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

CANDIDATES' ITEM RESPONSE ANALYSIS REPORT ON THE CERITICATE OF SECONDARY EDUCATION EXAMINATION (CSEE) 2021

MOTOR VEHICLE MECHANICS



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093 MOTOR VEHICLE MECHANICS

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FOREWORD

The Candidates Items Response Analysis (CIRA) Report for Motor Vehicle Mechanics subject in the Certificate of Secondary Education Examination (CSEE) 2021 has been written in order to provide feedback to candidates, teachers, parents, policy makers and the public in general to take appropriate measures in order to improve candidates' performance in future.

The Certificate of Secondary Education Examination (CSEE) marks the end of four years of secondary education. It is a summative evaluation which, among other things, shows the effectiveness of education system in general and education delivery system in particular.

The analysis presented in this report intends to contribute towards understanding of possible reasons behind the candidates' poor or good responses in Motor Vehicle Mechanics subject. The report highlights the factors that affected the candidates' performance. The analysis shows that, good performance of the candidates was due to adequate knowledge and skills on the tested topics and good understanding on the demand of the questions. Poor performance was due to poor English proficiency, inadequate knowledge and lack of practical skills on tested topics as well as failure to understand the demand of the questions.

Finally, the Council would like to thank all examiners and others 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 analysis of candidates' item responses shows the performance of candidates who sat for Motor Vehicle Mechanics in the Certificate of Secondary Education Examination (CSEE) 2021. The Motor Vehicle Mechanics examination measured the candidates' competences as stipulated in the 1994 syllabus and examination format. The report shows candidates' performance question-wise by identifying the candidates' strengths and weakness when attempting the questions. It analyses the items which were performed well, moderately or poorly.

The Motor Vehicle Mechanics paper had fourteen (14) questions with three sections: A, B and C. Section A had ten multiple choice items, section B had nine (9) short answer questions and section C had four (4) structured questions. Candidates were instructed to answer all questions in section A and B and three (3) questions from section C.

A total of 103 candidates sat for the Motor Vehicle Mechanics examination in 2021, of whom 49 (47.6%) passed and 54 (52.4%) failed the examination. In 2020, a total of 38 candidates sat for the examination and 22 (57.9%) passed. The performance has thus decreased by 10.3 per cent compared to that of 2020. Appendix IV summarizes this performance.

This analysis highlights the requirement of each question, the percentage of candidates who attempted the question and the percentage of those who scored various marks based on their responses. It also shows the strengths and weaknesses of candidates' responses and possible reasons for their performance in each question.

The performance of candidates in this report is presented in three categories based on the percentage which are: "Weak" if the percentage ranges from 0 to 29 marks, "average" if the percentage ranges from 30 to 64 marks and "good" if the percentage ranges from 65 to 100 marks. The categories of performance is represented in figures and tables using colours whereby a red, yellow and green color indicates weak, average and good performances respectively. Appendices I and II indicate overall performance of candidates who sat for Motor Vehicle Mechanics examination in 2021.

2.0 ANALYSIS OF THE CANDIDATES' PERFORMANCE IN INDIVIDUAL QUESTIONS

2.1 Section A: Objective Question

This section had ten multiple choice items each carrying one mark, making a total of ten marks. The scores were distributed in the following ranges. From 0 to 2.0 marks indicate weak performance; from 3.0 to 6.0 marks indicate average performance and 7.0 to 10.0 marks indicate good performance.

2.2 Question 1: Multiple Choice Items (Various Topics)

The items in this question were set from seven (7) topics, which are: *Power Unit (Engine), Fuel System (Petrol), Ignition System, Lubrication System, Cooling System, Transmission System* and *Wheel and Tyres.* The candidates were instructed to choose the correct answer from the five alternatives and write its letter beside the item number in their answer booklets.

The question was attempted by 103 (100%) candidates, of whom 29 (28.2%) scored from 0 to 2.0 marks, 70 (67.9%) scored from 3.0 to 6.0 marks and 4 (3.9%) scored from 7.0 to 10.0 marks. Figure 1 summarizes this performance.



Figure 1: The Candidates' Performance in Question 1

General performance in this question was average because 74 (71.8%) candidates scored average and above which is from 3.0 to 10.0 marks.

The candidates who passed the question had a good ability of utilizing the knowledge acquired in different topics to choose the correct answers among the given alternatives. The analysis shows that, most of the candidates chose correctly in item (i) from the topic of Transmission System. The rest of items were performed averagely. The following is the analysis of candidates' performance in each item:

In item (i), the candidates were required to apply the knowledge of different gears used in transmission to identify the advantages of using helical gears over spur gears. The question was:

- *(i)* What are the advantages of using helical gears compared to spur gears in a transmission system?
 - A Strength is high and less cost
 - B Strength is high and less end thrust
 - C Noise level is low and its strength is high
 - D Noise level is low and its economy in fuel
 - *E* Noise level is high and its strength is high

The correct answer was C *Noise level is low and its strength is high* and was chosen by 66.1% of the candidates who were able to apply the concept of Transmission System. Candidates who chose A *strength is high and less cost* did not understand that the strength of helical gear leads to high cost compared to spur gear. Those who chose B *strength is high and less end thrust* did not understand that although helical gear is stronger, it generates thrust forces and may require special lubricant due to their design. For those who chose D *Noise level is low and its economy in fuel* did not know that helical gears generate slippage on their contact hence they consume more fuel.

In item (ii), the question tested the candidates' ability to use the knowledge of wheel and tyre. The question was:

- (ii) If a wheel diameter is divided by section width of a wheel and the result is multiplied by 100%, what will be the outcome?
 - A Aspect ratio of the diameter expressed in percentage
 - *B* Aspect ratio of the tyre expressed in percentage
 - C Aspect ratio of the bead expressed in percentage
 - D Aspect ratio of the width expressed in percentage
 - *E* Aspect ratio of the height expressed in percentage

The correct answer was B *Aspect ratio of the tyre expressed in percentage*. Most of the candidates failed in this item as only 37.27% of them were able to choose the correct answer. The candidates had clear understanding on the descriptions of the tyre sidewall. Candidates who chose A, C, D, and E did not understand the meaning of aspect ratio. Hence they had insufficient knowledge on wheel and tyre.

Item (iii) required the candidates to use the knowledge of fuel system in determining the octane rating of petrol. The question was:

(iii) What is the octane rating of petrol available commercially with regard to motor car?
A 65-75 B 95-100 C 100-110
D 110-125 E 85-95

The correct answer was E 85-95. The candidates who chose the correct answer had an adequate knowledge on the properties of fuel hence they were able to determine the octane rating of petrol fuel. The 66.97 per cent of the

candidates opted for incorrect answers, which proves that they had insufficient knowledge on the properties of petrol fuel as used in motor car.

In item (iv), the candidates were required to identify the effects which will be experienced when there is wheel imbalance in Motor Vehicle Mechanic. The question was:

- *(iv)* What effects will be experienced when there is wheel imbalance in motor vehicle?
 - A Steering wheel vibrations and uneven tyre wear
 - *B Poor acceleration and hard steering*
 - *C Frequent hard steering and hard ride*
 - *D Poor acceleration and reduced fuel efficient*
 - *E Frequent wheel vibrations and uneven tyre wear*

The correct answer was A Steering wheel vibrations and uneven tyre wear. The candidates who chose the correct answer managed to use the knowledge of wheel and tyre in answering the question. The 70.91 per cent of the candidates chose incorrect answers such as B poor acceleration and hard steering, C frequent hard steering and hard ride, D poor acceleration and reduced fuel efficient and E frequent wheel vibrations and uneven tyre wear. These candidates did not understand that wheel imbalance cannot affect the acceleration of vehicle due to the fact that the source of problem is based on wheel and tyre and not from power unit. Also the candidates did not understand that the problem of hard ride or steering is associated with steering system problem and not wheel problems.

Item (v) required the candidates to use the knowledge of ignition system to identify the causes of black coating on the spark plug. The question was:

- (v) Which engine operation causes the spark plug to indicate deposit of black coating of soot?
 - A Most economical mixture B Stoichiometric mixture

Too rich mixture

- C Too lean mixture D
- E Stoichiometric fuel

The correct answer was D *Too rich mixture*. The candidates who chose the correct answer had a clear understanding of the fuel and air mixture in the combustion chamber. They knew that high amount of fuel in the combustion chamber results to the deposition of carbon on the spark plug tip which is

found on fuel. The candidates who chose incorrect response C *Too lean mixture* did not understand that too lean mixture is the ratio of fuel and air with too much oxygen which cannot result to black coating on spark plug. For those who chose B *Stoichiometric mixture* they did not know that is the ratio of air to fuel that burns all fuel with no excess air and it cannot form deposition of carbon on the spark plug. Those who chose A *Most economical mixture* and E *Stoichiometric fuel* lacked knowledge of ignition system.

In item (vi), the candidates were instructed to identify the crescent shaped cavity on the piston head top surface. The question was:

(vi) What does the crescent shaped cavity on the piston head top surface represent?

| Α | Piston oil hole | В | Snap ring | С | Valve recess |
|---|-----------------|---|------------------|---|--------------|
| D | Valve clearance | Ε | Piston fuel hole | | |

The correct answer was C *Valve recess*. The candidates were able to choose the correct answer due to the adequate knowledge of engine operations. The candidates who chose A *Piston oil hole* and E *Piston fuel hole* did not understand that piston has neither oil hole nor fuel. Hence it proves that they lacked the knowledge of engine operation. The candidates who chose D *Valve clearance* did not understand that valve clearance is the small gap between the rocker arm and the top of the valve stem, hence it has no relation with the piston head top. For those who chose B *Snap ring* did not understand the demand of the question because snap rings are fasteners used for axial fixation of components on shafts or bores. They are installed in grooves and provide a shoulder to prevent any lateral movement of components, like bearings.

