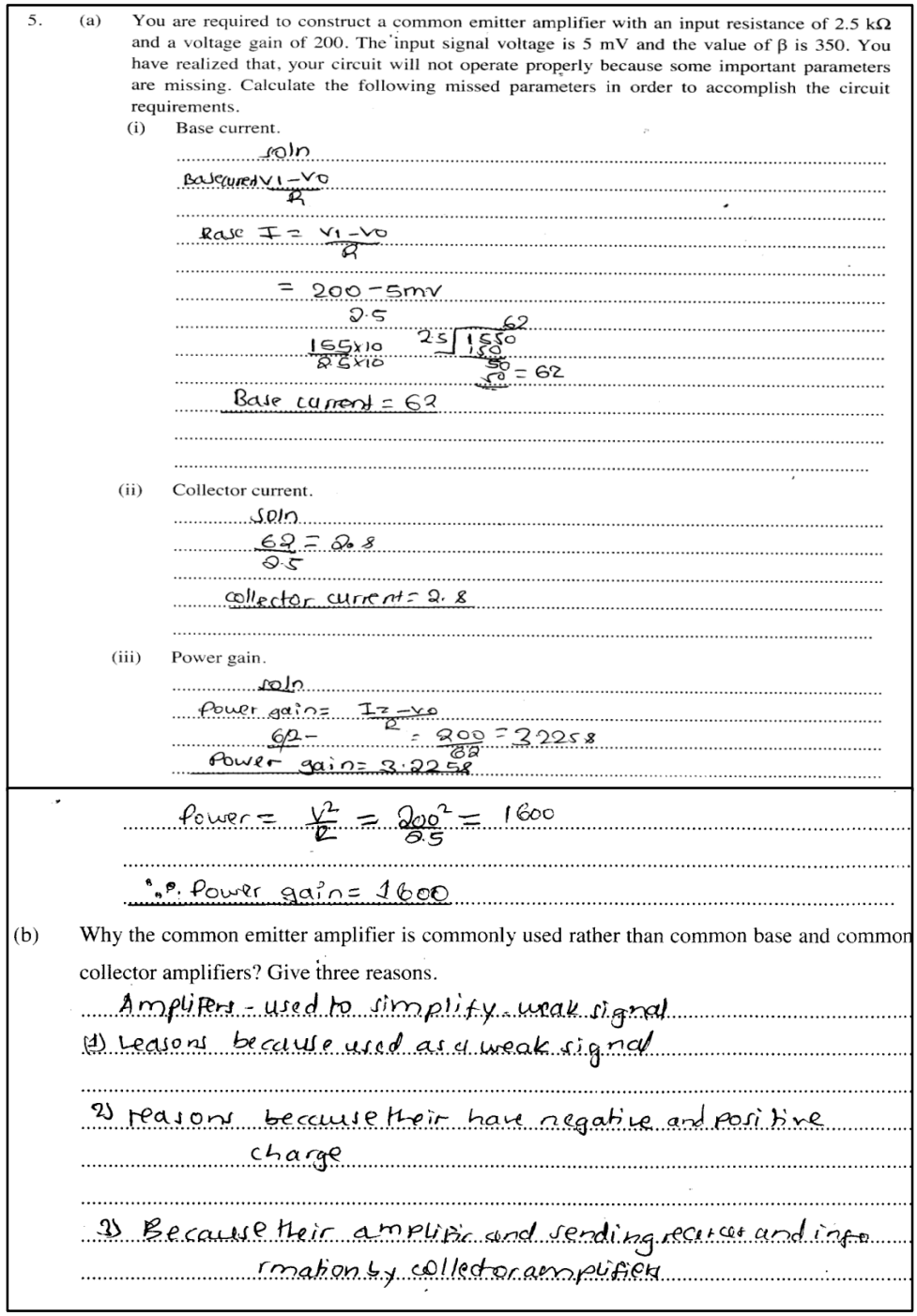


Figure 5: *Students' Performance in Question 5*

The general performance of this question was poor since 221 (96 %) students scored (0-3) marks. This suggests that the students did not have sufficient knowledge and skills on semiconductor devices, and on transistors' closed loop. The analysis on the students' responses shows that in part (a) (ii) some of them used Ohms law with wrong data to find base current. They also used better value (β) value and voltage gain to find the power gain, and others used Ohms law formula "$Power = I^2R$"to find power gain in part (i) and (ii). Moreover, there were students who wrote formula which do not relate to semiconductors while others did not write anything. In part (b), one student wrongly explained, "it is because that the common emitter gives the input

because emitter in the amplifier is an input and also it is common to both input and output". Extract 5.1 shows the incorrect responses of the student.


5. (a) You are required to construct a common emitter amplifier with an input resistance of 2.5 kΩ and a voltage gain of 200. The input signal voltage is 5 mV and the value of β is 350. You have realized that, your circuit will not operate properly because some important parameters are missing. Calculate the following missed parameters in order to accomplish the circuit requirements.

(i) Base current.

soln

Base current $\frac{V_1 - V_0}{R}$

Base I = $\frac{V_1 - V_0}{R}$

= $\frac{200 - 5mV}{2.5}$

$\frac{155 \times 10}{2.5 \times 10}$ $2.5\overline{)155}$ 62, 150, 50 = 62

Base current = 62

(ii) Collector current.

soln

$\frac{62}{2.5} = 2.8$

collector current = 2.8

(iii) Power gain.

soln

Power gain = $\frac{I_2 - V_0}{R}$ = $\frac{62 - \quad}{62} = \frac{200}{62} = 3.2258$

Power gain = 3.2258

Power = $\frac{V^2}{R} = \frac{200^2}{2.5} = 1600$

∴ Power gain = 1600

(b) Why the common emitter amplifier is commonly used rather than common base and common collector amplifiers? Give three reasons.

Amplifers - used to simplify weak signal

(1) Leasons because used as a weak signal

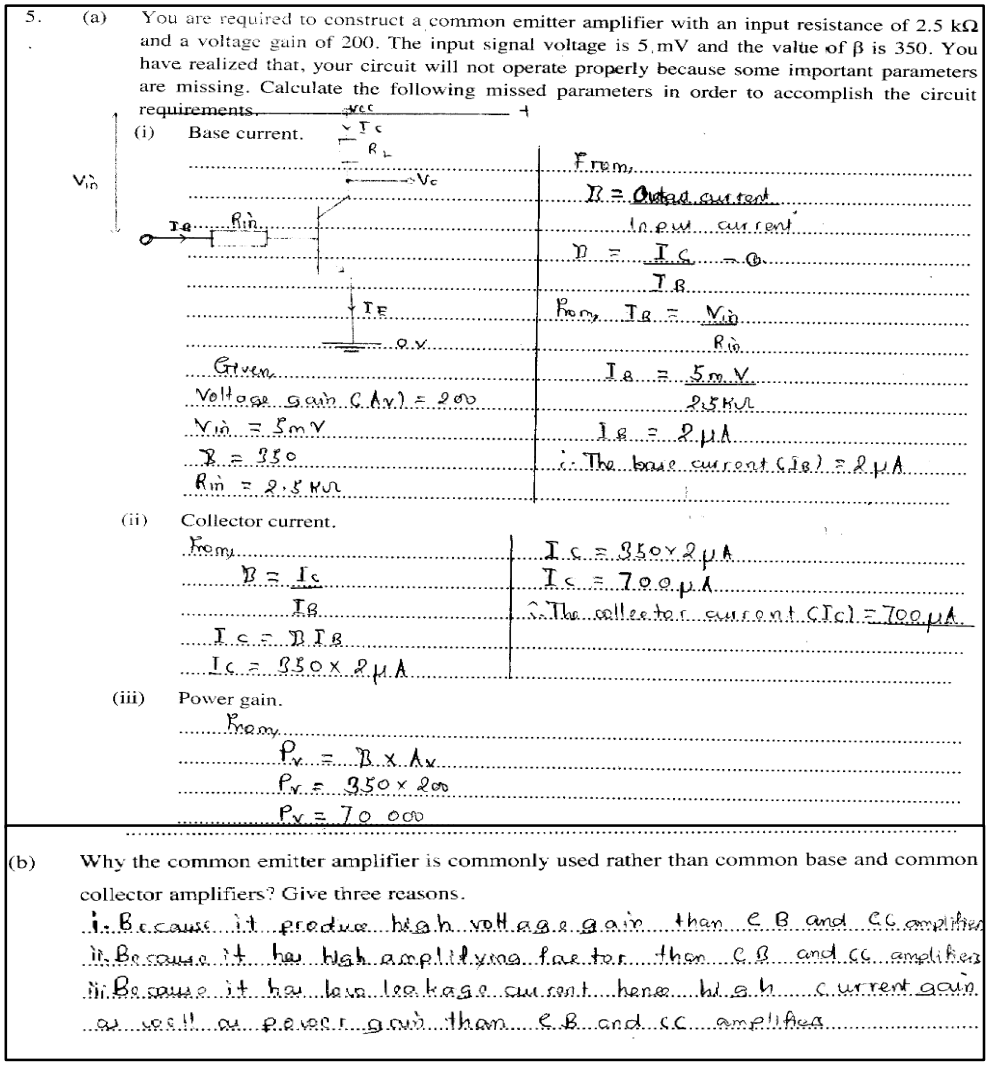
2) reasons becouse their have negative and positive charge

3) Because their amplifie and sending recieve and information by collector amplifier

Extract 5.1: A sample of poor responses to Question 5

In Extract 5.1, a student incorrectly calculated the missing parameters, collector current, power gain and managed to produce reason of a common emitter amplifier being commonly used rather than common base amplifier.

