



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



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

BUILDING CONSTRUCTION



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ON FORM TWO NATIONAL ASSESSMENT (FTNA)
2022**

071 BUILDING CONSTRUCTION

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FOREWORD

This report presents Students' Items Response Analysis (SIRA) on Form Two National Assessment in Building Construction 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 Building Construction subject.

The Form Two National Assessment (FTNA), is a formative evaluation, which intends to monitor students' learning outcomes and to provide feedback that teachers, students and other educational stakeholders can use to improve teaching and learning process. This analysis shows justification for the students' performance in the Building Construction subject. The students who attained high scores demonstrated their ability to understand the demands of the questions as well as enough knowledge, skills and competence in the subject matter. However, students who scored low marks lacked adequate knowledge of concepts and failed to respond according to the demands of the questions.

The report will 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 act appropriately during teaching and learning process.

The National Examinations Council of Tanzania (NECTA) expects that the feedback provided in this report will enable the education stakeholders to take proper measures to improve teaching and learning of Building construction subject. Consequently, students will be able to 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 prepared this report.



Dr. Said A. Mohamed
EXECUTIVE SECRETARY

1.0 INTRODUCTION

This report provides a detailed analysis of the students' performance on Form Two National Assessment (FTNA), 2022 in Building Construction subject. The assessment adequately covered the Form Two Syllabus for Technical Secondary School Education issued in 2019 and as per examination format issued in 2021. The Building Construction assessment paper consisted of 10 questions distributed in three sections namely, A, B and C.

Section A comprised of two (2) questions, (1 and 2) weighing 10 and 5 marks respectively, to make a total of 15 marks. The two questions in this section were constructed from various topics namely *Building construction (Site analysis)*, *Building Materials (cement, concrete, plastic and steel)*, *Introduction to Building Construction*, *Walls*, *Workshop Tools and Equipment and Temporary Support (shoring)*. Question 1 was a multiple choice question composed of ten items (i - x) and question 2 was a matching item question composed of five items (i – v) developed from the topic of “wall.”

Section B comprised of seven (7) short answers questions (questions 3 to 9) derived from various topics namely: *Building Construction*, *Science and Technology*, *Workshop Tools and Equipments* and *Building Materials (Glass and Timber)*. Other topics include *Walls (Bonding and Types of Walls)* and *Building Construction (Site analysis)*. Each of these questions carried 10 marks to make a total of 70 marks in the section. The last section of the paper was section C, comprising only one question on Workshop Practice (Foundation Setting out) with a total of 15 marks. The students were instructed to attempt all questions all three sections.

A total of 510 (96.41%) students out of 529 students sat for this assessment. The performance was generally average, whereby 55.49% of the students passed with satisfactory, average and good performance while 44.51% of the students failed. The students' performance and distribution of scores are shown in Table 1 and Figure 1 respectively.

Table 1: General Students' Performance in Building Construction Subject

Scores	Remarks	General Students Performance	
		Number	Percentage (%)
0 – 29	Weak	227	44.51
30 - 64	Average	272	53.33
65 – 100	Good	11	2.16
	Total	510	100

The distribution of scores and students' performance in the Building construction subject is shown in Figure 1.



Figure 1: The Distribution of students' Performance in Percentage

Among the students who sat for the Building construction assessment in year 2022, only 11 scored grade A and B while 272 students scored credit grade C and D, and the remaining 227 students failed by scoring grade F.

The range of the students' performance for each question was determined and an analysis of the strength and weakness of the students' responses was carried out. Extracts of students' good or poor responses are used to illustrate the cases presented. At the end of this report, a conclusion and recommendations are made to help education stakeholders to take

necessary measures to improve the prospective students' performance in the future.

2.0 THE ANALYSIS OF THE STUDENTS' RESPONSE IN EACH QUESTION

2.1 Section A: Multiple Choice and Matching Items

This section consisted of two questions. Question 1 had ten multiple-choice items, each carrying 01 mark to make a total of 10 marks. Question 2 had five matching items, each carrying 01 mark to make a total of 05 marks. The score ranges used for grading students' performance on each question has been shown. The students were considered to pass if they scored grade D and above.

2.1.1 Question 1: Multiple Choice Items

The score intervals used for grading students' performance on this question is shown in Table 2.

Table 2: Score Intervals of Students' Performance in Question 1

Scores range (marks)	General Performance		Remark
	Number of students	Percentage	
0-2	64	12.50	Weak
3-6	377	64.00	Average
7-10	69	23.50	Good
Total	510	100.00	

A total of 510 (100%) students attempted the question, whereby 64 (12.50%) scored 0 to 2 marks, 377 (64.0%) scored 3 to 6 marks while 69 (23.5%) scored 7 to 10 marks.

The general performance of students on this question was good as 87.5% of them scored D and above. These students managed to choose correct answers for 3 to 10 items. A summary of students' scores for this question is presented in Figure 2.

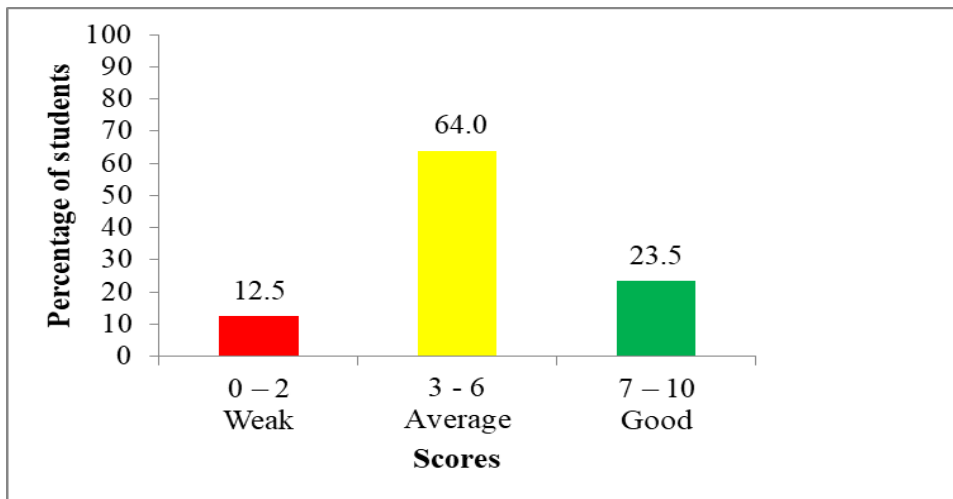


Figure 2: Students' Performance in Question 1

As shown in Figure 2, the 23.5% of the students who managed to score good marks in this question were able to choose the correct option from the given alternatives of the multiple-choice items. The students performed well in this question because they were able to utilize the knowledge acquired from different topics to identify the correct answers among the given alternatives.

The analysis of students responses also shows that, most of them chose correct answer in items (v) and (vii), which were constructed from the topics of *Walls* and *Introduction to Building Construction* respectively. On the other hand, most students failed to score in items (i) from the topic of *Foundation (site analysis)* and (ix) from the topic of *Building Materials (glass)*. The rest of the items were performed averagely.

The students' strengths and weaknesses in choosing responses for individual items of the question are analyzed as follows:

- (i) *While investigating the site, a thick layer of fairly firm clay over a deep layer of soft clay is encountered. Which type of foundation will you suggest to be used in this situation?*
- | | |
|------------------------------|---------------------------|
| <i>A Pile foundation</i> | <i>B Raft foundation</i> |
| <i>C Grillage foundation</i> | <i>D Strip foundation</i> |

In item (i), the students were required to select the suitable type of foundation that would suit the nature of the soil discovered or found in the site. The question intended to measure students' awareness or

understanding on the suitability of foundation types depending on nature of soil during construction (site analysis). The correct response for this item was alternative B (*Raft foundation*). Few students opted for alternative A (*Pile foundation*). Students failed to recall that Pile is used to transfer the load of a structure to deeper level. Some students select alternative C (*Grillage foundation*) which is also an incorrect answer because it is the type of foundation system that consist of a framework of horizontal and vertical steel bars or beams. Other students selected alternative D (*strip foundation*) which is an incorrect answer because this is the type of shallow foundation used to support structure such as building, bridge or wall.