In item (vii), the candidates were required to use the knowledge of lubrication system to identify the type of engine oil a mechanist is supposed to order for a multi-grade engine. The question was:

| (vii) | A m | echanist int | ends to | order a multi-gr | rade en | gine oil for th | e car. |
|-------|-----|----------------|-----------|--------------------|---------|-----------------|--------|
| | Whi | ich type of er | igine oil | l is he supposed t | o order | ? | |
| | Α | SAE 30 | В | SAE 20 W50 | С | API SF | |
| | D | API 50 | E | API 50 multi | | | |

The correct answer was B *SAE 20 W50*. Some of the candidates were able to choose the correct response, which indicate that they had clear understanding

on the type of lubrication in different working temperature. They knew that SAE 20W-50 is thicker oil with high viscosity at hot temperatures and is highly resistant to oil thinning which is used in motor vehicle engines. Other candidates who chose incorrect response like A *SAE 30* did not understand that SAE 30 oils contain additives that lower viscosity (make it thinner) hence it is mostly used at lower temperatures. The candidates who chose C *API SF*, D *API 50* and E *API 50 multi* lacked knowledge of lubrication. They did not understand that API is not applicable in motor vehicle standards hence it has no relation with grades of lubrication used in motor vehicle.

In item (viii), the candidates were required to identify parameters which determine the size of engine cylinder. The question was:

| (viii) Which parameters determine the size of engine cylinder | | | | | |
|---|---|---------------------|---|--------------------|--------|
| | Α | Diameter and bore | В | Displacement | and |
| | С | Diameter and stroke | D | Bore and length of | piston |
| | E | Bore and stroke | | | |

The correct answer was E *Bore and stroke* and was opted for by 41.28% of the candidates who proved to have knowledge on Power Unit (Engine). They understood that bore is the diameter of piston and stroke is the distance moved by piston. Most of the candidates failed to identify the correct size of engine cylinder. They ended up guessing and writing incorrect response such as A *Diameter and bore*, B *Displacement and efficiency*, C *Diameter and stroke* and D *Bore and length of piston*. These candidates did not understand the demand of the question and they had insufficient knowledge on Power Unit (Engine).

In item (ix), the candidates were required to identify the way to avoid arcing and wearing of contact breaker point of ignition system which affects the performance of the engine. The question was:

- *(ix) How can you avoid arcing and wearing of contact breaker point of ignition system which affects the performance of the engine?*
 - *A* By frequent change of contact breaker points
 - *B* By frequent adjusting contact breaker points
 - C By using solid state electronic devices
 - D By changing the condenser and resistor
 - *E* By the use of parallel variable resistor

The correct answer was A *By frequent change of contact breaker points*. The candidates who chose the correct answer had a clear understanding on the different faults and solutions for the problems that occurred in conventional ignition system. Hence they knew that changing contact breaker point is the solution in preventing arcing and wearing of contact breaker points. The candidates who chose B *By frequent adjusting contact breaker points* had inadequate knowledge on ignition system hence they did not understand that the adjustment of contact breaker point is performed only when ignition timing adjustment is required. The candidates who chose C *By using solid state electronics devices* failed to differentiate conventional ignition system with electronic ignition system hence they did not understand the demand of the question. For the candidates who chose D *By changing the condenser and resistor* and E *By the use of parallel variable resistor*, were wrong because the problem is associated with the action of opening and closing of the contact breaker points.

Item (x) required the candidates to use the knowledge of cooling system to identify the part of engine which indicates the temperature of the car. The question was:

- (x) Which part of engine indicates the temperature of the car?
 - A Oil lubricated jacket
- *B* Engine cylinder
- C Engine piston hole
- D Water cooling jacket
- *E Piston rings groove*
- The correct response was D *Water cooling jacket*. The candidates who chose the correct answer had a clear understanding on the demand of the question. In addition, they had knowledge of engine cooling system thus they were able to determine the part of engine which indicates the temperature. The candidates who chose A *Oil lubricated jacket* lacked the knowledge of engine cooling system hence they did not understand that oil as lubricant does not contain jackets but only cooling system. Those candidates who chose B *Engine cylinder* had inadequate knowledge on engine cooling system components hence they failed to differentiate engine cooling system components. Those who chose C *Engine piston holes* and E *Piston rings groove* lacked knowledge on cooling system hence they failed to understand that piston ring grooves used in fastening of oil rings and compression ring prevent leakage of oil and compression.

2.3 Section B: Short Answer Questions

This section had nine questions set from topics of *Workshop Practice and Safety, Power Unit (Engine), Lubrication System, Cooling System, Wheel and Tires and Steering System, Braking System* and *Engine and Vehicle Testing.* The candidates were instructed to answer all questions. Each question carried five (5) marks making a total of forty five (45) marks. In this section the scores were distributed in the following ranges: from 0 to 1.0 mark (weak), from 2.0 to 3.0 marks (average) and 4.0 to 5.0 marks (good).

2.3.1 Question 2: Workshop Safety

In this question, the candidates were instructed to explain five effects of hazardous materials to be observed when working in motor vehicle workshop.

The question was attempted by 103 (100%) candidates, of whom 68 (66.0%) scored from 0 to 1.0 mark, 22 (21.4%) scored from 2.0 to 3.0 marks and only 13 (12.6%) scored from 4.0 to 5.0 marks. Figure 2 summarizes this performance.



Figure 2: The Candidates' Performance in Question 2

Generally, the performance of the candidates in this question was weak because 68 (66.0%) candidates scored below average.

The candidates, who scored low marks from 0 to 1.0, failed to understand the demand of the question and lacked the knowledge on workshop safety. Those who scored 1.0 mark provided only one correct effect of hazardous material and other points were totally incorrect. For example one of the candidates wrote the correct response; such as *physical injury due to slippery caused by leaked oil* but mixed with incorrect response which is *wearing of parts of vehicle due to friction*. This candidate confused the injury of a person and the damage of the machine. Other candidates who scored 0 marks provided irrelevant answers such as *damages occur, example in skin, cutting of the part of the body, ignorance of the people for the tools used and frequently accidents*. These candidates did not understand the demand of the question. Extract 2.1 is a sample of poor responses from the candidate's script.



Extract 2:1: A sample of the candidates' poor responses in Question 2

In Extract 2.1, the candidate provided irrelevant explanation. Based on his/her explanations it proves that, he/she failed to understand the demand of the question and had poor proficiency in English language. The candidates provided the response like *it provide smoking, it consist metals, it consist petroleum* which were totally irrelevant to the demand of the question.

On other hand, 21.4% of the candidates who scored average marks (2.0 to 3.0 marks) provided one to three correct responses. For example, one of the candidates managed to provide two correct points but mixed with incorrect explanations such as *it cause electric shock example electric shock affect the people time of welding*. The candidate failed to understand the causes and effect of electric shock in the workshop. The candidates in this category

understand the demand of the question but they had partial knowledge in motor vehicle workshop practice and safety.

Candidates who scored high marks managed to list correctly four to five hazardous materials and explain the effects of those materials if handled improperly. This reveals that, the candidates had a clear understanding on the demand of the question as well as adequate knowledge on motor vehicle workshop practice and safety. In addition, these candidates also had a good literacy level in English language which helped them to give precisely explanations based on the requirement of the question. Extract 2.2 is a sample of good responses from the candidate's script.

| | 1 | |
|-----|--|-------|
| 02. | 17 The haseodous material are planmable, | hance |
| | they can eath fir easily and cours of | Nº |
| | occident. | |
| | li) The haizadows materials are corrossnee, hen | |
| | they can buin different tissues of the bidy of t | Miner |
| | if not handled compation, | -0- |
| | hilthe hairodous materials are possenous, hand | 9 |
| | they can even cause death when inhaled | te |
| | exten, unless precautions are taken. | |
| | With haizadous materials are aplasive, how | nre |
| | they can easily explode and had to a gre | at |
| | runident of the. | |
| | VI Some materials are stippery, have the | 2 |
| | can cause for of a workman and confirments | when |
| | they will be littered on the plan. Tidiness is importa | int. |
| | | |

Extract 2.2: A sample of the candidates' good responses in Question 2

In Extract 2.2, the candidate provided clearly five effects of hazardous materials in motor vehicle workshop. She/he managed to apply the knowledge on workshop practice and safety.

2.3.2 Question 3: Power Unit (Engine)

This question had two parts, (a) and (b). In part (a) the candidates were instructed to mention five stationary parts of an engine and in part (b) candidates were instructed to state the importance of each part in (a).

The question was attempted by 103 (100%) candidates, of whom 47 (45.6%) scored from 0 to 1.0 mark, 54 (52.5%) scored from 2.0 to 3.0 marks and only 2 (1.9%) scored from 4.0 to 5.0 marks. The general performance is summarized in Figure 3.



Figure 3: Performance of Candidates in Question 3

In general, the candidates' performance in this question was average because 60 (54.4%) candidates scored above average.