Although majority of the students performed poorly there were few students who managed to perform better. In part (a), the students correctly applied Kirchhoff's current law in a closed circuit by substituting correct input values for base current, and consequently obtained collector current and power gain. In part (b), the student clearly mentioned two out of three reasons, which reveals that the student had sufficient knowledge and skills of semiconductor devices. Extract 5.2 shows an example of good responses from one of the students.



Extract 5.2: A sample of correct responses to Question 5

In Extract 5.2, a student correctly calculated missed parameters in party (a) and mentioned the reasons of common emitter amplifier being mostly used compared with common base and common collector amplifiers in part (b).

2.2.4 Question 6: Safety Management and Rules

This question consisted of parts (a) and (b). In part (a), the students were required to explain the importance of wearing a hard hat, goggles, ear defender, gloves, overcoat and a mask before entering the workshop for practice session. In part (b) they were asked to explain the significance of four main safety signs used at the work place which each student who studies electronics and communication engineering should be conversant with.

This question was attempted by 338 (100 %) students, out of them 73 (21.6 %) scored from 0 to 3 marks, 172 (50.9 %) scored from 3.5 to 6 marks, and 93 (27.5 %) scored from 6.5 to 10 marks. Thus general performance of this question was good. The overall students' performance is summarized in Figure 6.

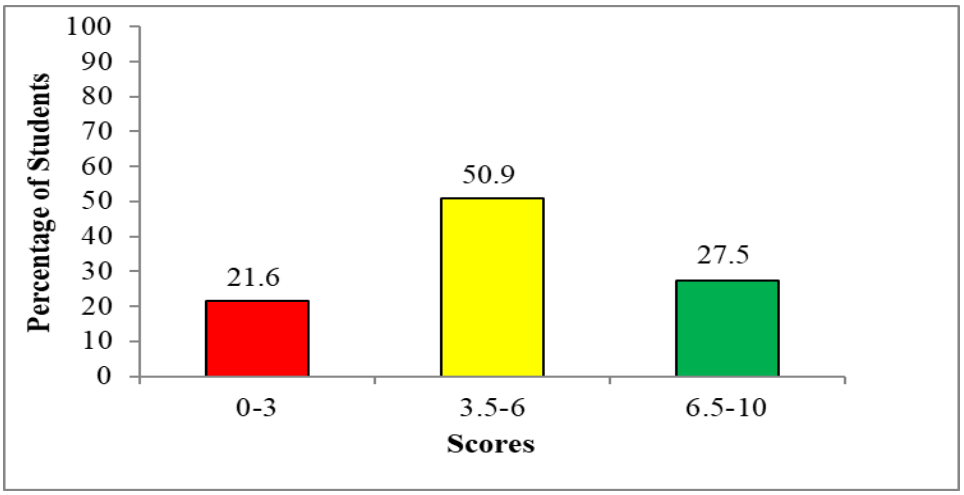
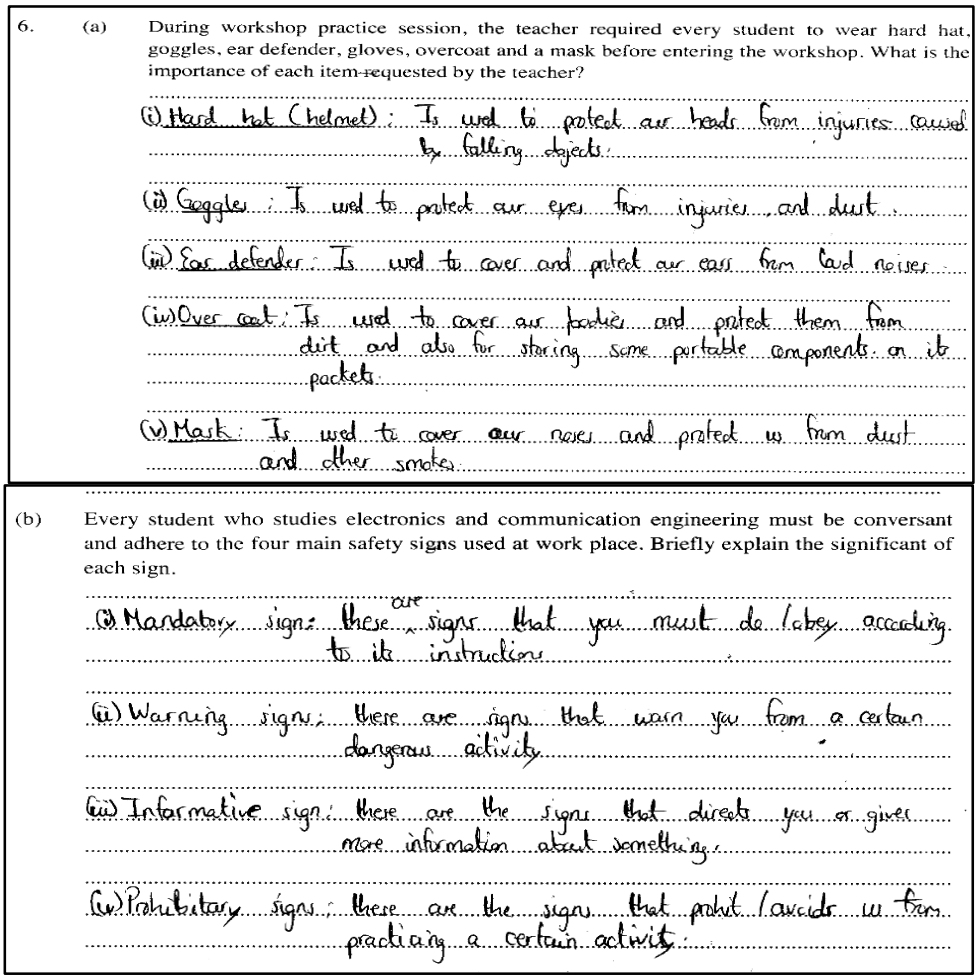


Figure 6: *Students' Performance in Question 6*

The overall performance of this question was good since 265 (78.4 %) scored average and above. This signifies that the students had sufficient knowledge and skills on safety management and rules. In part (a) one student mentioned clearly the importance of wearing hard hat, goggles, ear defender, gloves, overcoat and a mask before entering the workshop. This suggests that the student understood all the safety precautions to be taken in the workshop for practice session. In part (b) the students explained clearly the significance of

safety signs used at work place, indicating they had enough knowledge and skills. Extract 6.1 shows an example of a good responses of a student who managed to answer clearly both parts of the question.



6. (a) During workshop practice session, the teacher required every student to wear hard hat, goggles, ear defender, gloves, overcoat and a mask before entering the workshop. What is the importance of each item requested by the teacher?

(i) Hard hat (Helmet): Is used to protect our heads from injuries caused by falling objects.

(ii) Goggles: Is used to protect our eyes from injuries, and dust.

(iii) Ear defender: Is used to cover and protect our ears from loud noises.

(iv) Over coat: Is used to cover our bodies and protect them from dirt and also for storing some portable components on its packets.

(v) Mask: Is used to cover our noses and protect us from dust and other smoke.

(b) Every student who studies electronics and communication engineering must be conversant and adhere to the four main safety signs used at work place. Briefly explain the significant of each sign.