(ii) *A client wants to make reinforced cement concrete. Which type of steel is best to use?*

A *Stainless steel*

B *High carbon steel*

C *Mild steel*

D *Wrought iron*

Item (ii) required the students to identify the type of steel that is suitable for reinforced cement concrete. Only a considerable number of the student responded by selecting the correct responses C (*mild steel*). The students who opted for the correct answer were aware that the strength of steel vary according to carbon content. Moreover, the students who selected the alternatives A (*stainless steel*) were not correct because stainless steel contains a minimum of 10.5% chromium which gives it a unique property of being high resistant to corrosion and staining. Alternative B (*high carbon steel*) and D (*wrought iron*) were incorrect answers because high carbon steel contains high amount of carbon, between 0.6% and 1.5% by weight, while wrought iron contain very low amount of carbon.

(iii) *Which part of a building is constructed above the plinth level?*

A *Substructure.*

B *Basement.*

C *Foundation.*

D *Superstructure.*

In item (iii), students were required to identify the part located above the plinth level. The students with adequate knowledge on foundations opted for the correct response D (*superstructure*). These students were aware that a superstructure is a part of the building constructed above the ground level. A plinth is a thickening at the base of the wall, column or building, which make demarcation between a substructure and a superstructure. The students who opted for A (*Substructure*) were wrong because substructure

constructed below the plinth level. Other students select B (*Basement*) which is incorrect answer because it is the lowest part of storey building. Likewise, students who select C (*foundation*) was wrong because foundation is the base up on which a house is built.

(iv) *Suppose you are involved in setting a level of a residential building foundation trench. Which tool is required for the work?*

- | | | | |
|---|------------------------|---|--------------------|
| A | <i>Ranging rod.</i> | B | <i>Steel tape.</i> |
| C | <i>Leveling staff.</i> | D | <i>Boning rod.</i> |

In item (iv), the students performed moderately. Alternative D (*Boning rod*) was the correct answer. A boning rod is a tool used to maintain a level surface at the bottom of the foundation trenches. The students who chose the correct answer were familiar with the application of a boning rod. The students who opted for responses A (*Ranging rod*), and B (*steel tape*) were wrong because a ranging rod is a surveying instrument used to measure distances and elevations. While (steel tape) is a tool used to measure distances. Nevertheless, students who opted for C (*leveling staff*) were also not correct because this is a surveying tool used to measure vertical distances or elevation between point on the ground.

(v) *Which type of wall is constructed to divide the space within an office building?*

- | | | | |
|---|-----------------|---|-------------------|
| A | <i>Boundary</i> | B | <i>Fender</i> |
| C | <i>Party</i> | D | <i>partition.</i> |

Item (v) required the students to identify the type of wall constructed to divide the space within an office building. The correct answer was D (*partition*), the students who opted for the correct response exhibited enough knowledge to distinguish the types of walls based on their uses. Students who failed in this item seemed to contradict the application of *partition wall* with C (*party wall*). Party wall is a share wall or boundary that separate two adjacent properties or building. The students who selected alternative B (*Fender*) was wrong because fender is a part wall built in a basement under the heart store of a fire place in the story above. The students who opted for A(*Boundary*) was also wrong because boundary is a wall that separates two lines with different families.

(vi) *What type of an arch is used for high class buildings where appearances is of prime importance?*

- | | |
|-----------------------|---------------------|
| <i>A Ashlar</i> | <i>B Rubble</i> |
| <i>C Gauged brick</i> | <i>D Axed brick</i> |

In item (vi), the students were required to select the type of arch, which is used for high-class buildings where appearance is of prime importance. The correct alternative was *C (gauged brick)* and was chosen by the students who were aware that it is a very ornamental and expensive. The bricks require a lot of preparatory work before they can be used to build the arch. They are prepared and bedded with a very fine white joint. A sound knowledge of geometry is required before attempting this class of work. However, some of the students who chose either alternative *A (Ashlar)* or *B (Rubble)* were wrong because ashler arch is applied in masonry work to form regular coursed rubble stonewall while rubble arch consist exclusively of mineral waste such as concrete, bricks, ceramics, soil and sand. Alternative *D (Axed brick)* was also wrong because axed brick arch is constructed when the wedge shaped voussoirs are cut with a hammer and bolster and trimmed with a scutch hammer.

(vii) *Which one are essential sets of Personal Protective Equipment (PPE) for a technical secondary school workshop?*

- A Goggles, sneakers, masks and overcoat*
- B Short pants, overall, goggle and face shield*
- C Face shield, goggles, overcoat, and sandals*
- D Face shield, goggles, gloves and overcoats*

In item (vii), the students were required to select the appropriate sets of personal protective equipment. The correct alternative was *D (face shield, goggles, gloves and overcoats)*. Students chose the correct alternative because adequate protective clothing is familiar to various engineering fields. However, students who failed in this item by choosing *A (Goggles, sneakers, masks and overcoat)*, *B (Short pants, overall, goggle and face shield)* and *C (Face shield, goggles, overcoat, and sandals)* were not aware that sneaker, short pants and sandal are not PPE. Sneaker is soft shoes worn for sports, short pants is shortened version of trousers which care the entire leg, but not the foot while sandals are shoe which can be either an open work upper or straps attaching the sole to the foot.

(viii) *Suppose a concrete ratio of 1:3:6 is used for constructing a ground floor slab. Calculate the percentage of fine aggregate?*

A 100 B 60 C 30 D 10

In item (viii), students performed moderately. The students were required to calculate the amount of fine aggregate or sand needed for construction of a ground floor slab. The correct alternative was C (30). Some students who select B (60) misunderstood the ratio of the fine aggregate with that of coarse aggregate. Those who selected D (10) misunderstood the ratio of fine aggregate with that of cement. Students who selected A (100) was not aware of how to apply the mathematical knowledge to calculate the percentage of the mentioned materials in this ratio of concrete (1:3:6). This means the accurate measure of one part of cement, three parts of fine aggregate and six parts of coarse aggregate mixed with water at a certain ratio to form a homogeneous mass of concrete.

However, few students failed to score a mark due to lack of enough knowledge on mathematical calculations or failure to recall and apply the formula to find the percentage of materials used in the concrete.

(ix) *Identify the chemicals that are added to plastics during production so as to make it soft, flexible , and improve their toughness.*

A Powder filters B Plasticizers
C Lubricants D Binders

In item (ix), students were required to identify the chemicals that should be added to plastics during production in order to maintain the properties. The correct alternative was B (*plasticizers*). This term seems to be very familiar to most students because plastic is commonly used by students in day-to-day life. That is why most of them opted for the correct answer. Those selected D (*Binders*) were wrong because binder is a material used to form bond fibers while A (*powder filters*) also was wrong answer since powder filters is a device used to separate and remove impurities from a powdered substance. Students who opted C (*Lubricants*) were also wrong because lubricant is substance capable of reducing friction, heat and wear when introduced as a film between soil surfaces.

(x) *Suppose the intermediate building between party walls of two buildings has to be demolished or rebuilt . What is the temporary support to be used ?*

<i>A</i>	<i>Underpinning</i>	<i>B</i>	<i>Dead shore</i>
<i>C</i>	<i>Flying shore</i>	<i>D</i>	<i>Scaffolding</i>

In item (x), alternative C (flying shore) was correct responses and was chosen by the students who were able to recall, that a flying shoe is used to give horizontal support to two adjacent parallel party wall which have become unsafe due to removal or collapse of intermediate building. Students who selected A (*Underpinning*), B (*Dead shore*) and D (*Scaffolding*) were wrong. These students lacked knowledge on construction of temporary structures, specifically on their application.