The candidates' who scored low marks, (from 0 to 1.0 mark) had insufficient knowledge on power unit. Some of the candidates in part (a) managed to list one part of the engine and in part (b) explained its function. For example one candidate wrote *cylinder block* as a stationary component of engine and its function *is to hold all other engine parts*. This candidate managed to score

only one mark because he/she mentioned other engine stationary parts which were incorrect such as *camshaft and crankshaft* which are the moving parts of engine. Others listed two correct engine stationery parts but failed to provide its functions. For example, one of the candidates listed two correct points such as cylinder head and cylinder block and added other two incorrect stationary engine parts such as *flywheel and timing belt*. The 27.2% of the candidates scored 0 marks because they did not understand the demand of the question and also lacked the knowledge on engine operations. Another candidate in part (a), wrote radiator, crankshaft and piston as stationary engine parts and in part (b) he/she provided the functions of each part. This candidate listed the correct parts of the engine but they are not stationary parts hence scored 0 marks. Also the candidate did not understand that, radiator is not the part of engine but it's a component of cooling system of the engine. Another candidate provided totally irrelevant answers such as clutch, break, engine, steering and propeller shaft. This candidate did not understand the demand of the question as he/she listed different vehicle parts and systems instead of engine components. Extract 3.1 is a sample of poor responses from the candidate's script.

ank shall. neching road-3(6) Used to connect und discon ensine between a clubble. ii) Gear has It bely avelicle nd power of ave bieles heleto enduce DOMEY of Lue and P ombuscin Cha shaft Used to rolate the fly engine V) Connecting road Used to connec piston between a to Grante sha

Extract 3.1: A sample of the candidates' poor responses in Question 3

Extract 3.1 shows that, in part (a) the candidate mentioned five incorrect stationary parts of an engine such as *clutch, gear box, piston, crank shaft and connecting rod*. This candidate did not understand that piston, crankshaft and connecting rod are the moving parts of engine and not stationary parts. Hence it proves that the candidate did not understand the demand of the question. Also the candidate scored 0 marks in part (b) because its answer depends on the response provided in part (a).

The candidates' who scored from 2.0 to 3.0 marks were able to provide correctly some of the stationary parts of engine and its importance. For example, one candidate managed to list *cylinder block and cylinder head* as the engine stationary parts and also in part (b), he/she provided correct explanations. This candidate scored 2.0 marks because he/she listed other incorrect stationary engine parts such as *piston, inlet valves and exhaust*

valves. Further analysis shows that some of the candidates had poor proficiency in English language since they failed to write the correct spellings of the engine parts. For example, one candidate wrote *head gast* instead of writing *cylinder head gasket*. Others had inadequate knowledge on engine parts hence they mixed up wrong and correct responses.

On the other hand, the very few (1.9%) of the candidates who scored 4.0 marks had an adequate knowledge on the engine. Therefore they were able to mention clearly the stationary parts of an engine in part (a) and stated the importance of each part in (b). These candidates understood the requirements of the question and had adequate knowledge on engine operation. There were only two candidates who scored 4.0 marks and they did not score full marks because they mentioned only four correct engine parts with their importance out of five required. Extract 3.2 is a sample of good responses from the candidate's script.

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|--------|-------------------------------|--|
| بھ) کے | Stationary parts of an Engine | |
| | e) The cyleder block. | |
| | 1 mc cycling cr souge | |
| | ii) the cylinder head | |
| | The oil supplying | |
| | m) the UIL Supply | |
| | IV) The Cylinder head gasket. | |
| | 1) The solution manifold | |
| | V) THE LINAUCIUM TRANSPORT. | |
| | | |

| 161 | The importance of each part |
|-------------|---|
| <u>(</u> =7 | (P) The cylinder block. |
| | It has to house the main working |
| | - It help to houses me perton cranleshelt |
| | peuts of an engine such as piscon engine |
| <u> </u> | and camsnort. |
| | the charles band |
| | 11/ Ine Cylinder berg. |
| | - It helps to holds the spanting places or |
| | the diesel injector pozzles. |
| | |
| | m) the oil sumption. |
| | - It helps to hold store The oil for |
| | Lubrication of The engine parts. |
| | · · · · · · · · · · · · · · · · · · · |
| | I'v) The cylinder head gasket |
| | - It belos to form a gas-tight, oil-tight, |
| | and water-tight seal between the chinder |
| | head and the cylinder block in the Engene. |
| | |
| | V) Induction Manifold |
| | - It belos to hold the giv/petrol mixture |
| | or all only (in diesel engines) before to enter |
| | the energy combustion chamber. |
| | |
| | |

Extract 3.2: A sample of the candidates' good responses in Question 3

In Extract 3.2, the candidate mentioned correctly stationary parts of engine and importance of each part. However, the candidate failed to score all five marks because of incorrect explanations provided in induction manifold. The mixture of air and fuel is in petrol engine and not in diesel engine.

2.3.3 Question 4: Lubrication System

In this question, the candidates were required to briefly explain five important engine components which facilitate the flow of the lubricating oil in an engine.

The question was attempted by 103 (100%) candidates, of whom 52 (50.5%) scored from 0 to 1.0 mark, 26 (25.2%) scored from 2.0 to 3.0 marks and 25 (24.3%) scored from 3.5 to 5.0 marks. Figure 4 summarize this performance.



Figure 4: The Candidates' Performance in Question 4

Generally, the performance in this question was average because 51 (49.5%) candidates scored average and above.

The 50.5% of the candidates scored low marks from 0 to 1.0 mark. The candidates who scored 0 had poor English proficiency as they wrote incorrect sentences. For example, one of the candidates wrote unclear sentence such as *it help the engine do not get the rust* and *it help the engine do not get the friction* instead of listing and explaining the components. Some of the candidates had poor understanding on the demand of the question and lacked knowledge on lubrication system as they wrote irrelevant answers. For example, one candidate wrote *piston, joint of the connecting road, camshaft and piston hole.* Those who scored 1.0 mark, managed to provide one correct component and other points were incorrect. This was contributed by insufficient knowledge on engine lubrication system. For example, one candidate wrote *crankshaft* and provided precise explanation but he/she added other irrelevant points such as *piston rings, connecting rod,* and *piston.* Extract 4.1 is a sample of poor responses from the candidate's script.



Extract 4.1: A sample of the candidates' poor responses in Question 4

In Extarct 4.1, the candidate failed to write correct answers. He/she listed just the holes that are found in different engine parts instead of identifying the parts that facilitate the flow of lubricating oil in the engine. This candidate did not understand that, the hole is not a component but it is a path in which a fluid can flow from one part to another. This proves that, he/she lacked the knowledge on the engine lubrication system.

The candidates who scored from 2.0 to 3.0 marks managed to explain two to three correct responses out of the required five engine lubricating components. For example, one of the candidates provided three correct responses which are *oil filter*, *oil sump and oil strainer* but added two incorrect components such as *fuel filter* and *fuel tank*. This candidate did not understand that, fuel filter and tank are the components of fuel system and not the components of lubricating oil. This reveals that, the candidates in this group had partial understanding of the engine lubrication system.

On the other hand, 24.3% of the candidates who scored high marks in this question were able to give precisely correct components as per demand of the question. These candidates understood the requirements of the question and had sufficient knowledge on engine lubrication system. However, the candidates who scored four marks, failed to recall all five components of engine lubricating components. For example, one candidate managed to write all five correct components but added incorrect response like *deep* gauge/ deep stick. He/she did not understand that dip stick is used to check the level of oil in the tank but does not facilitate flow of the lubricating oil in an engine. Likewise, others failed to explain clearly all five important engine

components which facilitate the flow of lubricating oil in an engine. Extract 4.2 is a sample of good responses from the candidate's script.

| 4 Five waretant anders company at 121 | + |
|--|---|
| faillitate the Plana of the united and | |
| in an praine ave- | |
| i) THE OUL DUMP: | + |
| This of the dowice which of used to hand | |
| Cuchette off in the surrey and nume it to | |
| Lubrication Parts through the other pertory | |
| - consumy parts mouth me one process | |
| i) The oil sumplein | |
| + It below to stave the ensine of Pour | |
| Lubre done It is a device made at pressed that | |
| for staring the pil. | |
| | |
| iii) The oil strainer. | |
| - It by the device which by used to remove | |
| the large v divity proticiles in the engine of | • |
| - me and partices in the entire bic. | |
| W) Oil gallaries | |
| + These are small passages of al all be the | |
| enaive this enables the Lubricative off to | |
| flow to the Lubrication parts. | |
| | I |
| v) The oil filter | |
| - Thes is the device which is used to remove | |
| Nevy small contaminants and divits in the | |
| LubiPcating oil which can not be seen with | |
| Dur naked eyes. | |
| | |

Extract 4.2: A sample of the candidates' poor responses in Question 4

In Extract 4.2, the candidate managed to provide correctly all five engine lubricating components and precise explanation on each component. This candidate managed to apply the knowledge of engine lubrication system in answering the question.

2.3.4 Question 5: Cooling System

This question required the candidates to explain two functions of the valves available in a radiator cap. The question was attempted by 103 (100%) candidates, 55 (53.4%) of whom scored from 0 to 1.0 mark, 44 (42.7%) scored from 2.0 to 3.0 marks and only 4 (3.9%) scored from 4.0 to 5.0 marks. This performance is summarized in Figure 5.



Figure 5: The Candidates' Performance in Question 5

The general performance in this question was weak because 55 (53.4%) candidates scored below average.