(i) Mandatory sign: These are signs that you must do/obey according to its instructions.

(ii) Warning sign: there are signs that warn you from a certain dangerous activity.

(iii) Informative sign: there are the signs that directs you or gives more information about something.

(iv) Prohibitary signs: there are the signs that prohi/avoids us from practicing a certain activity.

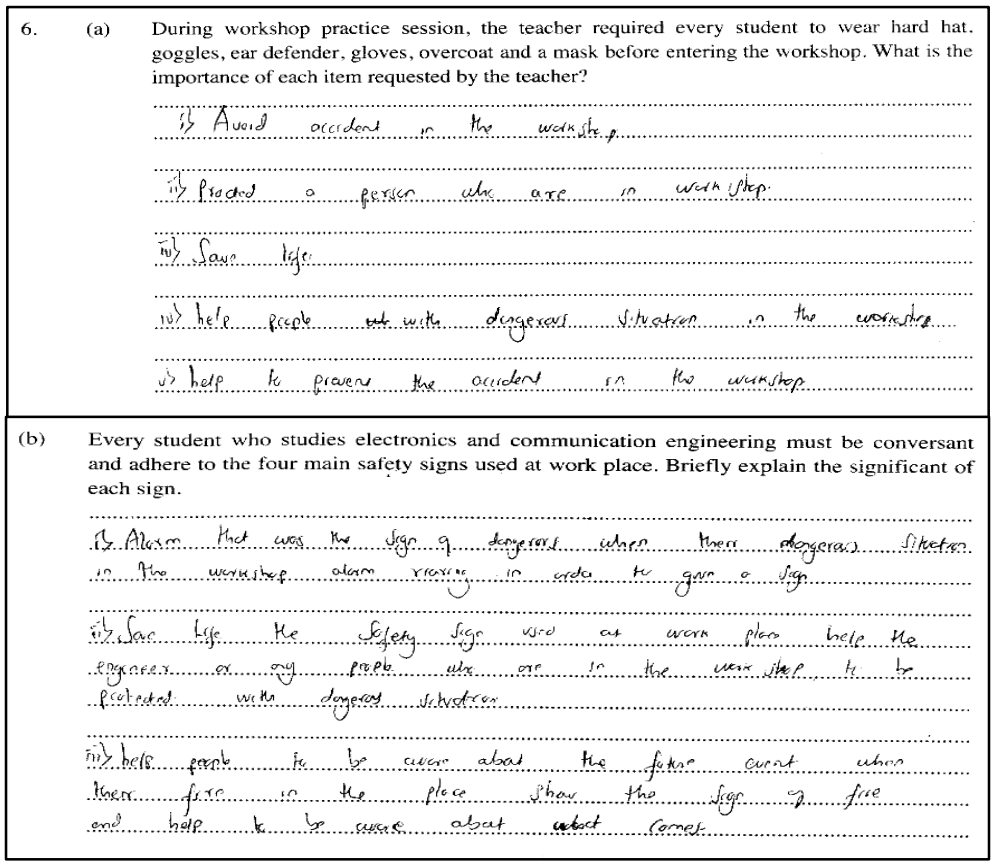
Extract 6.1: A sample of correct responses to Question 6

In Extract 6.1, a student correctly explained the importance of wearing a hard hat, goggles, ear defender, gloves, overcoat and a mask before entering a workshop and he/she also explained four main signs used in a workshop.

However, 73 (21.6%) students performed poorly in this question, which implies that they had inadequate knowledge on safety management and rules. They were not familiar with different protective gears such as hardhat, goggles, ear defender, gloves, overcoat and a mask before entering workshop. For example, in part 6 (a), one of the students explained the importance of hardhat as to "protect leg from getting injury for example

electric shock". This suggests that he/she did not understand the importance of those equipment used in the workshop. In part (b), instead of explaining the signs used in work place he/she mentioned and explained first aid tools and rules. For example, he/she student mentioned and explained safety first aid kit and fire extinguisher.

Other student mentioned safety precautions such as *"don't run and do not smoke in the work place"*. In part (a) this student failed to explain importance of wearing a hardhat, goggles, ear defender, gloves and overcoat instead he/she explained that those protective gears are used to protect accident. In part (b), the student explained that the importance of an alarm is to alert when any dangerous occurred in the workshop. This shows that such student is aware that an alarm is a sign in a workplace. Extract 6.2 shows an example of a poor response from a student who failed to explain the importance of different protective gears used in a work place.



6. (a) During workshop practice session, the teacher required every student to wear hard hat, goggles, ear defender, gloves, overcoat and a mask before entering the workshop. What is the importance of each item requested by the teacher?

i) Avoid accident in the workshop

ii) Protect a person who are in work shop

iii) Save life

iv) help people not with dangerous situation in the workshop

v) help to prevent the accident in the workshop

(b) Every student who studies electronics and communication engineering must be conversant and adhere to the four main safety signs used at work place. Briefly explain the significant of each sign.

i) Alarm that was the sign of dangerous when there dangerous situation in the workshop alarm rrrrrrr in order to gave a sign

ii) Save life the safety sign used at work place help the engineer or any people who are in the work shop to be protected with dangerous situation

iii) help peoples to be aware abat the future event when there fire in the place shaw the sign of fire and help to be aware abat abat comes

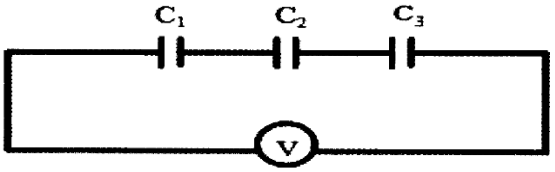
Extract 6.2: *A* sample of poor responses to Question 6

In Extract 6.1, a student incorrectly explained the importance of wearing hard hat, goggles, ear defender, gloves, overcoat and a mask before entering a workshop and explained four main signs used in a workshop.

2.2.5 Question 7: Introduction on Electricity

This question consisted of five parts namely (a), (b), (c), (d) and (e). This question intended to measure students' ability to calculate electrical quantities when capacitors are connected in series. The question was as follows:

The figure below is a basic electric circuit with three capacitors connected in series across a supply voltage (V). Study it carefully and then answers the questions that follow.



How would you determine mathematically the following parameters of the given circuit?

(a) Charge on each capacitor.
(b) Voltage across each capacitor.
(c) Voltage supplied in a circuit.
(d) Total capacitance in a circuit.
(e) *Energy stored in a circuit.*

This question was attempted by 338 (100 %) students. Out of those who attempted 226 (66.9 %) scored from 0 to 3 marks, 74 (21.9 %) scored from 3.5 to 6 marks, and 38 (11.2 %) scored from 6.5 to 10 marks. Students' performance in this question is summarized in Figure 7.