2.1.2 Question 2: Matching Items

The question required the students to match items (i - v) described in list A with responses in list B by writing the letter of the corresponding correct response beside the item number. Each item in this question carried 01 mark, making a total of 05 marks. The question was designed to test the students' knowledge about *Bonding* in Walls.

The score ranges used to grade students' performance in this question are presented in Table 3.

Table 3: Score Intervals of Students' Performance in Question 2

Scores range (marks)	General Performance		Remark
	Number of Students	Percentage	
0 – 1	152	29.80	Weak
2 – 3	192	37.70	Average
4 – 5	166	32.50	Good
Total	510	100.00	

This question was attempted by 510 (100%) students, whereby 152 (29.8%) scored from 0 to 1 mark, 192 (37.7%) scored from 2 to 3 marks, and 166 (32.5%) scored from 4 to 5 marks.

The performance on this question was generally good as 70.2 % of the students scored pass marks and above. A summary of students' scores is presented in Figure 3.

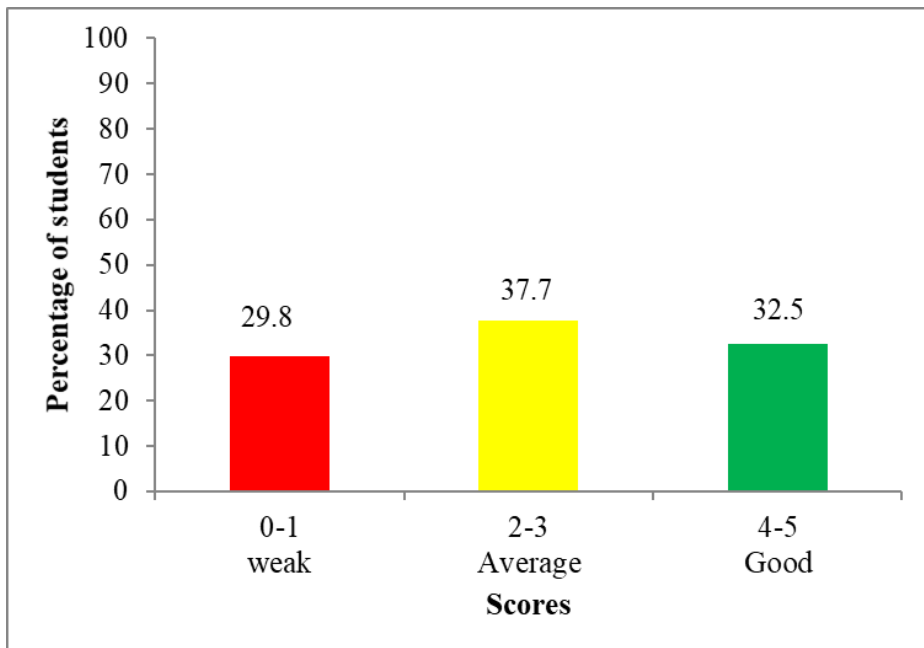


Figure 3: *Students' Performance in Question 2*

As shown in Figure 3, there was 70.2 % of the students who scored pass marks and above in this question. This might attribute to adequate knowledge on the types of bond in bricks walls. Bricks are the oldest materials for wall construction, which were used even in the past before the invention of blocks. However, knowledge of both brick and blocks is useful. None is better than the other as their uses depends on the nature of your project and the intended use of the building. The laying style of the brick is what distinguishes the type of bonds, which required the students to match with correct descriptions of wall brick bond. In this group, the students managed to match correctly two to five descriptions of walls with their corresponding types of bonding. Extract 1.1 shows a sample of students' correct matches in question 2.

2. Match the meaning of brick wall bonds in **List A** with their corresponding technical term in **List B** by writing the letter of the correct answer below the item number in the table provided.

List A	List B
(i) The bond having headers and stretchers laid at alternate courses and every course started with a $\frac{3}{4}$ brick-bat.	A Heading bond
(ii) The bond having all the bricks laid as stretchers in every course.	B Flemish bond
(iii) The bond having all the bricks laid as headers in every course of a wall.	C Dutch bond
(iv) The bond having headers and stretchers laid alternately in the same course.	D Zig Zag bond
(v) The bond having headers and stretchers laid in alternate course.	E Facing bond
	F Raking bond
	G English bond
	H Stretching bond

Answer

List A	(i)	(ii)	(iii)	(iv)	(v)
List B	C	H	A	B	G

Extract 1.1: A sample of the student's good responses to Question 2

The rest of the students (29.8%) scored below the pass mark, and 15.1% of these students scored zero. This shows that some of the students were not well informed about the types of bonds since they failed to match the descriptions listed in list A with their correct technical names of wall bond mentioned in list B. Lack of knowledge on stretcher and header sides of the bricks led the students to score low marks. Extract 1.2 is a sample of a student's incorrect matches in question 2.

2. Match the meaning of brick wall bonds in **List A** with their corresponding technical term in **List B** by writing the letter of the correct answer below the item number in the table provided.

List A	List B
(i) The bond having headers and stretchers laid at alternate courses and every course started with a $\frac{3}{4}$ brick-bat.	A Heading bond B Flemish bond
(ii) The bond having all the bricks laid as stretchers in every course.	C Dutch bond D Zig Zag bond
(iii) The bond having all the bricks laid as headers in every course of a wall.	E Facing bond F Raking bond
(iv) The bond having headers and stretchers laid alternately in the same course.	G English bond H Stretching bond
(v) The bond having headers and stretchers laid in alternate course.	

Answer

List A	(i)	(ii)	(iii)	(iv)	(v)
List B	A	B	C	D	H

Extract 1.2: A sample of the student's poor responses to Question 2

2.2 Section B: Short Answer Questions.

This section consisted of seven (7) questions from 3 to 9, each carrying 10 marks. The score intervals used for grading the performance of students in this section is as indicated in Table 4.

Table 4: Score interval for Question 3 to 9

Score Range (Marks)	Remarks
0 – 2.5	Weak
3 - 6	Average
6.5 - 10	Good

2.2.1 Question 3: Building Construction, Science and Technology

This question required the students to state the importance of a team of personnel in the construction of large building projects.

The question was attempted by 510 (100%) students, whereby 236 (46.30%) scored from 0 to 2.5 marks, 145 (28.40%) students scored from 3 to 6 marks and 129 (25.30%) students scored from 6.5 to 10 marks.

The performance in this question was generally average as 53.7% of all the students scored pass and above as summarized in Figure 4.

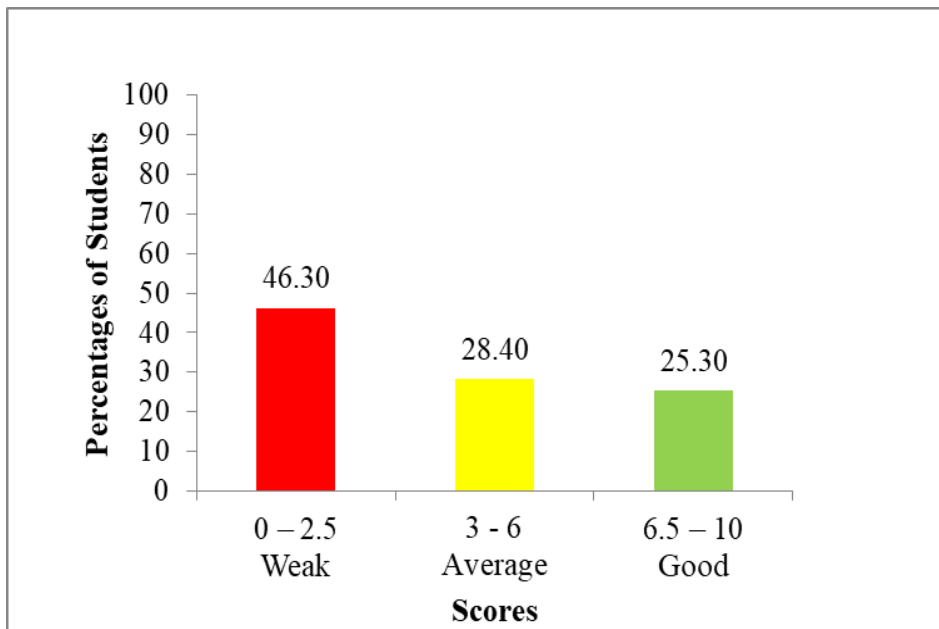


Figure 4: *Students Performance in Question 3*

Analysis shows that more than half of the students who attempted this question scored the pass mark and above. These students demonstrated knowledge on technical personnel involved in large construction projects. Construction projects require many resources. However, having materials and equipment alone is not enough for successful completion of a construction project. More often, what makes a project successful or breaks a project is the construction team. Different roles require different skills, knowledge, and the experience, but they are all invaluable in construction. The students in this category knew the roles and the necessity of the building team members to execute the project accordingly. Therefore, these students produced relevant responses about a building team as depicted in Extract 2.1.