Most of the candidates (53.4%) scored low marks. They failed to understand the demand of question and lacked knowledge on the engine cooling system. Those who scored 0 marks provided irrelevant functions of the valves in a radiator cap. For example one candidate wrote *it controls the amount of water in radiator cap*. He/she did not understand that the valves used in the radiator cap controls the temperature of the coolant and not water. Another candidate wrote wrong response like *it allow and distribute water towards the places possible to be cooled*. Extract 5.1 is a sample of poor responses from the candidate's script.



Extract 5.1: A sample of the candidates' poor responses in Question 5

In Extract 5.1, the candidate wrote irrelevant answers by copying the points from question 1 such as *frequent hard steering and hard ride*, *displacement and efficiency*, *by the use of parallel variable resistor* and *oil lubricated jacket*. Not only that the candidate had inadequate knowledge on engine cooling system, as well as poor English proficiency.

The 42.7% of the candidates who scored from 2.0 to 3.0 marks had partial knowledge on engine cooling system as they were able to provide correct functions of valves in radiator but failed to identify the type of valves. For example, one of the candidates wrote the correct function of valve but repeated the same point on the second function hence he/she scored only 2.0 marks.

On the other hand, 4 (3.9%) candidates who scored high marks in this question had adequate knowledge on the engine cooling system, particularly functions of the valves available in a radiator cap. They were able to give correct response and hence they scored above average marks. Extract 5.2 is a sample of good responses from the candidate's script.

| 05 | 13 To regulate the arrulation of Carant. |
|----|--|
| | is To regulate the tempesture and pressure |
| | a colla at |
| | |

Extract 5.2: A sample of the candidates' good responses in Question 5

In Extract 5.2, the candidate provided two correct functions of the valves used in radiator cap.

2.3.5 Question 6: Wheel and Tyres and Steering System

This question had two parts, (a) and (b). In part (a) the candidates were instructed to describe in brief three main parts of the tyre and in part (b) candidates were required to explain in brief two characteristics of a steering system that must be realized in motor vehicle.

The question was attempted by all 103 (100%) candidates, 49 (47.6%) of whom scored from 0 to 1.0 mark, 46 (44.5%) scored from 2.0 to 3.0 marks and 8 (7.8%) scored from 4.0 to 5.0 marks. Figure 6 summarize this performance.



Figure 6: The Candidates' Performance in Question 6

The general performance in this question was average because 54 (52.4%) candidates scored average and above.

The candidates (47.6 %) who scored 0 to 1.0 mark lacked knowledge on wheel and tires as well as Steering System. Candidates who scored 1 mark managed to provide either one part of a tire out of three or one characteristic of steering system out of two. Those who scored 0 marks wrote incorrect responses in both parts (a) and (b). For example in part (a) one candidate wrote *rim* and *wheel* as the parts of a tire. He/she did not understand that wheel is an assembly of rim and tire. In part (b) the candidate wrote the requirement of the steering system instead of giving the characteristics of

steering system such as *it should be well constructed*. This proves that, the candidates in this category failed to understand the demand of the question. They also had insufficient knowledge on wheel and tire as well as steering system. Extract 6.1 is a sample of poor responses from the candidate's script.

5 the rally a) Tubes_ ano 11 2 Consist an Inter th Cinethe the L tri 1.M ùi I Sporken part controal $\sigma \phi$ ılı er don mon es the danat workind people h rely

Extract 6.1: A sample of the candidates' poor responses in Question 6

Extract 6.1 shows that, in part (a) the candidate failed to identify main parts of the tire by writing *tubes, rim and sporken*. The candidate did not understand that tubes and rims are components of wheel and not the parts of tire, hence it proves that he/she did not understand the requirement of the question. In part (b) he/she wrote *it do not the control the movement of steering. Is the people which to move on the people because the people to balance of the vehicle.* The candidate wrote meaningless sentences because he/she had poor English proficiency as well as inadequate knowledge on characteristics of steering system.

The 44.7% of the candidates who scored from 2.0 to 3.0 marks had partial knowledge on wheel and tires and steering system as they were able to either describe three main parts of the tyre or explain the characteristics of a steering system that must be realized in motor vehicle.

On the other hand, the candidates who scored from 4.0 to 5.0 marks had sufficient knowledge on wheel and tires and steering system as well as clear understanding on the demand of the question. Extract 6.2 is a sample of good responses from the candidate's script.

| 6 | a) I) Treads - this is the parts which is in outer part and is |
|---|--|
| | direct contanet contanet with land, much for giving |
| | 9 good contact of thre with land |
| | |
| | 11) Carcass - are stool rods which are small in shape, |
| | are used to give thre it's strongth and avoid |
| | penestrators to destruct tube, It found in the |
| | tire |
| | (11) Wire steel beads - used to give Is the part of thro |
| | used to give tire strength and toughness in the |
| | place where fitted directly with rim. |
| | Iread |
| | |
| | Carcais |
| | |
| | () () iii) at a logate |
| | Wire steel |
| | |
| | |
| ų | b) U should be good returnability inorder to avoid hard |
| | roturn of whoel |
| | 1) Should be response to the actions of stearing |
| | w should use small effort during steering and to |
| | awe case steering (2 any - Circum strate |
| | a construction and a construction |

Extract 6.2: A sample of the candidates' good responses in Question 6

In Extract 6.2, the candidate managed to describe in brief three correct main parts of the tire. The candidate went further by sketching a diagram which illustrates the tire and its main parts although it was not the demand of the question. Also he/she explained clearly two characteristics of a steering system that must be realized in motor vehicle.

2.3.6 Question 7: Fasteners and Locking Devices

In this question, candidates were required to briefly explain the procedures of removing a broken stud or nut by using extractor.

This question was attempted by all 103 (100%) candidates, 98 (95.2%) of whom scored from 0 to 1.0 mark, 3 (2.9%) scored from 2.0 to 3.0 marks and 2 (1.9%) scored from 4.0 to 5.0 marks. Figure 7 summarizes this performance.



Figure 7: The Candidates' Performance in Question 7

In general, the performance of candidates' in this question was weak because 98 (95.1%) candidates scored below average from 0 to 1.0 mark.

Weak performance in this question reveals that, most of the candidates had inadequate knowledge on fasteners and locking devices as a result they failed to explain the procedures of removing broken stud or nut by using extractor. Also the candidates lacked workshop skills on fasteners and locking devices because the question required the candidates to understand the faults that are likely to occur in locking device and the solutions for the problems. Other candidates did not understand the demand of the question. For example, one of the candidates provided irrelevant answers like by *using permanent fasteners, by using semi-permanent fasteners and temporary fastener.* This candidate did not understand that fastener is a mechanical device which used to join one part and other part example bolt, stud or nut. The candidate did not understand the demand of the question because he/she mentioned types of fasteners instead of explain how to remove the broken fasteners by using extractor. Another candidate provided this response, *the broken stud removed by using extractor because the extractor are many sizes of hole to support any parts to removed, so nut are fitted in other holes in the extractor and the support to removed.* This candidate lacked English proficiency and knowledge on fasteners as he/she wrote unclear sentences. Most of the candidates did not write anything in this question, which increased the number of candidates who scored 0 marks. Extract 7.1 is a sample of poor responses from the candidate's script.

| 7. | The effractor is less to remare the broken material in |
|----|--|
| | the Vehille Such as Aus ; nut ere So this is used by |
| | Larce ethracter and there to misturize the Statern stud or |
| | mette and after that hild the broken that a net with estro |
| | Chor and rolling slocky and the then the that event will |
| | se romaned. |
| | |

Extract 7.1: A sample of the candidates' poor responses in Question 7

Extract 7.1 shows that, the candidate wrote the function of extractor instead of explaining how an extractor is used to remove broken stud or nut. This indicates that, the candidate did not understand the demand of the question.

Despite the weak performance shown by most candidates there were few (2.9%) who scored from 2.0 to 3.0 marks. These candidates had partial knowledge on fasteners and locking devices as they provided partial explanation on how to use extractor in removing the broken stud or nut.

On the other hand, very few (1.9%) of the candidates who scored 5 marks provided precise explanations on how to remove the broken stud and nuts by using extractor. They managed to apply the skills of fasteners and locking

device to answer the question. Extract 7.2 is a sample of good responses from the candidate's script.

| | - A longing and an all an | |
|-----|---|--|
| 07. | A bloken not stud is removed using an | |
| | expractor by drilling the nut or stud to | |
| | a specific chape for the extractor to be | |
| | filled, then the extractor is driven together | |
| | with the broken nut or stud out of the part. | |
| | | |

Extract 7.2: A sample of the candidates' good responses in Question 7

Extract 7.2 shows that the candidates managed to explain clearly the procedure of removing the broken stud or nut by using an extractor.

2.3.7 Question 8: Braking System

In this question the candidates were instructed to enumerate five major components of hydraulic operated brakes and their application.

The question was attempted by all 103 (100%) candidates, whereby 59 (57.3%) scored from 0 to 1.0 mark, 25 (24.3%) scored from 2.0 to 3.0 marks and 19 (18.4%) scored from 4.0 to 5.0 marks. Figure 8 summarizes the performance in this question.



Figure 8: The Candidates' Performance in Question 8

The general performance in this question was weak because 59 (57.3%) candidates scored below average.