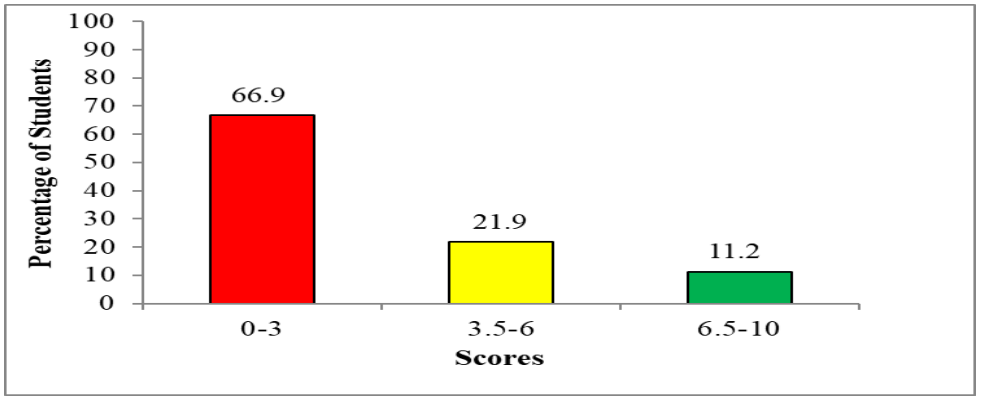
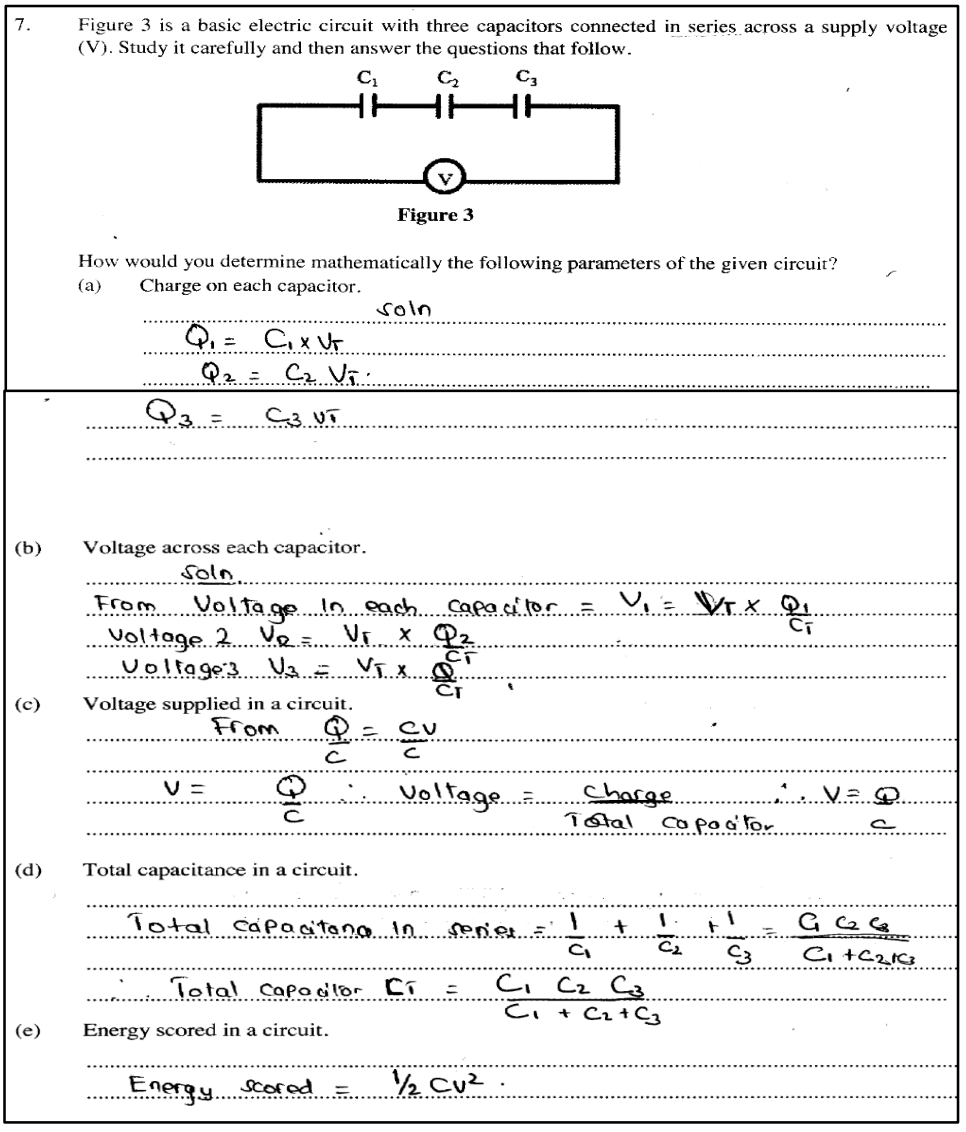


Figure 7: *Students' Performance in Question 7*

The overall performance of this question was average since 112 (31.1%) students scored average and above, however, 38 (11.2 %) students performed better. The student succeeded to determine mathematically the given parameter from the question by attempting all sub-questions. The students clearly showed the analysis of charge and voltage on each capacitor, voltage supplied, total capacitance and energy stored in a circuit. Extract 7.1 is an example of a good response from one student who attempted the question.



Extract 7.1: A sample of correct responses to Question 7

Extract 7.1, a student correctly determined mathematically the charge on each capacitor, voltage across each capacitor, voltage applied in a circuit and energy stored in a circuit.

Although few 74 (21.9 %) students scored average, some 226 (66.9 %) students performed poorly. These students failed to analyze charge and voltage on each capacitor, voltage supplied, total capacitance and energy stored in a circuit. Some students in part (a) used a power formula $\text{Charge} = \text{VI voltage} \times \text{current}$ to find charge on each capacitor, in part (b) the students wrote a wrong formula $V = \frac{Q}{C}$ to find voltage across each capacitor. In part (b) the student gave wrong explanation as "sum of all voltages across capacitor". In part (c) some of the students used incorrect formula to find voltage across each capacitor $Q = \frac{C}{V}$. In part (d) the student used a formula to find parallel capacitance instead of series capacitance and in part (e) they used a wrong formula to find the voltage supplied in a circuit $C = \frac{Q}{C}$. Extract 7.2 shows the example of a poor response from a student who failed to attempt all five components in the question.

7. Figure 3 is a basic electric circuit with three capacitors connected in series across a supply voltage (V). Study it carefully and then answer the questions that follow.

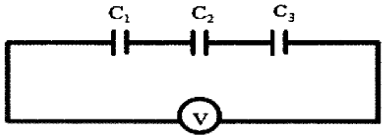


Figure 3

How would you determine mathematically the following parameters of the given circuit?

(a) Charge on each capacitor.

F coloumb (F)

(b) Voltage across each capacitor.

C1+C2+C3

C1 C2 C3

(c) Voltage supplied in a circuit.

C1C2C3 x V

C1C2C3V

(d) Total capacitance in a circuit.

C1+C2+C3 = C1C2C3

Total capacitance in a circuit = C1C2C3

(e) Energy scored in a circuit.

voltage

Energy scored in a circuit = voltage

Extract 7.2: A sample of incorrect responses to Question 7

In Extract 7.2, a student failed to attempt all five components in the question. In part (a) the student failed to calculate total capacitance of capacitor in parallel instead he/she gave a formula to calculate charge. In part (b) he/she multiplied current and resistance instead of using a formula to calculate voltage. In part (c), the student provided the formula to calculate charge instead of voltage supplied in a circuit, while in part (d) he/she provided the formula to calculate capacitance in series instead of total capacitance. In part (e) he/she provided the formula $E = \frac{C}{V}$ to calculate energy stored in a circuit which was wrong.

2.2.6 Question 8: Semiconductor Devices

This question intended to test student's ability to identify different types of diodes with their schematic symbols. The question was as follows:

During group discussion, your fellow students selected you to explain about different types of diodes. Simplify your explanation by using schematic symbols to illustrate six types of diodes.

This question was attempted by 338 (100 %) students. Out of them 58 (17.2 %) scored from 0 to 3 marks, 86 (25.4 %) scored from 3.5 to 6 marks, and 194 (57.4 %) scored from 6.5 to 10 marks. The overall students' performance in this question is summarized in Figure 8.

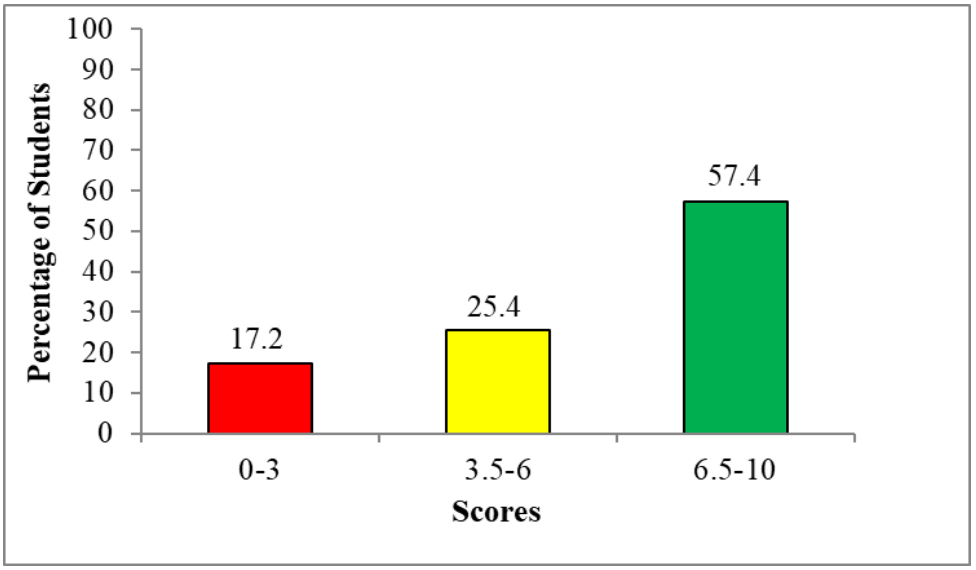
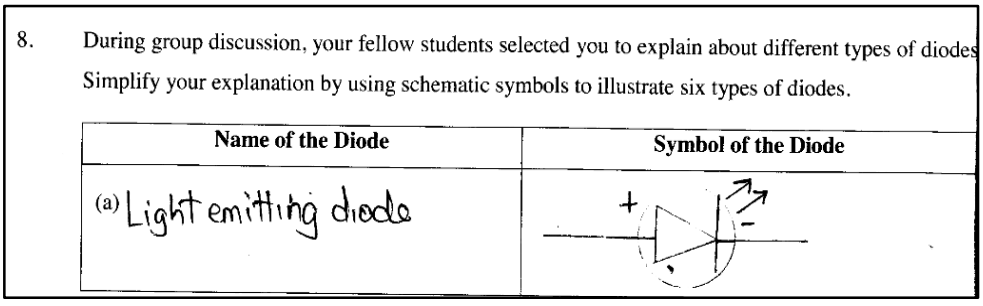