3. Normally a big team of personnel are involved in the construction of large building projects. Why is it necessary to have the following team members?

(a) Client

He or she is necessary because he/she is the one owning the project. With out him/her, there will be no project or even directions on how to build the project.

(b) Contract manager

He or she is the one who deals with all legal matters of the contract between the client (owner of the project) and the site engineer.

(c) Quantity surveyor

A quantity surveyor is necessary because he/she is the one who counts and records the number of building materials that will be used on the project.

(d) General foreman

He or she is necessary because he/she is the one who ~~manages the work done by~~ does the general work on the site. By this I mean that he/she does many kinds of works ~~in~~ by no specialization.

Extract 2.1: A sample of the student's good responses to Question 3

Extract 2.1 shows a sample of the response from one of the students who was able to state the necessity of involving a technical personnel in large construction projects.

The analysis also found that 46.3% of the students failed to score pass marks. Lack of knowledge on the building team is among the core factors that led the students to fail by scoring zero or below the pass mark. These students were unable to give any role of different members in a building team. Generally, they wrote irrelevant roles of the members of the building team. Likewise, some students wrote other things instead of the roles of the building team members. Extract 2.2 portrays a sample of such responses.

3. Normally a big team of personnel are involved in the construction of large building projects. Why is it necessary to have the following team members?

(a) Client
To make reinforced cement concrete.

(b) Contract manager
To correct the place if which have not been built well.

(c) Quantity surveyor
To supervise the builder's members the way they could built.

(d) General foreman
The person who built a building.

Extract 2.2: A sample of the students' poor responses to Question 3

Extract 2.2 shows the responses of a student who failed to recall any roles and duties of the building team members involved in large construction projects.

2.2.2 Question 4: Workshop tools and equipment

The question required the students to describe the use of various tools used for concrete block manufacturing, such as a wheelbarrow, plates, shovels, hand pans and trowels. This question was attempted by 510 (100%) students, whereby 276 (54.10%) scored 0 to 2.5 marks. The students who scored from 3 to 6 marks were 184 (36.10%) while there were 50 (9.80%) who scored from 6.5 to 10 marks. Generally, the student's performance in

this question was average as 45.9% of the students scored pass marks and above as summarized in Figure 5

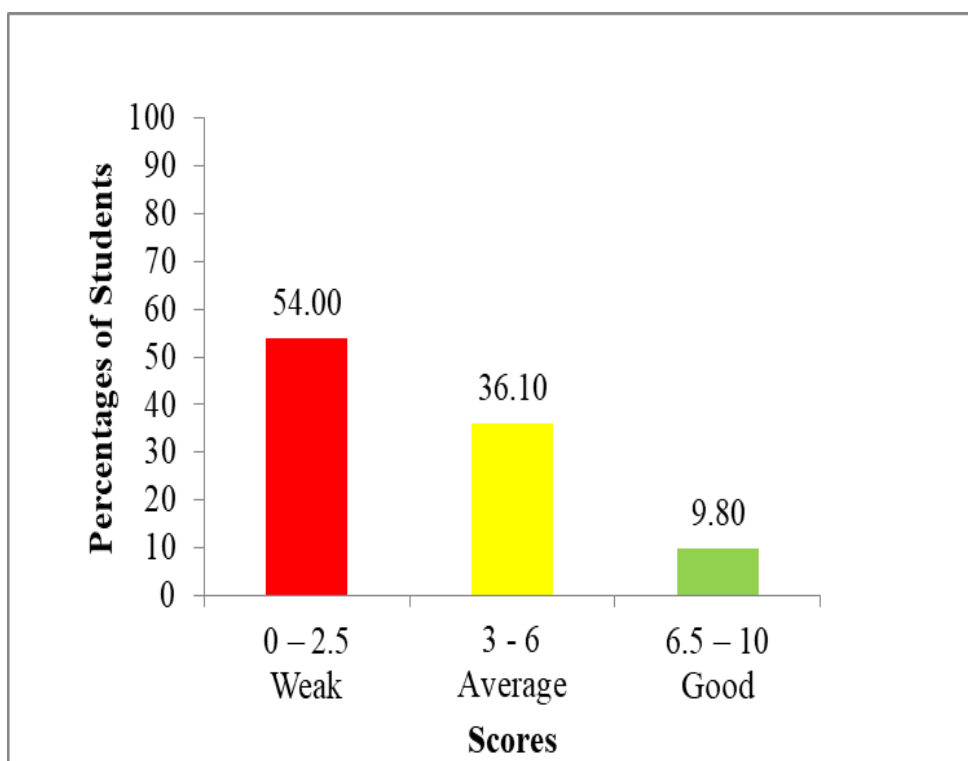


Figure 5: *Students Performance in Question 4*

About 54.1% of the students failed in this question. Their failure is an indication that they had little knowledge on the tested topic of workshop tools and equipment. In addition, it can be due to either little participation in workshop practices, or they had poor workshop orientation because those tools and equipment commonly used in daily routine activities. Workshop orientation is done when new students are introduced to the workshop rules and safety precautions, workshop areas, and study environments. During an orientation, the teacher helps the students to familiarize with the studying area, tools, equipment and machines used in the workshop. A comprehensive orientation programme helps to lower accidents rate and enables students to make appropriate use of the tools, equipment and machines used in the workshop. Most of the students in this category wrote irrelevant responses and some of them copied some words or phrases from other questions and wrote them as their responses as depicted in Extract 3.1.

4. Describe the use of the following tools to a concrete block manufacturer.

(a) Wheelbarrow

Is a Which person leveling suppose

(b) Plates

Suppose the intermediate building between party walls of two building has to be demolisher.

(c) Shovels

Is the temporary supports to the be used under pinnings.

(d) Head pans

Identify the chemicals are added to plastic during production

(e) Trowels

Is a concrete ratio for constructing a ground.

Extract 3.1: A sample of the students' poor responses to Question 4

Extract 3.1 is a sample response from the student who gave incorrect answers to all parts of the question by copying words from question 1. For example, the responses in item (b) comprise words from question 1.

On other hand, 234 (45.9%) students scored average marks and above. They knew the use of the tools given in this question and were able to

provide relevant responses. Extract 3.2 shows responses from the student who attempted the question and provided relevant responses.

4. Describe the use of the following tools to a concrete block manufacturer.

(a) Wheelbarrow

It is used to carry working tools, ~~to~~ already made blocks from the working area and even carrying the mixed concrete to the area where they make the blocks if there is absence of head pans.

(b) Plates

These are used as standing surfaces for when making the blocks so as the concrete blocks won't bind with the ground and to give a standing shape of the blocks.

(c) Shovels

It is used to mix well the fine aggregate, coarse aggregate, cement and water so as to get concrete for making concrete blocks.

(d) Head pans

These are tools used also to carry the already mixed concrete to the area where they manufacture the blocks.

(e) Trowels

These are tools used to put the concrete in special block-like shaped structures made of timber so as to make the concrete bricks. They are also used to smoothen the upper surface of the concrete bricks.