The candidates who scored low marks from 0 to 1.0 mark failed to understand the demand of the question and others lacked knowledge on the hydraulic operated brake system. Those who scored 0 marks provided irrelevant answers such as *brakes, brake plate and tires*. These candidates mentioned the parts which are found in vehicle but have no any relation with the demand of the question. These candidates did not understand the concept of hydraulic brake system. Some of the candidates managed to write one component of hydraulic-operated brakes but failed to give its applications. Others managed to provide one correct component and its function. For example, one of the candidates wrote *pedal* and provided its function but the other components were incorrect. Extract 8.1 is a sample of poor responses from the candidate's script.

| - | | 0 - ka | 01 | t . | i. | | d | for | tig | wten in | <u>i</u> ~^ | d | rela | wition |
|----|------------|--------|------------|------------|-----|---------|------|--------|-----|---------|-------------|---|------|----------|
| 8. | ע | Date | _ <u>_</u> | ~ | | | | | | | , | | | |
| | 07 | me | Je | nicle | | لمعماته | ۱. | | | | | | | 10.15 |
| | | 0.14 | in | | . 1 | to | nald | , t. | zet | معد | parts | 9 | hy | Janute |
| | > | Berlo | 0, | 0.0 | | | | | | | | | | |
| | مك | te. | | | | | | | | | | | | |
| | | N. t | 5 | used | Ł | for | tigi | Arnin. | 9 | The | 60141 | ~ | wen | assensin |
| | <u>"``</u> | Nun | | | | | | | 10. | | | | | |
| | ha | with | نه ۱ | pres | | parts | 4 | asra | | | | | | |

Extract 8.1: A sample of the candidates' poor responses in Question 8

Extract 8.1 shows that the candidate provided wrong responses which are *brake plate, belts and nuts*. This candidate understood the demand of the question but had insufficient knowledge on the hydraulic-operated brake as he/she provided irrelevant components. By mentioning nut, a candidate failed to understand that it is not the major component specifically for brake but nut can be used in fastening different components in motor vehicle.

The 24.3% of the candidates who scored from 2 to 3 marks had insufficient knowledge in hydraulic operated brake as they managed to give either two or three correct responses. Some of the candidates provided all correct five responses but lacked logical flow of explanations and clarity.

On other hand, a few (18.4%) candidates who scored high marks had adequate knowledge of hydraulic operated brakes also understood clearly the demand of the question. Therefore, they managed to identify correctly the major components of hydraulic operated brakes and gave precise application of each part. Extract 8.2 is a sample of good responses from the candidate's script.

| 8, | Major comparent of the hydrochic brakes and their application | |
|----|---|---|
| | of Faal medale | |
| | Tourse a new to the hidrent's betom the bruke | |
| | To cleare a prepare to me nywarde maren of a state | |
| | | |
| | ri/ Mater cytinde | |
| | - To trunmit and multiply the previous created by the | |
| | east pead pedd to the wheels- cylipider | |
| | | |
| | 55: 1 He draulis lines. | |
| | - To hald the hydroulic and to transmit acount the | |
| | mul alinde to the chest adiadase | |
| | India gaine to the where yourcest | |
| | | |
| | Wheel cylinder | |
| | - To truppet the pressure see & received any to the wheel to | |
| | allow maion which will enable a cur to deed white or stop | |
| | moving | |
| | | |
| | 1. 1 Wheel aitime | |
| | To know allow a draw as dick to attach the wheel | |
| | 1 1 1 all with a prove of more to and here | 1 |
| | the order to allow price on whech the the | |
| | decelorating the car or stoping the vehicle | |
| | | |
| 1 | | 1 |

Extract 8.2: A sample of the candidates' good responses in Question 8

Extract 8.2 shows that the candidate managed to provide correctly all five major components of hydraulic-operated brakes and their application.

2.3.8 Question 9: Engine and Vehicle Testing

In this question, candidates were required to explain five ways of solving the problem of the client's car engine which emits a lot of gases.

The question was attempted by 103 (100%) candidates, where by (87.4%) 90 scored from 0 to 1.0 mark, 11 (10.7%) scored from 2.0 to 3.0 marks and 2 (1.9%) scored from 4.0 to 5.0 marks. Figure 9 summarizes this performance.



Figure 9: The Candidates' Performance in Question 9

General performance in this question was weak because 90 (87.4%) candidates scored below average; that is, from 0 to 1.0 mark.

The 87.4% of the candidates scored low marks due to different factors such as lack of English language proficiency, failure to interpret the question and insufficient knowledge and skills on engine and vehicle testing. Those who scored 0 marks wrote incorrect explanation. For example, one of the candidates provided the faults that result to emission of gases from engine instead of providing ways of eliminating the problem of emission in client's car such as the *linkage of oil tank* and *the linkage of exhaust pipe*. This candidate did not understand the demand of the question and is poor in English language as he/she wrote *linkage* instead of leakage. Another candidate provided response such as *to remove noisy of the car, to remove friction of the engine* and *to do services of the car engine*. This candidate did not understand the question as he/she provided responses which were irrelevant to the exhaust gases of engine. Extract 9.1 is a sample of poor responses from the candidate's script.

| 9 . | O Cleaning all parts of the fuel |
|------------|------------------------------------|
| | Swtem |
| | To check all spark plugs if they |
| | have good working ethilienty |
| | |
| | (17) To put a pipe so that exhaust |
| | agies emitted ment be remared out |
| | |

Extract 9.1: A sample of the candidates' poor responses in Question 9

Extract 9.1 shows that, the candidate wrote wrong responses which were irrelevant to the demand of the question such as *check all spark plugs if they have good working efficiency*. This candidate did not understand clearly the causes of too much emission in vehicles as the spark plug efficiency could not result to emission. Also he/she wrote *to put a pipe so that exhaust gases emitted must be removed out*. This candidate did not understand that exhaust pipe is one of exhaust system components of a vehicle. Hence it cannot be reinstalled to reduce the emitted gases. Nevertheless, according to the question, exhaust pipe was not the cause of emissions of gases in client's vehicle.

The candidates who scored from 2.0 to 3.0 marks had partial knowledge and skills on engine and vehicle testing as most of them provided one to three correct ways to solve the client's problem. For example, one candidate managed to write two correct ways out of five such as *to disconnect by replacing the worn out piston rings* and *by mounting the muffler or catalytic converter*. This candidate understood clearly the demand of the question and also had knowledge on engine as he/she understood that the worn of piston rings result to leakage of either compression or oil into combustion chamber which lead to emission of gases from the exhaust pipe. Also he/she knew that catalytic converter is used to control harmful gases from engine by either oxidation or reduction. However, this candidate failed to score all five marks because he/she added other incorrect responses such as *by replacing the spark plugs*.

However, very few (1.9%) of the candidates scored from 4.0 to 5.0 marks. These candidates understood clearly the demand of the question and had sufficient knowledge and skills on engine and vehicle testing. The candidates' scores varied depending on clarity of their expressions and the number of correct points given by individual candidates. Extract 9.2 is a sample of good responses from the candidate's script.

| 9, | r Remedy the piston n'nys | |
|----|---|---|
| | ir Clean the first tank | |
| | un la | |
| | in Remedy the pitton nhas. First of all you must remedy | |
| | The piston nings which control the passage of oil in order | } |
| | to dvoid the mix have between fuel and oit. | |
| | 17/lean the fuel tank. Also the hugt fank must be cleaned | |
| | because cap have some untarninants which pollute the | |
| | fuel. | |
| | IN Remedy the true pitter. Also the fuel fifter must be maint | ł |
| | ained because can tail to fill the fuel and cause | |
| | that publim. | |
| | WI Remedy the Dit filter. Also the oil filter must be mainta. | |
| | ined because when the oil not filted to very nellian | |
| | Laure this pridem. | |
| | VI Kemedy the exhaust system. Also the exhaust system | |
| | must be maintained because when its not work | |
| | Ven well can cause that publism. | |
| | | |

Extract 9.2: A sample of the candidates' good responses in Question 9

In Extract 9.2, the candidate managed to explain correctly all five ways used to solve the problem of the client's car engine which emits a lot of gases.

2.3.9 Question 10: Workshop Practice and Safety

This question was set from the topic of safety. The candidates were instructed to identify five safety precautions to be considered when removing airbags from the vehicle. The question was attempted by 103 (100%) candidates, out of whom 82 (79.6%) scored from 0 to 1.0 mark, 20 (19.4%) scored from 2.0 to 3.0 marks and 1 (1.0%) scored from 4.0 to 5.0 marks. Table 1 summarizes this performance.

| Scores Range | 0 - 1.0 | 2.0-3.0 | 4.0 - 5.0 | |
|-------------------------|---------|---------|-----------|-------|
| Performance | Poor | Average | Good | Total |
| Number of Candidates | 82 | 20 | 1 | 103 |
| Percentage (%) | 79.6 | 19.4 | 1.0 | 100 |

Table 1: Performance of Candidates in Question 10

In general, the performance of candidates in this question was weak because 82 (79.6%) candidates scored below average.

The candidates who scored low marks (from 0 to 1.0) lacked workshop practice on various tasks especially in removing air bags and the knowledge on safety precautions when performing different activities in the workshop. Most of the candidates scored 0 marks as they provided general workshop safety precautions instead of providing safety precautions when removing air bags. For example, one of the candidates wrote *do not fight in the workshop*, *do not run in the workshop* and *do not eat in the workshop*, which are not correct answers. Other candidates did not understand the demand of the question. For example, one of the candidates wrote incorrect response like *use of wheel spanner for opening the bolt or nut but of correct size*. This candidate did not understand the proper tools used in performing different tasks in motor vehicle service as he/she failed to understand that, wheel spanner is used to open and tighten the nuts when removing or installing the wheel, hence it has no relation with the air bags. Extracts 10.1 is a sample of poor responses from the candidate's script.

| 10. | Put the car over the redk |
|-----|--|
| 1 |)Adding another handle to support the rack |
| | in Renound autoces |
| | W Remove the jack |
| | NRemoving the handle |
| | |

Extract 10.1: A sample of the candidates' poor responses in Question 10

In Extract 10.1, the candidate wrote responses which do not relate with the requirement of the question as he/ she based on the jacking the vehicle which has no relation with the safety to be observed when removing air bags.