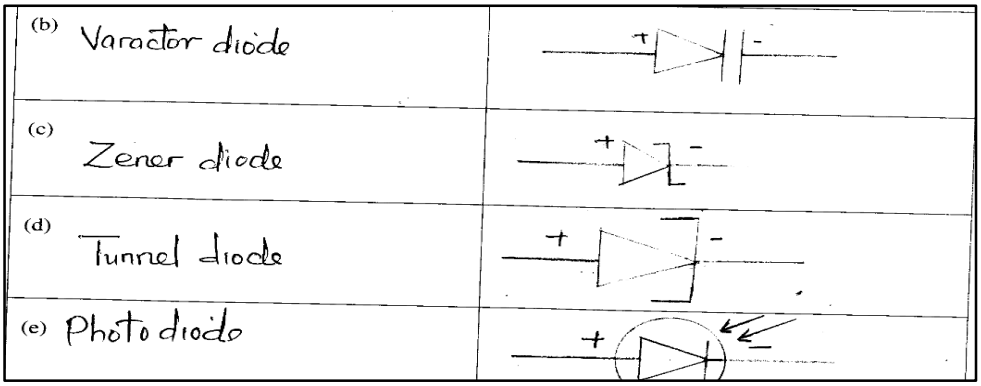
Figure 8: *Students' Performance in Question 8*

The performance of this question was good since majority 280 (82.8%) of the students scored average and above. This means that most of the students had sufficient knowledge and skills on semiconductor devices, specifically


8. During group discussion, your fellow students selected you to explain about different types of diodes Simplify your explanation by using schematic symbols to illustrate six types of diodes.

Name of the Diode	Symbol of the Diode
(a) Light emitting diode	

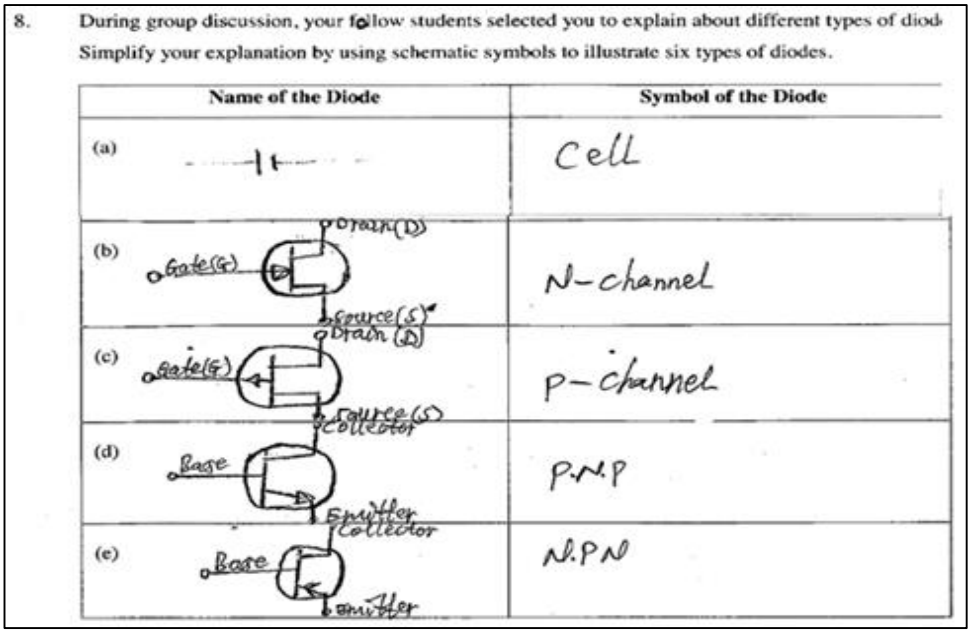
the types of diode with their schematic symbols. An example of a good response from a student is provided in Extract 8.1.



Extract 8.1: A sample of correct responses to Question 8

In Extract 8.1, a student correctly drew diode symbols with their correct names.

Besides good performance, 58 (17.2%) students performed poorly. These were not familiar with the types of diode and their symbols. Some of them drew logic gates instead of diodes, while others drew diode symbols with wrong names. Moreover, some students drew variable resistor and named it as a variable diode, while others drew pn junction structure with metal on side and called it metal diode. Also there were those who drew PNP transistor with inside arrows and called it photo diode, and some drew NPN transistors without side arrows and called it as light emitting diode.



Extract 8.2: A sample of incorrect responses to Question 8

In Extract 8.2, a student drew a symbol of cell in part (a) and unipolar diode (JFET) in other parts, which was not related to the question.

2.2.7 Question 9: Electronic Components

This question consisted of parts (a), (b), (c) and (d). This question intended to measure students' ability to calculate electrical quantities when capacitor is connected in series with a coil. The question was as follows:

When an A.C voltage (V) of a frequency (f) is applied to a capacitor (C) which is connected in series with a coil (L) of a resistance (R), the resonance which occurred causes minimum impedance and large voltages across (C) and (L). If the value of V = 24 V, R = 100 Ω, C = 10 µF, L = 2.0 H, f = 50 Hz, determine:

(a) The inductive reactance
(b) Capacitive reactance
(c) The impedance of the circuit
(d) The r.m.s current

This question was attempted by 338 (100 %) students. Out of those who attempted, 250 (74.0 %) scored from 0 to 3 marks, 80 (23.7 %) scored from 3.5 to 6 marks, and 8 (2.3 %) scored from 6.5 to 10 marks. The students' overall performance in this question is summarized in Figure 9.