Extract 3.2: A sample of the students' best responses to Question 4

Extract 3.2 shows a sample of responses from the student who managed to provide the required responses in this question and scored reasonable marks. The students wrote the correct responses regarding the use of the stated tools by a concrete block manufacturer.

2.2.3 Question 5: Building Materials

In this question, the students were required to (a) briefly explain three advantages and three disadvantages of using glass as a building material and (b) mention four building components that are made of glass.

This question was attempted by 510 (100%) students whereby 150 (29.40%) scored from 0 to 2.5 marks. The students who scored from 3 to 6 marks were 219 (43.00%), while 141 (27.60%) students scored from 6.5 to 10 marks.

The performance in this question was generally good as the majority of the students who attempted the question scored pass marks and above. The distribution of students' scores in this question is summarized in Table 5.

Table 5: General Students' Performance in Question 5

Scores range (marks)	General Performance		Remark
	Number of Students	Percentage (%)	
0 – 2.5	150	29.40	Weak
3 - 6	219	43.00	Average
6.5 - 10	141	27.60	Good
Total	510	100.00	

Table 5 shows that most of the students (70.6%) scored pass mark and above. These students managed to answer large part of the question correctly. Glass is a solid like and transparent material that is used for different purposes in our daily lives. Glass is made from natural and abundant raw materials (sand, soda ash and limestone). Such materials are melted at a very high temperature to form a new material known as glass. The massive use of glass nowadays made most of the students to perform well in this question. These students had adequate knowledge regarding glass as a building material, hence they managed to mention the building components that are made of glass. They also managed to describe the advantages and disadvantages of using glass. Extract 4.1 is a sample of correct responses from one of the students who attempted this question.

5. Suppose an architect decide to use glass as a building material for the newly designed building.
- (a) What are the three advantages and three disadvantages of using glasses as building materials?
- Advantages
- (i) It is an excellent electrical insulator.
 - (ii) It is strong and brittle.
 - (iii) It can take excellent polish i.e. it is shiny.
 - (iv) It comes in different colours.
 - (v) It can be drawn, pressed or blown.
- Disadvantages
- (i) It can be transparent hence can't be used for partition walls (it can see through).
 - (ii) It is costly.
 - (iii) It can break easily.
- (b) Mention four building components which are made of glass.
- (i) Glass doors.
 - (ii) Glass windows.
 - (iii) Glass partition walls eg. curtain walls.
 - (iv) Glass roofs.

Extract 4.1: A sample of good responses to Question 5

Extract 4.1 shows a sample of responses from one of the students who had enough knowledge on the advantages and disadvantages of using glass as a building material and managed to mention the building components that are made of glass.

However, few students scored below the pass mark by writing irrelevant responses in both parts (a) and (b). They either copied the questions and wrote them as their responses or wrote explanations that were irrelevant. This category of students portrayed lack of knowledge and practice on building materials. Hence, they failed to score pass marks. Extract 4.2 shows a sample of incorrect responses given by one of the students who attempted Question 5.

5. Suppose an architect decide to use glass as a building material for the newly designed building.

(a) What are the three advantages and three disadvantages of using glasses as building materials?

Advantages

(i) Fire resistance

(ii) heat resistance passage

(iii) Durability

Disadvantages

(i) Transparent light

(ii) high level of accumulative with dirty

(iii) It does not strong

(b) Mention four building components which are made of glass.

(i) Sand fusion

(ii) Aluminium

(iii) Oxide venni

(iv) Jitica

Extract 4.2: A sample of poor responses to Question 5

Extract 4.2 illustrates poor responses given by a student who failed to write the appropriate advantages and disadvantages of using glass as building material. The student also failed to mention the building components that are made of glass.

2.2.4 Question 6: Walls

In this question, students were required to sketch a single elevation of a brick wall, which is under construction and show the following parts on constructed brick wall; (i) Header (ii) Stretcher (iii) Bed joints (iv) Vertical joints (v) Perpend (vi) Racking back and (vii) Queen closer.

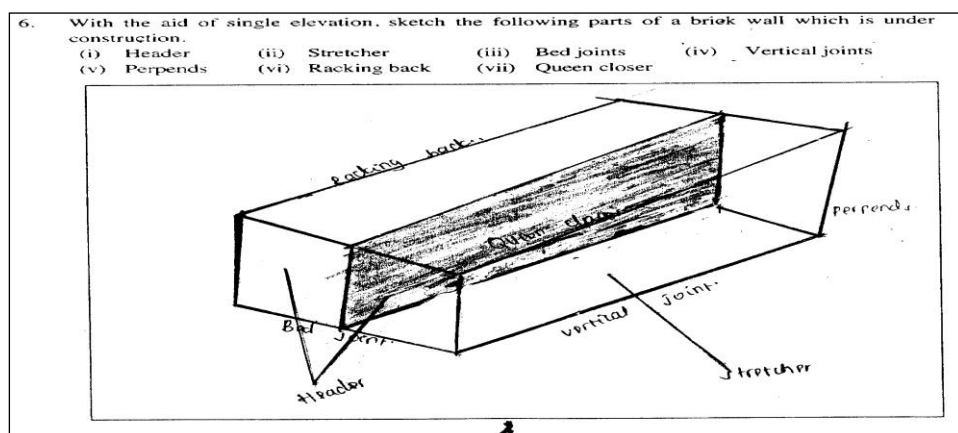
A total of 510 (100%) students attempted this question. Out of that number, 351 (68.80%) scored from 0 to 2.5 marks, 133 (26.10%) scored from 3 to 6 marks and 26 (05.10%) scored from 6.5 to 10 marks.

The performance in this question was generally poor as the majority of the students who attempted it scored below the pass mark. The students' performance in this question is summarized in Table 6.

Table 6: General Students' Performance in Question 6

Scores range (marks)	General Performance		Remark
	Number of students	Percentage (%)	
0 – 2.5	351	68.8	Weak
3 - 6	133	26.1	Average
6.5 - 10	26	05.1	Good
Total	510	100.00	

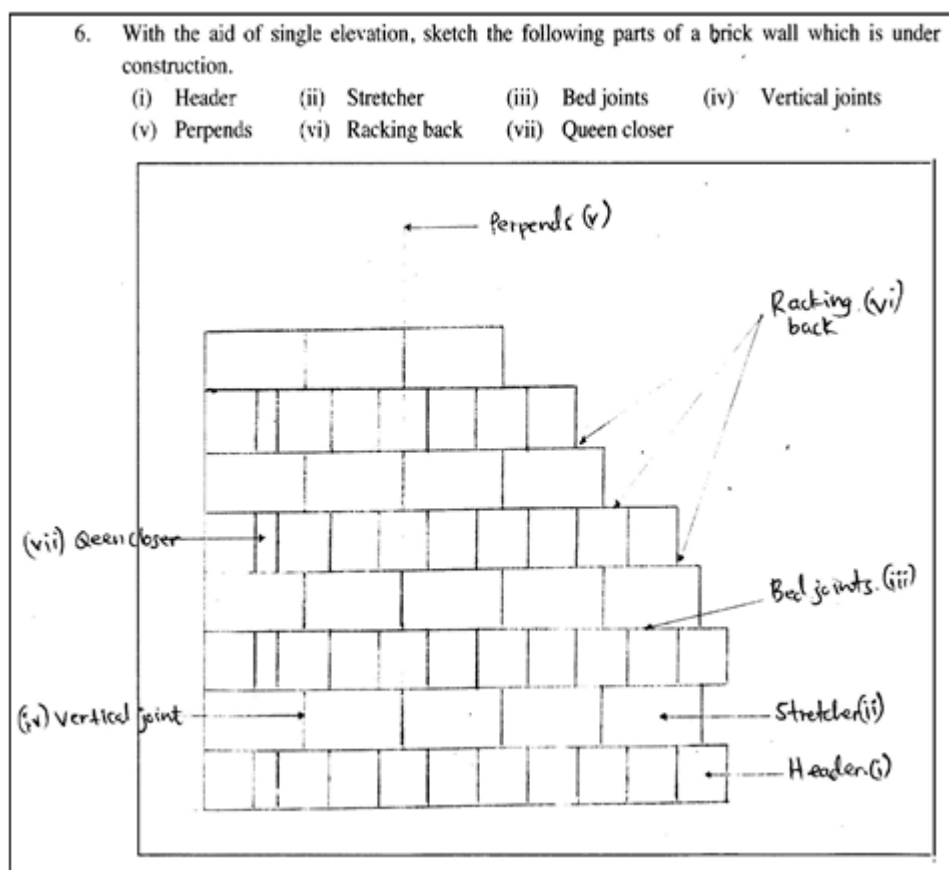
The analysis shows that 68.8% of the students scored below pass mark. These students did not comprehend the requirements of the question. The majority of students lacked skills of drawings, especially on interpreting the terms on technical drawings. Therefore, they failed to sketch an elevation of a brick wall used to show the different parts as demanded in the question. The students in this group drew different things but incorrectly. Drawing a single brick to show a header, stretcher and other parts of brick is among the answers given by students from this group. Extract 5.1 depicts a sample of a poor response from one among the students who failed in this Question.