On the other hand, the candidates who scored from 2.0 to 3.0 marks were able to provide one to three out of five correct precautions when removing airbags from the vehicle. These candidates had partial knowledge and skills on workshop practice and safety in various workshop activities.

However, only 1 (1.0%) candidate scored 4 marks and thus understood clearly the demand of the question. It seems the candidate was competent in various workshop activities and safety precautions as he/she managed to write precautions observed when removing air bag. Extract 10.2 is a sample of good responses from the candidate's script.

| 12 stavoid from boring the air Lass during operation |
|--|
| 3) Remove all air present in the nirbage |
| Jont use sharp & instruments during possitive |
| DAvording high hat and diadean A star A |
| avoid airbags from burning |

Extract 10.2: A sample of the candidates' good responses in Question 10

In Extract 10.2, the candidate almost mentioned correctly procedures to be followed when removing airbags in vehicle. This candidate did not score all five marks due to lack of key issues in some of the procedures. For example, he/she wrote *avoiding high heat production during operation to avoid airbags from burning*. He/she failed to provide more clarifications on the source of high heat and how to prevent it.

2.4 Section C: Structured Questions

This section had four questions set from the topics of *Wheel and Tires, Ignition System, Transmission System* and *Cooling System*. The candidates were instructed to answer only three questions. Each question carried a total of fifteen (15) marks making a total of 45 marks. In this section the score were distributed in the following ranges: From 0 to 4.0 marks (weak), from 5.0 to 9.0 marks (average) and 10 to 15 marks (good).

2.4.1 Question 11: Wheel and Tyres

This question had three parts (a), (b) and (c). In part (a), the candidates were required to make comparisons of different ways of holding air in tubeless and tubed tyres. In part (b), the candidates were required to identify four periodic inspections of tyres maintenance that should be done on a newly bought car, and state two functions of the wheel in the motor vehicle. In part (c) the candidates were required to give explanations of wheel and tyre which are: tyre rotation, rim, tyre bead and ply rating.

This question was opted by 99 (96.1%) candidates, out of whom 69 (69.7%) scored from 0 to 4.0 marks, 28 (28.3%) scored from 4.0 to 9.0 marks and only 2 (2.0%) scored from 10 to 15 marks. Table 2 summarizes the performance of this question.

| Scores | 0 - 4 | 5.0 - 9.0 | 15-10 | |
|-------------------------|-------|-----------|-------|-------|
| Performance | Poor | Average | Good | Total |
| Number of Candidates | 69 | 28 | 2 | 99 |
| Percentage (%) | 69.7 | 28.3 | 2.0 | 100 |

Table 2: Performance of Candidates in Question 11

In general, the performance of candidates in this question was weak because 69 (69.7%) candidates scored below average. The candidates' low marks (from 0 to 4.0) was associated with different factors such as poor understanding on the demand of the question in some items, lack of knowledge and skills on wheel and tire and lack of English language proficiency as most of the candidates provided irrelevant answers. For example one of the candidates wrote incorrect response in each item such as

in part (a) he/ she wrote *tubeless tire used in long term while tubes used in small time*. In part (b) (i), he/she wrote incorrect inspections for the tire maintenance such as *use the pump in order to identify the tube problem and to make solution on the problem*. In part (b) (ii), he/she wrote incorrect functions of the wheel such as *to protect the tube* and *to protect the spokes*. In part (c), he/she provided incorrect functions of the given terms of wheel and tire. Based on the candidate's responses it reveals that, he/she either did not understand the demand of question or had little knowledge on wheel and tire as he/she include tubes and spoke in answering all items.

Others provided one or two correct responses from the three parts and mixed with incorrect points. For example in part (a) one of the candidates wrote incorrect difference between tubeless tire and tubed tire such as *tubeless tire used disc without using spokes while tube tire used spekes*. This candidate used incorrect words *spokes* and *spekes* which were irrelevant with tubeless or tubed tire. In part (b), the candidate provided two correct inspections for a tire such as *wearing of tire* and *presence of air* and the other two points were incorrect. In part (b) (ii) he/she managed to provide one function of wheel such as *to support other vehicle parts* but the other point was incorrect. In part (c) the candidate wrote incorrect responses. Hence the candidate managed to score 4 out of 15 marks allotted to the question. Extract 11.1 is a sample of poor responses from the candidate's script.

| 11 a) Fuberles the Tuber type it holds air than |
|---|
| Tubelles fore |
| 0 |
| bijopen a fastener which attached in |
| rim into fly weel |
| - remove type in the rim and change |
| type to put new type in the rim |
| - Pupp air in the type |
| - Cross a fastener which attached in |
| Tim into fly wheel |
| U · |

its-TOS Support movement in between acar - To redu due Friction JIONU Chi)Tyre rotation TO rota in Y Rim TO attached to hold air pear ratin

Extract 11.1: A sample of the candidates' poor responses in Question 11

Extract 11.1 shows that, in part (a) the candidate failed to provide the comparison of tubeless and tubed tire based on how it holds air. He/she wrote tubeless holds more air than tubed but failed to give clarifications why it has the ability to hold that air as compared to that of tubed tire. In part (b) (i) the candidate explain incorrectly procedures of removing tire which was not the demand of the question. In part (b) (ii), he/she wrote wrong functions of wheel in motor vehicle such as *to friction between a car an underground*. Also this candidate is poor in English language because he/she provided meaningless explanations in most parts of the question. In part(c) the candidate just copied the question without answering it.

On other hand, 75 (72.8%) candidates who scored average marks from 5.0 to 9.0 had partial knowledge and skills on wheel and tire as they managed to provide correct answer in one of the three given parts. For example, in part (a) one of the candidates provided precise differences of tubeless and tubed tire. In part (b) (i), he/she managed to write one correct inspection of tire and one incorrect response such as *checking the wheel balance*. This candidate did not understand that, the demand of the question was based on inspections of tire and not the wheel. In part (b) (ii), he/she provided all two correct functions of the wheel and in part (c), the candidate wrote incorrect functions such as *tire rotation - to control the tire into different motion, rim-it is the outer edge of the wheel which a tire is covered by*.

Conversely only, 2 (1.9%) candidates scored high marks. These candidates were able to provide correct answers in both parts as per demand of the items. This proves that, they understood the demand of each item and had adequate knowledge and skills on wheel and tire. Extract 11.2 is a sample of good responses from the candidate's script.

| 11. | of Tubelers tyre depends on the type bead |
|-------------|--|
| | to form ait tight real is the type during |
| | all the operation. |
| | White. |
| | Tubod Tyre dopends on the tube provided |
| | inclusite to hold air to form air tight real |
| | By the type funny all the operation. |
| | |
| | b/ptour inspections for a tyre maintence |
| | he should do are : |
| | D Check the sign of wear on the side |
| | wall of the tyre. |
| | i) Check for righ of samage of the |
| | Wheel on |
| | (ii) check for the recursty of at the |
| | point of mounting between the axle and |
| | 'tyre (kiheal) |
| | in Check the operation of type for |
| | for and change it decording to |
| | the menugacturer recommendation. |
| | , , , , , , , , , , , , , , , , , , , |
| | |
| | 1/1 Function of the Wheel in the motor voluce. |
| | 2 Provale heration for mounting of the |
| | tyre. |
| | i) pravide Location for Wheel / tyre |
| | balancing. |
| 1.1 | |
| <u>L</u> 1. | C 12 19the rotation is the ripidning of the |
| | Type on its acts on the road furtace during |
| | toward and reverse mayment to provide |
| | The vehicle motion |
| | 12 Kin is the part which provide the |
| | Lozation for attachment of Wheel to the car. |
| | |
| | 11/ Type bead is the part of type which |
| | form the cell fight real in the type. |
| | |
| | 14 PLX rating the indication in the |
| | Type Which show the number of place that |
| | are used to make that type of type. |
| 1 | |

Extract 11.2: A sample of the candidate's good responses in Question 11

Extract 11.2 shows that, the candidate managed to provide precisely the correct answers in each items. The candidate managed to apply the knowledge and skills of wheel and tire.

2.4.2 Question 12: Ignition System

This question was set from the topic of Ignition System. It had three parts, (a), (b) and (c). In part (a) (i), the candidates were instructed to identify the device in a motor car which steps up voltage in the ignition system. It also demanded the candidates to explain the construction of the device mentioned in (a) (i) with the aid of sketch. In part (b), the candidates were instructed to identify four requirements to be considered while selecting the spark plug. In part (c), the candidates were required to explain ways of setting the contact breaker gap in ignition system and what will happen when the contact breaker gap is either too wide or too narrow.