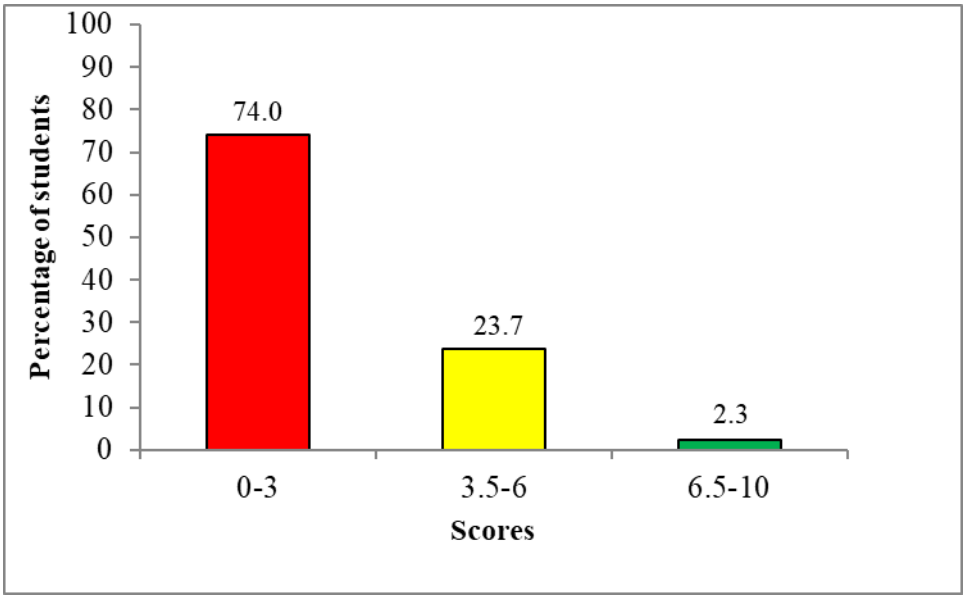


Figure 9: *Students' Performance in Question 9*

The overall performance of this question was poor since 250 (74.0 %) scored below average. This shows that the students had insufficient knowledge and skills on electronic components specifically on resonance circuit. The analysis indicates that some of the students used wrong formulas for instance, in part (a), they incorrectly used the formula $Inductive = \frac{\text{Re}sistance}{Coil}$ to determined inductive reactance, while in part (b), they used $Capacitive = \frac{frequancy}{Capacitance}$ to find capacitive reactance. In part (c) they used $\text{Impedance} = \frac{resistance}{frequancy}$, others wrote $\text{Impedance} = \text{frequancy} \times \text{Inductor} \times \text{Capacitive}$ to find impedance. Others thought that impedance uses Ohms law, hence they used a formula $\text{Im}pedance = \frac{V}{I}$ instead of $\text{Impedance}(Z) = \sqrt{R^2 + (X_L - X_C)^2}$. Some of the students used formulas $XL = \frac{1}{2\pi fc}$ to find inductive reactance instead of $XL = 2\pi fL$ and some used $XC = 2\pi fL$ instead of $XC = \frac{1}{2\pi fC}$ to find capacitive reactance. Similarly in part (d), some of the students used a wrong formula $I = \frac{Z}{R}$ to find r.m.s current and ohms law $Current = \frac{Voltage}{\text{Re}sistance}$. Extract 9.1 shows a sample of good responses from a student who correctly calculated all components given in a circuit.

9. When an A.C voltage (V) of a frequency (f) is applied to a capacitor (C) which is connected in series with a coil (L) of a resistance (R), the resonance which occurred causes minimum impedance and large voltages across (C) and (L). If the value of V = 24 V, R = 100 Ω, C = 10μF, L = 2.0 H and f = 50 Hz, determine:

(a) The inductive reactance.

Data provided.

$V = 24\,V$

$f = 50\,Hz$

$R = 100\,\Omega$

$C = 10\mu F$

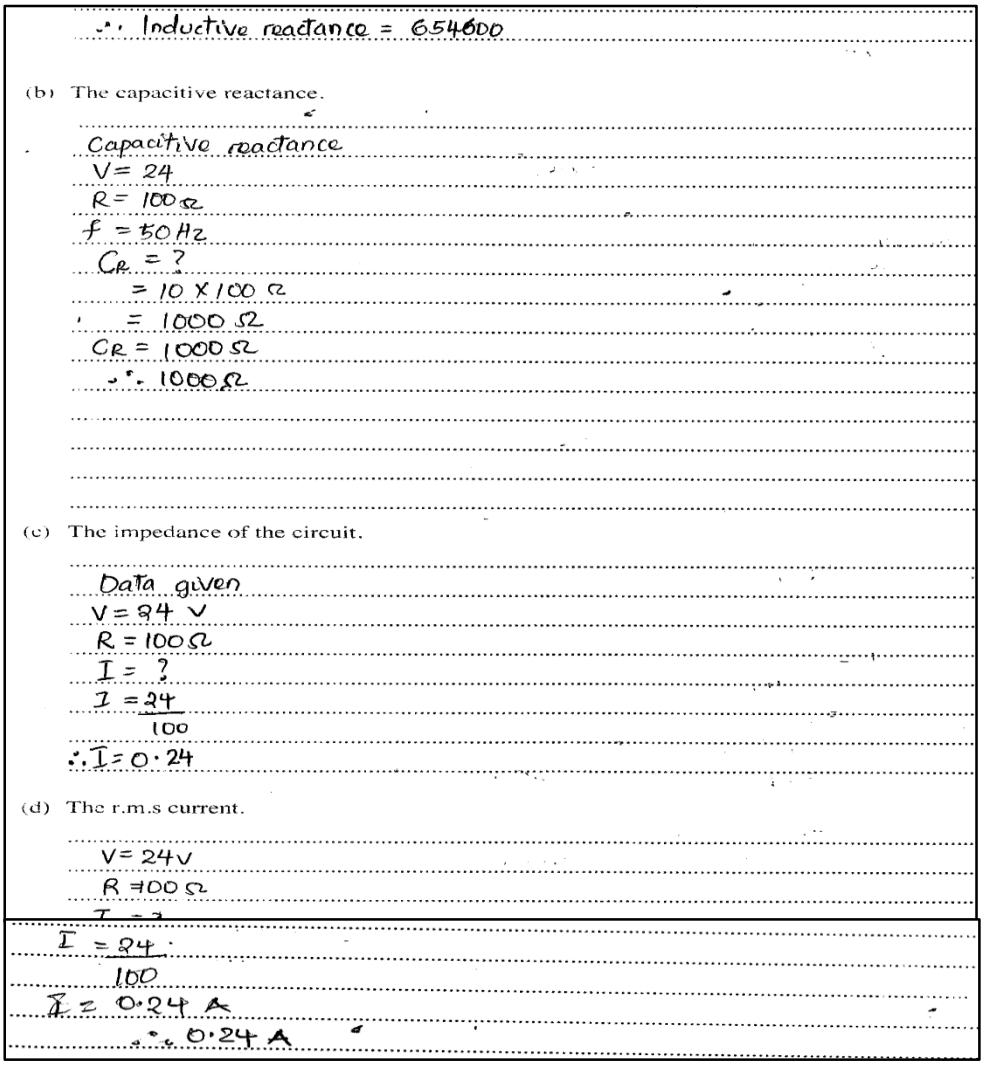
$L = 2.0\,H$

Find inductive reactance.

$X = 2\pi \times 24 \times 50 \times 100 \times 2.0 \times 10$

$= 314 \times 24 \times 5 \times 2 \times 10$

$= 314 \times 24 \times 100 = 2400 \times 314 = 654600$



Extract 9.1: A sample of incorrect responses to Question 9

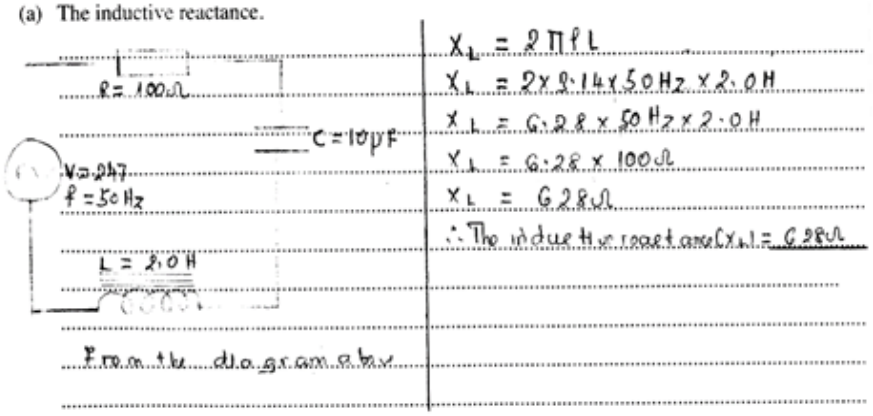
In Extract 9.1, a student failed to calculate all components given in a circuit. In part (a) student multiplied all parameters, voltage, capacitor, frequency, inductor and resistance to get inductive reactance which was incorrect. In part (b) student multiplied capacitance and resistance ($X_c = C \times R$) instead of capacitive reactance. In part (c) and (d) he/she used the same formula to calculate current , $I = \frac{V}{R}$ instead of impedance and r.m.s current of the circuit.