Extract 5.1: A sample of poor responses to Question 6

Extract 5.1 is a sample response from one of the students who failed to provide relevant responses to this question. This student sketched the method of timbering to trenches used in firm soil, instead of a sketch showing the parts of a brick wall which is under construction.

Further analysis shows that 31.2% of the students scored the pass marks. Such students managed to give correct responses by sketching relevant drawing showing the parts of a brick wall which is under construction. Extract 5.2 displays a sample of a good response from one of the students who attempted Question 6.



Extract 5.2: A sample of good responses to Question 6

Extract 5.2 shows a sample response from one of the students who was able to produce the relevant responses to many parts of the question and hence scored good marks.

2.2.5 Question 7: Walls

In this question, the students were required to (a) provide a detailed section sketch of a cavity wall so that the construction can proceed at lintel as well as at sill.(b) briefly describe three types of walls; (i) separating wall (ii) a curtain wall and (iii) composite wall.

This question was attempted by 510 (100%) students. A total of 462 (90.6%) scored from 0 to 2.5 marks and 48 (9.4%) scored from 3 to 6 marks, while there was no one who scored from 6.5 to 10 marks. The general performance in this question was poor as only 48 (9.4%) of the students who attempted this question scored pass marks. The distribution of students' performance in this question is summarized in Table 7.

Table 7: General Students' Performance in Question 7

Scores range (marks)	General Performance		Remark
	Number of students	Percentage(%)	
0 – 2.5	462	90.60	Weak
3 - 6	48	9.40	Average
6.5 - 10	00	0.00	Good
Total	510	100.00	

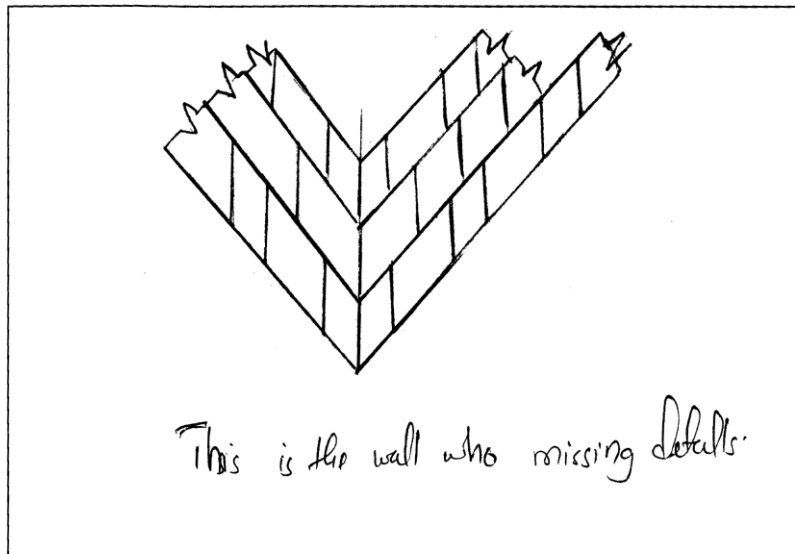
Majority of the students (90.6%) scored below the pass mark. These students failed to provide a detailed section sketch of parts of cavity wall in which the construction could not proceed until the parts are constructed. These were a lintel and a windowsill. In addition, they failed to describe the types of wall especially, (i) separating wall, (ii) a curtain wall (iii) composite wall.

A cavity wall is a kind of masonry structure consisting of two leaves constructed in parallel to each other, held together with the help of ties or bonding units to make them act as a single unit. As the name suggests, the wall has a cavity filled with insulating material, but air is the most common insulating material for the walls. Also, mineral fibers can be used as per requirement. Failure to provide correct responses in this part shows that students had little or lack of knowledge on the tested topic. This type of wall seems to be not familiar to the students because the construction of cavity wall is not common. In addition, the students failed to describe the given types of walls, hence they scored below the pass mark. Some

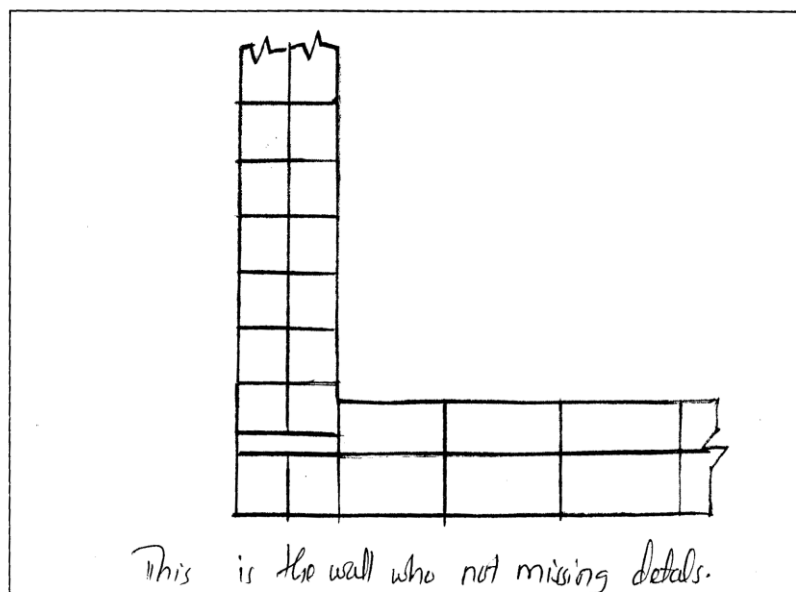
students sketched the bonding of wall and others wrote irrelevant responses.

7. (a) Suppose a construction has stopped because of the missing details of a cavity wall. Provide a detailed section sketch at the following areas of a cavity wall so that the construction can proceed.

(i) At lintel



(ii) At sill



Extract 6.1 is a sample of such responses.

(b) Briefly describe each of the following types of walls:

(i) Separating wall

Is the wall which is built so as separate or build boundaries from different room in a building.

(ii) A curtain wall

Is the wall which it is used to make a curve example at the doors and windows.

(iii) Composite wall

Is the wall which it carries the dead load which it is the roof and other materials.

Extract 6.1: A sample of the students' poor responses to Question 7

Extract 6.1, is a sample response from one of students who attempted Question 6 but failed to provide relevant responses. The student failed to provide a detailed sketch of a cavity wall and to show the missing parts namely a lintel and a sill. Also, the student failed to describe the various types of walls as asked in this question.

2.2.6 Question 8: Building Construction Science and Technology

The question required the student to (a) justify the statement that the construction cannot start until site clearance is done by giving three advantages of site exploration, (b) describe four operations involved during site clearance, and (c) identify two precautions to be observed during site clearance operation.

This question was attempted by 510 (100%) students whereby 304 (59.6%) scored from 0 to 2.5 marks, 164 (32.2%) scored from 3 to 6 marks while 42 (8.2%) students scored from 6.5 to 10 marks.