The question was opted for by 75 (72.8%) candidates, of whom 63 (84.0%) scored from 0 to 4 marks and 12 (16.0%) scored from 5.0 to 9.0 marks. There were no candidates who scored from 10 to 15 marks. Table 3 summarizes this performance.

| Scores Range | 0 – 4 | 5.0-9.0 | 10 – 15 | Total | |
|-------------------------|-------|---------|---------|-------|--|
| Performance | Poor | Average | Good | 10000 | |
| Number of Candidates | 63 | 12 | 0 | 75 | |
| Percentage (%) | 84.0 | 16.0 | 0.0 | 100 | |

Table 3: Performance of Candidates in Question 12

General performance in this question was weak because 63 (84.0%) candidates scored below average and none scored high marks.

Most of the candidates scored low marks in this question due to lack of knowledge and skills on conventional ignition system. This was proven by the fact that most of the candidates failed to explain how to set the contact breaker point and the results of too or narrow contact breaker point. For example one of the candidates wrote the following in part (c) (i) *the breaker gap set ignition by screw so as to break the some amount of electricity*

produced from a battery. In part (c) (ii) he/she wrote narrow or wider gap the amount of an electricity produced from the battery cannot pass through so as to producing firing by spark plug. This candidate did not understand the purpose of setting the contact breaker point and the effect of too narrow or wider gap in vehicle. Also some of the candidates lacked drawing skills as they failed to sketch the diagram of the ignition coil in part (a). Other candidates failed to understand the demand of the question as they provided irrelevant answers in all parts hence they scored 0 marks. Extracts 12.1 is a sample of poor responses from the candidate's script.





Extract 12.1: A sample of the candidates' poor responses in Question 12

In Extract 12.1, the candidate wrote irrelevant answers in all parts. In part (a) instead of giving the correct answer which is *ignition coil*, he/she listed *mechanical device, electrical device and physical device*. This was due to lack of knowledge on the components and functions of ignition system. In part (a) (ii), he/she misinterpreted the question hence he/she drew irrelevant sketch. In part (b) instead of writing the requirements which should be considered in selecting a spark plug, he/she mentioned the parts of spark plug and the sketch of a spark plug. This indicates that, the candidate did not understand the demand of the question. In addition, the candidate did not write anything in part (c).

On other hand, the candidates who scored from 5.0 to 7.0 marks provided correct answers in some of the parts of the question. Some of the candidates provided correct answers but failed to provide clear explanations. The candidates in this category had little knowledge on ignition system as they managed to respond well in some of the items. Extract 12.2 is a sample of average responses provided by one of the candidate.

a.i. The davice in a motor car ests up the voltage in ignition system is Coil or ignition coil. 12. ignition coil ii. The diagram high current wing himary 1 SECONDERY coil Coil rone CORO =p The ignition coi is *w* രഖ് shich recieve He alactric CULLOL ente ignition COi Prona ct Upt Vollage the dectric current and ansmit through 14 high current wire distributor. 枨 0 b. hequirements condiciared while selecting the spart plug the of spark ply (cold or hot) the YPR ii, The number Spark plug the 5120 and ot threads 12. 2 iii. The of th plug (hight and wide) 5120 spark The iv. of the spark quae Si2.4 plug. in ignition c. The contact breacher gap is set sotac 9S 980 meaning system clearenc st the required point CB When wida contect bree her 98P a time the production parks ത นที่ไ ЪĽ wil Jol in thing C81 มหาเทิด combustion chamber <u>contact</u> 980 is Ηn MOLLEU spead ot thing will Sparkis increa 0 the will make ignition occur that A ignition stroke before

Extract 12.2: A sample of the average responses in Question 12

Extract 12.2 shows that, the candidate provided unsatisfactory response in some parts of the question hence he/she scored average. In part (a) (i), the candidate managed to identify the device in a motor car that is used to step

up voltage in the ignition system. Also in part (a) (ii) the candidate was able to explain with the aid of neat sketch the construction of the device mentioned in (a) (i). In part (b), the candidate identified the requirements to be considered when selecting the spark plug but he/she failed to give more clarifications on the size of spark plug. In part (c), the candidate explained partially the way the contact breaker gap can be set in ignition system and the effect when the contact breaker gap is either too wide or too narrow but he/she failed to write more clarifications on the tools and method used to set the contact breaker point.

2.4.3 Question 13: Transmission System

This question had two parts (a) and (b). In part (a), the candidates were required to explain how *engaging the gear smoothly, changing gears and acting as positive brake* can be achieved by friction clutch. In part (b), the candidates were required to describe symptoms and two possible causes of the clutch slip, clutch spin and clutch judder.

Most of the candidates avoided this question as the question was attempted by 52 candidates which are 50.5% of all the candidates who attempted the examination. Despite of few candidates who opted for this question, all candidates scored from 0 to 4.0 marks. Table 4 summarizes this performance.

| Scores | 0-4.0 | 5.0-9.0 | 10-15 | Total |
|----------------|-------|---------|-------|-------|
| Performance | Poor | Average | Good | |
| Number of | 52 | 0 | 0 | 52 |
| Candidates | | | | |
| Percentage (%) | 100 | 0 | 0 | 100 |

 Table 4: Performance of Candidates in Question 13

General performance in this question was weak, because all 52 (100%) candidates who attempted this question scored below average.

The analysis shows that, all candidates who attempted this question scored low marks from 0 to 4.0 marks. The 25 (24.3%) candidates who scored 0 marks failed to understand the demand of the question and lacked knowledge and skills on friction clutch. This is proved by the fact that, most of the candidates provided irrelevant answers. For example, in part (a) one of the

candidates provided wrong explanation on the given clutch actions such as friction clutch can engage the gear smoothly when the vehicle is in motion and friction clutch change the gear when the vehicle is in static. The candidate misunderstood the demand of the question as he/she provided the duration in which the friction clutch can be used in different actions. In part (b), the candidate wrote incorrect causes and symptoms for the clutch faults such as clutch slip occurs when applying a clutch while you travel in higher speed its symptom is changing gear failure, clutch spin is caused by uses of clutch its symptom is difficult in changing of gear at a given time and clutch judder occurs when you apply them its symptom is efficiency is reduced. The candidate had insufficient skills on symptoms and causes of different problems in friction clutch as he/she failed to provide correct symptoms and cases of the given clutch problems. Other candidates who scored from 1.0 to 2.0 marks managed to provide correct explanation in some of the items. For example, in part (b) one of the candidates wrote clearly the cause and symptoms of clutch slip such as *clutch slip caused by wear of the clutch* linkage and its symptom is failure to change gear. This candidate provided incorrect responses in other items hence he/she scored only 1.0 mark in this question. Extract 13.1 is a sample of poor responses from the candidate's script.

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Extract 13.1: A sample of the candidates' poor responses in Question 13

Extract 13.1 shows that, in part (a) the candidate failed to understand the demand of the question as he/she explained the functions of smoothly changing the gear and acting as positive brake instead of explaining how those clutch actions are achieved by friction clutch. In part (b), he/she explained the meaning of *clutch slip, clutch spin and clutch judder* instead of providing the causes and solutions for each fault. In addition to the candidate's inadequate knowledge and skills on transmission system, he/she lacked English proficiency as his/her explanations were not clear.

Although all candidates scored low marks, there were 10 (9.7%) candidates who scored from 3.0 to 4.0 marks as they provided correct explanation in some of the items. This reveals that these candidates understood the demand of the question but had partial knowledge and skills on clutch operation specifically friction clutch. For example, one of the candidates provided correct explanations in some of the items but failed to provide more clarifications in other items. In part (a) (ii), he/she failed to explain clearly the achievement of positive clutch which is done by the application of accelerator pedal as well as clutch pedal when ascending or descending to or from step hill. Also the candidate provided incorrect responses in some of the items when answering part (b) like in (i) he/ she wrote one of a clutch slip symptom is clutch pedal start to be difficult. The correct response is that the clutch pedal become soft hence free play. In (ii) he/she failed to explain the causes of clutch spin and clutch judder by providing response like presence of fuel and finishing of clutch plate. This candidate lacked enough skills on some of clutch problems, symptoms and causes.

2.4.4 Question 14: Cooling System

This question had two parts, (a) and (b), which was set from the topic of Cooling System. In part (a), the candidates were instructed to explain thermo-siphon cooling system and two disadvantages of it. It also required the candidates to differentiate vertical flow from cross flow radiators. In part (b), the candidates were required to label the components of radiator shown below and explain their roles in cooling system.



A Diagram of Radiator

The question was opted by 82 candidates which is 79.6 per cent of all the candidates who sat for the examination. Out of those who attempted the question 51 (62.2%) scored from 0 to 4 marks, 19 (23.2%) scored from 5.0 to 9.0 marks and 12 (14.6%) scored from 10 to 15 marks. Figure 10 summarizes this performance.



Figure 10: The Candidates' Performance in Question 14

Generally, the performance in this question was weak because 51 (62.2%) candidates scored below average.