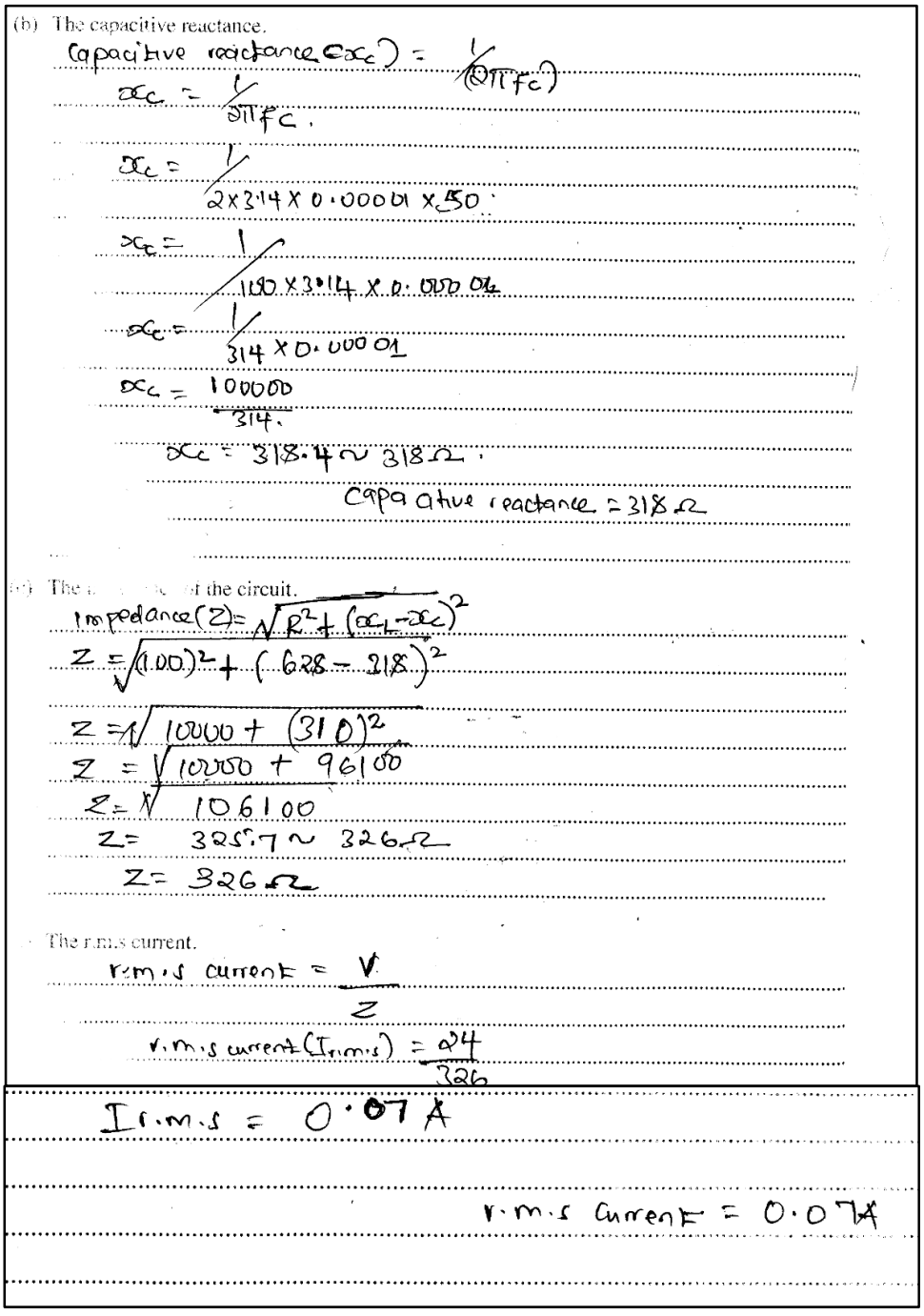
Although majority of the students perform poorly, few (26.3 %) students managed to perform better. In part (a), these students correctly applied the

formula to calculate the inductive reactance and correctly calculated the data and got the correct answer. Similarly, in part (b), the student correctly calculated capacitive reactance, as well as in part (c), and (d) he/she provided answers as per question demand.

9. When an A.C voltage (V) of a frequency (f) is applied to a capacitor (C) which is connected in series with a coil (L) of a resistance (R), the resonance which occurred causes minimum impedance and large voltages across (C) and (L). If the value of V = 24 V, R = 100 Ω, C = 10μF, L = 2.0 H and f = 50 Hz, determine:

(a) The inductive reactance.





Extract 9.2: A sample of correct responses to Question 9

In Extract 9.2, a student managed to use correct formulas to calculate the reactance as per question.

2.3 Section C: Structured Question

2.3.1 Question 10: Drawing Technique

The question was as follows:

An isometric block can be seen from different views. Justify this fact by producing three views in third angle projections from Figure 4.

Note: All measurements are in millimeters(mm)

This question was attempted by 338 (100 %) students, out of them 289 (85.5 %) scored from 0 to 4 marks, 43 (12.7 %) scored from 4.5 to 10 marks, and 6 (1.8 %) scored from 10.5 to 15 marks. The overall students' performance in this question is summarized in Figure 10.

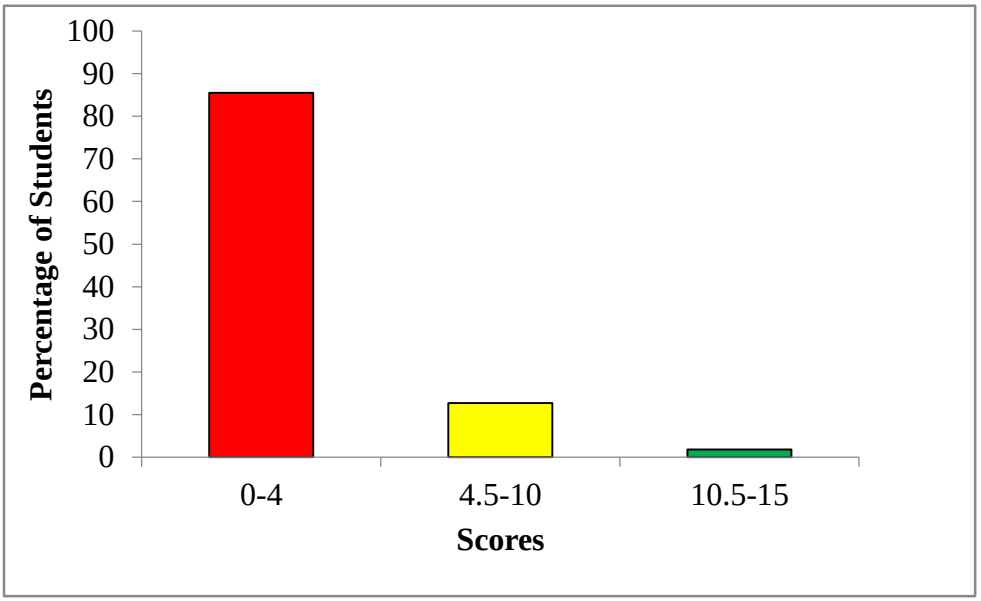
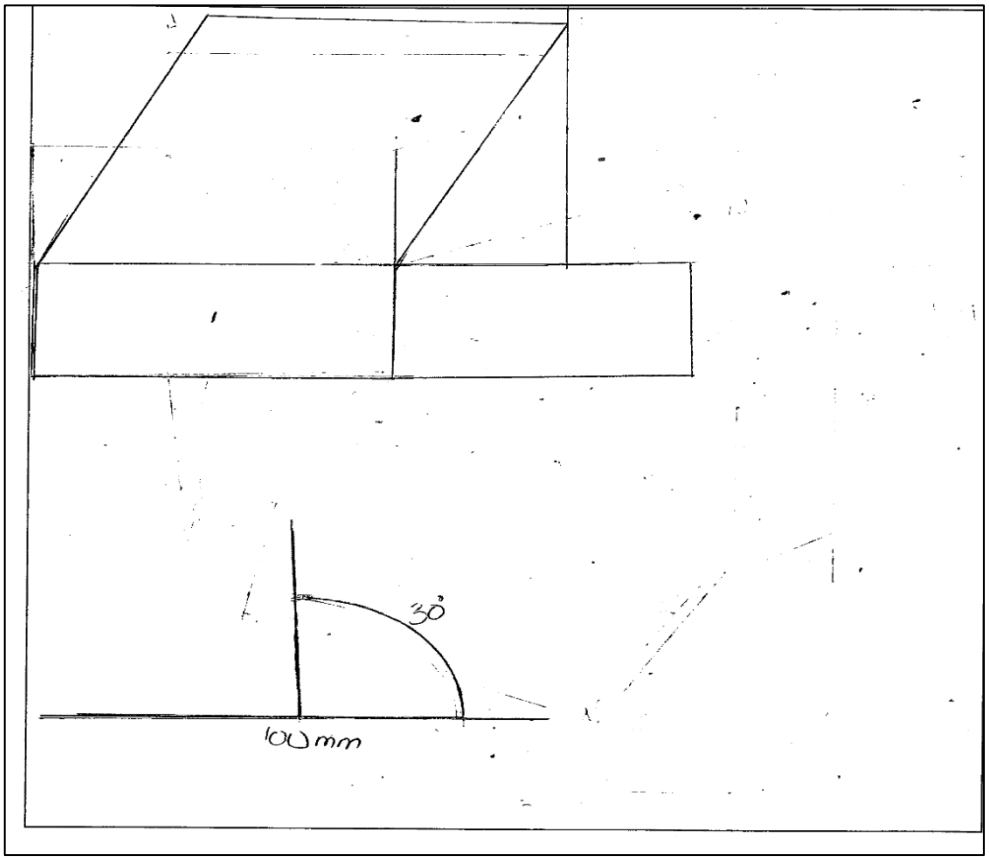