The general performance in this question was average since about 206 (40.4%) of the students who attempted this question scored pass marks. The students' performance in this question is summarized in Figure 6.

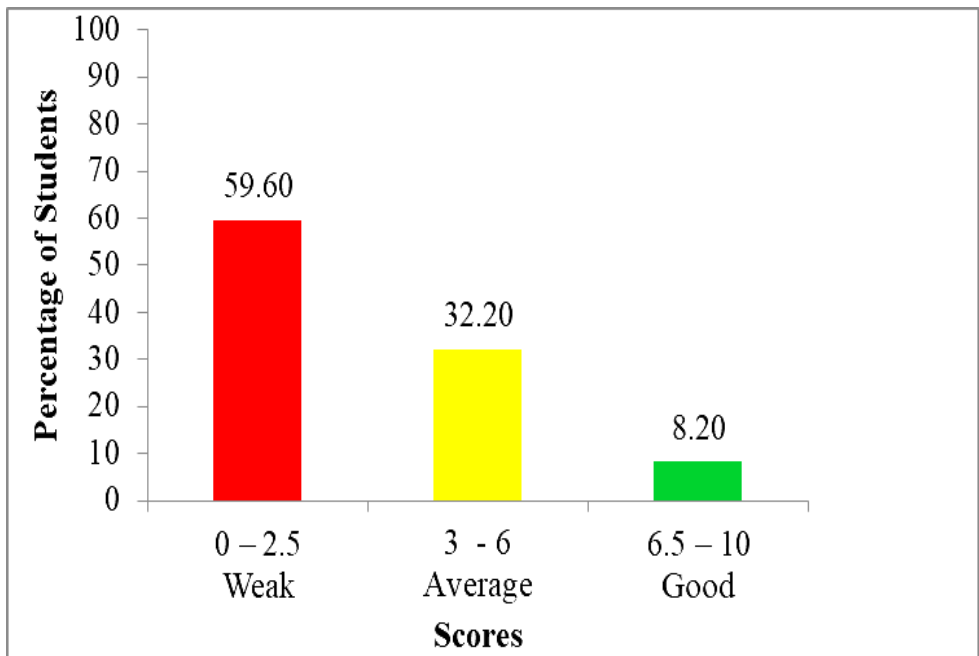


Figure 6: *Students Performance in Question 8*

Figure 6 shows that 59.60% of the students scored below pass mark. Most of the students confused between two terms, site clearance and site exploration. The students considered site exploration as part of site clearance but these are two different activities with different purposes. This misconception attributed their failure to produce relevant responses in both areas of this question. Those who scored either little marks or nothing totally failed to attempt part (a), (b) and (c) of this question. The students seemed to lack knowledge on site exploration, which is most important and is done to obtain the information about the surface and subsurface conditions of the site for a proposed construction. Most of the students wrote irrelevant responses. Some of them copied the questions and wrote them as their responses. Extract 7.1 represents poor responses to question 8.

8. (a) The construction cannot start until site clearance is done. Justify the statement by giving three advantages of site exploration.
- (i) It help in knowing the site environment.
 - (ii) It help in removing soft soil and base unneeded materials in the site
 - (iii) It help in knowing the security in the site.
- (b) Describe four operations involved during site clearance.
- (i) ~~Removing soft soil in the environment~~
Access consideration.
 - (ii) Site security.
 - (iii) Storage consideration.
 - (iv) Accommodation consideration.
- (c) What precautions should be observed during site clearance operation? Give two precautions.
- (i) About Danger and security of site.
 - (ii) Site safety.

Extract 7.1: A sample of the students' poor responses to Question 8

Extract 7.1 is a sample of responses from one of the students who failed to provide correct answers due to little knowledge on the topic.

However, some students (40.40%) scored the pass mark and above. Such students wrote correct responses by giving the advantages of site

exploration and described the four operations carried out during site clearance. They were also able to identify two precautions to be observed during site clearance operation. In general, no one was able to score full marks as they failed in either part (a), (b) or (c) of the question, in most cases part (a). Extract 7.2 is a sample of responses from one of the students who was able to respond correctly to the question asked and scored good marks.

8.	(a)	The construction cannot start until site clearance is done. Justify the statement by giving three advantages of site exploration.
	(i)	To determine different soil strata, their types and thickness.
	(ii)	To determine the excavation depth of the foundation
	(iii)	To determine the bearing capacity of different layers of soil used to form ground in a site.
	(b)	Describe four operations involved during site clearance.
	(i)	Clearing of shrubs and bushes: The shrubs and bushes at the site should be cleared in order to provide enough and required space to erect
	(ii)	Removing Vegetable matters: The vegetable matters found in the the soil should be removed to enhance the soil to gain full compactibility,
	(iii)	levelling: We are required to level the site if there is presence of dug holes in order to prepare the area for the building project to take place,
	(iv)	Clearing termites: If there is termites in the area of the site we must clear them off in order to avoid them from attacking some of materials.
	(c)	What precautions should be observed during site clearance operation? Give two precautions.
	(i)	Personal safety: During clearing the site or site clearance operation we need to be careful with our safety and stay away from danger.
	(ii)	

Extract 7.2: A sample of the students' good responses to Question 8

Extract 7.2 shows a sample of good responses from one of the students who responded to the question correctly and scored good marks, but failed to provide the second precaution in part (c).

2.2.7 Question 9: Building Materials

In this question, the students were required to (a) give six reasons of timber seasoning recommended before use and (b) briefly describe two methods used in timber seasoning.

This question was attempted by 510 (100%) students whereby 207 (40.60%) scored from 0 to 2.5 marks, 205 (40.20%) scored from 3 to 6 marks, while 98 (19.20%) of the students managed to score from 6.5 to 10 marks.

Generally, the performance in this question was average as 59.40% of the students scored above the pass mark. The distribution of student's performance in this question is summarized in Figure 7.

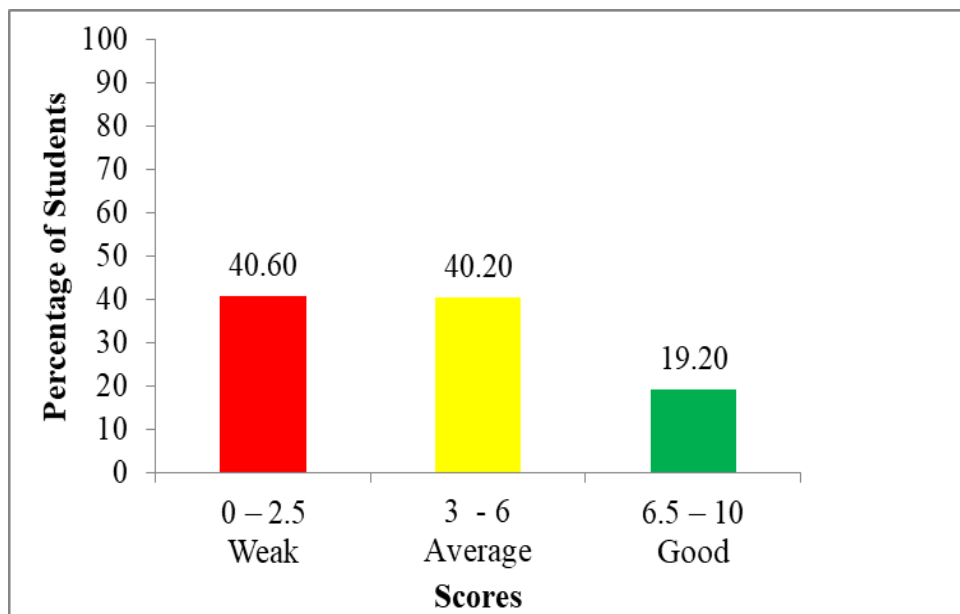


Figure 7: *Students Performance in Question 9*

Figure 7 shows that 59.4% of the students scored pass mark and above. The majority of those who attempted the question performed averagely, which is an indication that they had basic knowledge of timber seasoning and its advantages.