Analysis shows that 39 (37.9%) candidates who scored low marks (from 1.0 to 4.0 marks) had inadequate knowledge on cooling system as they managed to write the correct explanation in some of the items. For example, in part (a) (i), one of the candidates provided irrelevant meaning of thermo siphon cooling by writing *is the cooling which use fan to cool the engine part*. Also he/she provided incorrect disadvantages of thermo-siphon such as *the cooling fan required more power output from the engine*. In (iii) he/she managed to differentiate vertical flow with cross flow radiator. In part (b) the candidate managed to label correctly one radiator component such as *A-radiator cap* but labelled incorrect functions of the radiator such as *C-water jacket* instead of Fins. Also he/she failed to name parts B and D. In part (b) (ii) he/she provided incorrect functions of the radiator components by providing responses such as *used to open radiator cap when putting water*. This candidate had little knowledge on the engine cooling system as

they provided irrelevant response in all parts as well as failed to apply the drawing skills to study and label the radiator components. Also these candidates did not understand the demand of the question. For example, one of the candidates provided incorrect meaning of thermo siphon by writing *is a type of cooling system which does not using water or air* and *its disadvantage is need a lot of energy*. It seems this candidate did not know anything about thermo siphon hence he/she provided irrelevant answers. He/she was supposed to know that the cooling system requires either water or air. In part (b) the candidate failed to apply the drawing skills in identifying the indicated parts hence he/she provided incorrect meaning such as *A-upper top, C-radiator block* and *D-lower top*. Extract 14.1 is a sample of poor responses from the candidate's script.

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Extract 14.1: A sample of the candidates' poor responses in Question 14

Extract 14.1 shows that, in part (a) (i), the candidate wrote the wrong function of thermo siphon. Also he/she provided incorrect disadvantages of thermo siphon by providing advantages. In (iii), he/she wrote the incorrect and unclear explanation on difference between the vertical and horizontal flow

radiators. In part (b), the candidate failed to identify the meaning of the parts labeled by writing *A*- *valve*, *B*- *air crener*, *C*-tube and *D*-bolt. Also he/she provided incorrect functions of each part. This candidate did not understand the demand of the question and lacked the knowledge on cooling system as well as he/she demonstrated poor English proficiency.

On other hand, the candidates who scored high marks from 10 to 15 marks had clear understanding on the demand of the question and they had an adequate knowledge on cooling system as they provided correct explanations in part (a). Also they managed to apply the drawing skills in studying the radiator diagram and label clearly the given parts as well as provided the functions of each part. However, the candidates in this group failed to score all 15 marks because their responses missed important information especially in parts which they had to give the meaning and disadvantages of thermo siphon. Extract 14.2 is a sample of good responses from one candidate's script.

| 1 | | | | | | |
|--------|---|--|--|--|--|--|
| 14(9) | () Thermo-siphon cooling system 'Is the carlier | | | | | |
| | type of cooling system in which the trank | | | | | |
| | grade placed slightly above | | | | | |
| | the engine as the flow of cooling water | | | | | |
| | Baliston accepted on gravity as well as the | | | | | |
| | actual of pressure | | | | | |
| 14(9) | (ii) The disadvantage of Thermoscichas | | | | | |
| | colung system is as follows. | | | | | |
| | - It needs high bonnet line as the tank | | | | | |
| | will be placed slightly above the engine, | | | | | |
| | | | | | | |
| | - IT is not suitable for heavy duty | | | | | |
| | senices and other modern vehicles as it | | | | | |
| | and as poisible. | | | | | |
| 124(0) | (iii) bipporence between wertical plan and | | | | | |
| | cross-flow radiator are as follows | | | | | |
| | · Vertical plaw radiators are those in | | | | | |
| | which cooling water flows vertically from | | | | | |
| | the upper tank to the lower tank through | | | | | |
| | 1000000 100000000000000000000000000000 | | | | | |
| | It to the a grate and more wall wall and | | | | | |
| | cooling voter flows botirontally from the | | | | | |
| | upper tank to the lower tank through the | | | | | |
| | radiator motrices. | | | | | |
| | | | | | | |

| 14(6) | (i) components identified | | | | | |
|-------|---|--|--|--|--|--|
| 10 5 | A - Radiator pressure cap | | | | | |
| | B - Vent pressure pipe. | | | | | |
| | C- Radiator matrices (fins), | | | | | |
| | b - Drain tap (plug). | | | | | |
| 4(6) | (ii) Functions of each component. | | | | | |
| | Component A(Radiator pressure rap). This is used to control and relieve any excess pressure in order to allow easy flow, of cooling pater through the firs when the water gets very hot. | | | | | |
| | - This pripe is used to collect excess usater verpours to the expansion tank when the pressure in the hot water tends to exceed its safe maximum rapacity. | | | | | |
| | · Component C(Radiator fins) - These are special constructed matrices which allow cooling process to take place over the hot water by allowing them to flow freely by circulating through. | | | | | |
| 4(6) | (11) · Component D(Drain tap) - This tap is used to drain and removing water out from the inside of the radiator, hence enabling flushing of fine solid particles that are within the radiator. | | | | | |

Extract 14.2: A sample of the candidates' good responses in Question 14

In Extract 14.2 shows that, the candidate provided precise explanations in parts (a) (iii) and (b), but he/she failed to score 15 marks because in part (a) (i) he/she provided incorrect meaning of thermo siphon. He/she managed to provide one correct disadvantage out of required two in part (a) (ii).

3.0 ANALYSIS OF THE CANDIDATES PERFORMANCE PER TOPIC

The analysis shows that, twelve (12) topics out of sixteen (16) were examined in motor vehicle mechanics. These are: *Lubrication System, Power* Unit (Engine), Fuel System (Petrol), Ignition System, Lubrication System, Workshop Practice and Safety, Braking system, Fasteners and Locking Devices, Cooling System, Steering System, Transmission System and Wheel and Tyres.

The candidates' good performance was observed in Question 1 which was composed from various topics in which 71.8% of the candidates scored above average. The candidates who had good performance understood clearly the demand of the questions as well as ability to apply the knowledge and skills acquired.

The average performance was observed in questions 3, 4, 5, 6, 8 and 14 from the topics of *Power Unit (Engine)* (54.4%), *Lubrication System* (49.5%), *Cooling System* (38.4%), *Wheel and Tyre and Steering System* (52%) and *Braking System* (42.7%). The candidates who had average performance partially understood the demand of the questions. In addition, they showed average ability to apply the knowledge and skills in the topics tested to produce sketches, study drawings, provide explanations and to identify some of motor vehicle components and systems.

Further analysis of the candidates' performance reveals that weak performance was observed in the topics of *Workshop Practice and Safety* (27.2%), *Fasteners and Locking Device* (4.8%), *Engine and Vehicle Testing* (21.5%), *Ignition System* (16.0%) and *Transmission System* (0.0%) which was tested in Questions 2, 7, 9, 10, 11, 12 and 13 respectively. Weak performance of the candidates was contributed by poor English proficiency, inadequate knowledge and practical skills on tested topics as well as failure to understand the demand of the questions. For example, some of the candidates sketched irrelevant drawing of ignition coil in the topic of ignition system and failed to identify the labeled components of radiator from the topic of cooling system. The candidates' performance in each topic is summarized in Appendix I.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The general performance of the candidates in Motor Vehicle Mechanics subject for CSEE 2021 was average because 47.6% of the candidates scored average and above. The analysis of the candidates' responses in different topics shows that, the multiple-choice question (Question 1) which comprised of various topics had good performance with the percentages of 71.6.

The analysis of the candidates' performance in each question indicates that, the weak performance was contributed by the various factors such as; in adequate knowledge and skills in tested topic which was observed in Question 12 and 14 where the candidates failed to draw the sketch of ignition coil and to identify the components of the diagram of radiator. Other factors are misinterpretation of the demand of the questions and poor level of English language which led the candidates to provide irrelevant answers, partial explanations and omit some of the questions.

4.2 Recommendations

In order to improve the candidates' performance in Motor Vehicle Mechanics subject, it is recommended that:

- (a) Students should be encouraged and guided to read various Motor Vehicle Mechanics books so as to improve their knowledge and skills.
- (b) Students should be helped to improve English language by developing the passion of speaking and writing in English. This can be achieved by allowing them to participate in debates, discussion and presentation of various assignments.
- (c) Students should practice drawing different motor vehicle components. This will help them to acquire appropriate skills of drawing neatly and correctly label diagrams.
- (d) Students should develop the culture of reading questions carefully before attempting them so that they understand the requirements of the questions.

Appendix I

| S/N | Торіс | Question Number | Percentage of Candidates Who Scored 30% and above | Remarks |
|-----|--|--------------------|--|---------|
| 1 | Power Unit (Engine), Fuel System (Petrol), Ignition System, Lubrication System, Cooling System, Engine and Vehicle testing, Transmission System, Steering system and Wheel and Tyres | 1 | 71.8 | Good |
| 2 | Power Unit (Engine) | 3 | 54.4 | Average |
| 3 | Wheel and Tyre and Steering System | 6 | 52 | Average |
| 4 | Lubrication System | 4 | 49.5 | Average |
| 5 | Braking System | 8 | 42.7 | Average |
| 6 | Cooling System | 5 & 14 | 38.4 | Average |
| 7 | Workshop Practice and Safety | 2 & 10 | 27.2 | Poor |
| 8 | Engine and Vehicle Testing | 9 & 11 | 21.5 | Poor |
| 9 | Ignition system | 12 | 16.0 | Poor |
| 10 | Fasteners and Locking Devices | 7 | 4.8 | Poor |
| 11 | Transimission system | 13 | 0.0 | Poor |

A Summary of Candidates Performance (Topic- Wise)

Appendix II

General Candidates Performance

| Scores Range | 0 – 29 | 30-64 | 65 - 100 | Total |
|----------------------|--------|---------|----------|-------|
| Performance | Poor | Average | Good | |
| Number of Candidates | 54 | 49 | 0 | 103 |
| Percentage (%) | 52.4 | 47.6 | 0.00 | 100 |



The Performance of the Candidates in each Question

Appendix IV



Comparison of Candidate Performance for Year 2020 and 2021