Figure 10: *Students' Performance in Question 10*

The general performance of this question was poor since 289 (85.5%) of the students scored low marks (0-4). This suggests that the students had insufficient knowledge and skills on drawing techniques. The analysis done on students' responses shows that most of them failed to draw the isometric block in third angle projection while others drew it in first angle projection. Some students reproduced the same figure as shown in the question paper, while others just drew a rectangular block. It was also noted that some

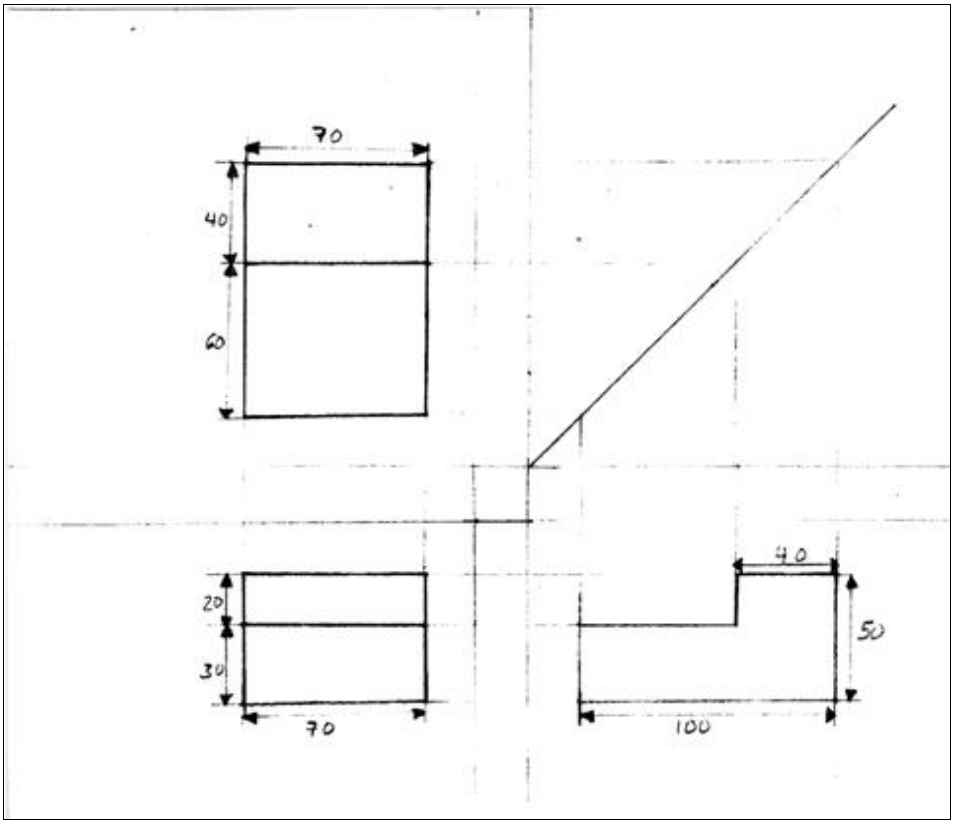
students drew a box shape and label it as a front view. For instance, one of the students drew 90°, 60° and 30° angles instead of drawing front, plan and end views. Extract 10.1 shows a sample of an incorrect response from one of the students who attempted the question.



Extract 10.1: A sample of incorrect responses to Question

Extract 10.1 is a sample of the students who did not draw the block in front view, side view and end elevation, instead he drew perpendicular line by showing 30° and polygon figure.

Besides poor performance of most of the students, there were few 6 (1.8 %) who performed better. These students drew all three views in a correct position; dimension and views are in third angle projection as per question demand.



Extract 10.2: A sample of correct responses to Question 10

In Extract 10.2, a student correctly drew the views in third angle projection. He/she showed all important dimensions and construction lines on the block.

3.0 STUDENTS' PERFORMANCE ON EACH TOPIC

The analysis on students' performance on the topics assessed in the Electronics and Communication Engineering subject for the year 2022 indicates that the students' performance was good in 1 topic, average in 3 topics and weak in 1 topic. Question 1, which was composed from various topics, had good performance.

The topic that had good performance was *Safety management and rules (74.8%).* The good performance on this topic signifies that the students had sufficient knowledge, skills and competence on the tested concept. Furthermore, the analysis of the students' performance in each question indicates that the students had good performance of 77.5 % in question 1 which was a multiple choice item, 79.9 %, in the question 4, 78.4 % in question 6, and 82.8 % in question 8.

The topics, which had average performance, were *Introduction on Electricity (56.5 %), Semiconductor Devices (50.9 %),* and *Electronic Components (44.3 %).* In terms of question the student had an average performance in question 2 (64.8%), question 3 (62.7%) and question 7 (33.1%). This performance shows that the students had partial knowledge, skill and competence on those topics.

The students performed poorly in the topic of *Drawing Techniques (14.5 %)* because they lacked knowledge on this topic. Also students had poor performance in question 5 (5.0 %), question 9 (26.0 %) and question 10 (14.5 %).

The Appendix presents a summary of the students' performance on each topic where green, yellow and red colours represent good, average and poor performances respectively.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The general performance of the students on FTNA, 2022 in Electronics and Communication Engineering subject was good. Out of 338 students who sat for the paper, 253 (74.85 %) passed while 85 (25.15 %) failed.

The analysis of the students' performance reveals that, the students faced some challenges when attempting the questions. It was observed that inadequate content knowledge was one of the major reasons for weak performance to most of the students. Some of the students provided incorrect responses while others skipped some of the items without writing any answer.

The analysis shows that lack of mathematical skills was also a challenge on the performance, particularly in the questions, which required application of formula and calculations through several steps to reach the final answer. For instance, in question number 9 (a) which required the students to determine the inductive reactance, capacitive reactance, impedance of the circuit and r.m.s current, majority of the students failed to apply the correct formula and mathematical manipulation, hence they ended up with an incorrect answer. Another reason was poor English language proficiency. Due to this some of the students provided responses with grammatical errors while others failed to give satisfactory explanations of the necessary concepts. For example, question 5 (b) which required the students to explain why the common emitter amplifier is commonly used rather than common base amplifier, the students failed to explain in details. They failed to compose their sentences correctly and hence scored low or no marks. Moreover, lack of drawing skills contributed to poor performance of some students. In question 10, for example, which required the candidates to produce three views in third angle projection from the given figure, most of the students were unable to produce while others drew the diagram as the one provided in the question.

4.2 Recommendations

From the shortcomings observed in the analysis of students 'item response, the following are recommended:

(a) The teaching and learning process for the Electronics and Communication Engineering subject should focus more on practical methods including drawing to give room for the learners to build their skills and competencies in the subject.

(b) Students are advised to study hard in order to gain enough knowledge of the concepts in the syllabus.

(c) Students should do different computation exercises to support their ability to tackle questions, which require applications of formulae and calculations. For instance, *Measurements and Instruments*, *Introduction on Electric current and Electronics components.*

(d) Since English is the medium of instruction for the Electronics and Communication Engineering subject, students should put more emphasis on the use of English language by practicing it through writing, reading, listening and speaking. This strategy will improve students' English proficiency.

Appendix

A Summary of Students' Performance in each Topic

S/N	Topic	Question Number	Percentage of Students' Performance(%)	Remarks
1	Safety Management and Rules	6	78.4	Good
2	Electronics Engineering Occupational Information, Safety Management and Rules, Drawing Techniques, Introduction on Electricity, Introduction to Measurement and Instrumentation, Electronic Component and Semiconductor Devices	1	77.5	Good
3	Introduction on Electricity	4 &7	56.5	Average
4	Semiconductor Devices	2, 5, & 8	50.9	Average
5	Electronic Components	3 & 9	44.3	Average
6	Drawing Techniques	10	14.5	Weak