Timber seasoning is a controlled process during which timber is allowed to dry out prior to being used for construction. Avoiding the use of moist wood in construction projects is very important for a number of reasons which make this process to be essential the quality of timber for buildings of all types. There are a number of reasons for timber seasoning. The main reason is to reduce the water content of wood by around 15 per cent through removal of bound water, as well as the free water found in various crevices of the wood. Reducing water content increases the quality of the timber.

In this part of the question, students managed to respond correctly and provide all the required advantages. This indicates that they had mastered the topic and attained the required skills.

Timber seasoning is performed through a number of methods but the students were supposed to describe only two as required in part (b) of this question, which were natural seasoning and artificial seasoning. Natural seasoning is done through free circulation of natural air. Air seasoning is considered as the best method since the drying process takes place gradually and uniformly. Artificial seasoning involves water seasoning, boiling seasoning, chemical seasoning, electrical seasoning and kiln seasoning. These methods are applied when air seasoning cannot be done. The students who scored high marks knew this type of timber treatment and gave good responses. Extract 8.1 is a sample of students' correct responses to question 9.

9. (a) Why seasoning of timber is recommended before use? Gives six reasons.
- To increase durability of timber
 - To avoid warping or twisting of timber
 - To reduce moisture content of timber to a suitable level
 - To avoid insect or fungus to attack the timber
 - To increase the strength of timber
 - To avoid coming off of paint during decoration process.
- (b) Briefly describe two methods used to season timber.
- Natural seasoning which involves air seasoning in which timber is put in to a shed on a platform and air is circulated around it to reduce moisture content. It also involves water seasoning where timber is placed in to a river for 2 to weeks then air seasoned to reduce the moisture content. It is slow and less accurate.
 - Artificial seasoning, which involves regulated heat, controlled humidity and proper air circulation. It involves kiln seasoning in which timber is put in solution of salts and salt soaps to reduce through diffusion process. It also involves electrical seasoning which involves the -

Extract 8.1: A sample of the students' correct responses to Question 9

Extract 8.1 shows a sample of responses from one of the students who was able to give reasons for timber seasoning and to clearly describe two common methods used to season timber. The extract shows that the student had adequate knowledge on timber seasoning, something that made him/her score good marks.

However, some of the students failed in either part (a) or (b). They wrote irrelevant responses contrary to the demand of the question. As it has been the case, few students wrote irrelevant responses due to little knowledge they had on the tested concepts. In this category, the students totally lacked knowledge and had little practical skills of performing timber treatment. Some of them wrote the uses of timber as construction materials, which means that they confused timber treatment with timber use. Extract 8.2 is a sample of irrelevant responses given by one of the students.

9. (a) Why seasoning of timber is recommended before use? Gives six reasons.

- (i) timber it is covered and strong
- (ii) timber it is dry and used to building
- (iii) timber it is strong and during long period of construction
- (iv) It is good timber when construction or building
- (v) timber is used from one place to another working area of job in the building
- (vi) It does not loss or cutting time to time when during building

(b) Briefly describe two methods used to season timber.

- (i) Shadow place is used to keep timber and to strong and good timber and does not timber damage or cutting time wood. In the during building
- (ii) Timber to place building It help timber may be cause do or damage of timbe in the building.

Extract 8.2: A sample of the students' incorrect responses to Question 9

Extract 8.2 is a sample response from one of the students who failed to give any correct reason as to why seasoning of timber is recommended before use. Again, he/she failed to describe the two methods used to season timber. Instead, the student wrote the properties of timber and stated how the timber is stored.

2.3 Section C: Structured Question

2.3.1 Question 10: Workshop Practice – Foundation Setting out

The question had two parts, (a) and (b). Part (a) required the students to identify three methods that can be adopted when digging foundation trenches in water logged sites. Part (b) required them to explain, with the aid of diagrams, the process of timbering trenches in firm soil, moderately firm soil and loose and water logged soil.

This question was attempted by 510 (100%) students whereby 479 (93.9%) scored from 0 to 4.5 marks, 24 (4.7%) scored from 4.5 to 9.5 marks, while 07 (1.4%) students scored from 10 to 15 marks.

The performance in this question was generally poor as only 31 (6.1%) students scored a pass mark and above. The distribution of students' performance in this question is summarized in Table 9.

Table 9: General Students' Performance in Question 10

Scores range (marks)	General Performance		Remarks
	Number of students	Percentage	
0 – 4	479	93.90	Weak
4.5 – 9.5	24	04.70	Average
10 - 15	07	01.40	Good
Total	510	100.00	

The analysis shows that the majority of the students (479, equivalent to 93.90%) scored below the pass mark. These students had inadequate knowledge on the tested topic *Workshop Practice Foundation Setting out*. This question was practical-oriented as it required students to identify dewatering methods that can be adopted when digging foundation trenches in water logged sites. That is *construction of drains, constructing deep wells, freezing process, chemical consolidation of soil and Well point system are among methods adopted for dewatering in waterlogged site*. The removal of water from a construction site to another place, like a detention pond or forest, to make the construction site safe to work on, is a necessary step in preparing an area for construction work. However, this process is often adopted in large projects that the students cannot be able to reach during their learning period. That is why they failed to recall anything required during site preparation concerning dewatering process. Moreover, the students failed to sketch any diagram of timbering to trenches in different types of the soil as required in part (b) of this question. The students in this category wrote irrelevant responses in all parts of the question. A sample response taken from students' scripts as evidence of this mass failure is presented in Extract 9.1.

10. (a) What are the three methods that can be adopted while digging foundation trenches in water logged sites?

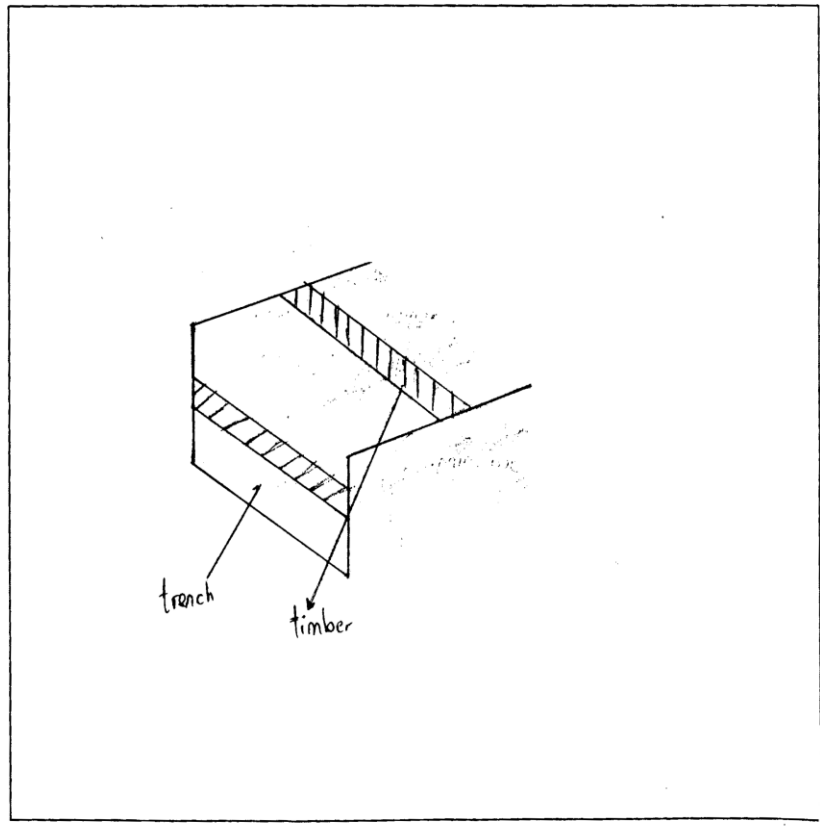
(i) Using builders square

(ii) Using 3:4:5 method

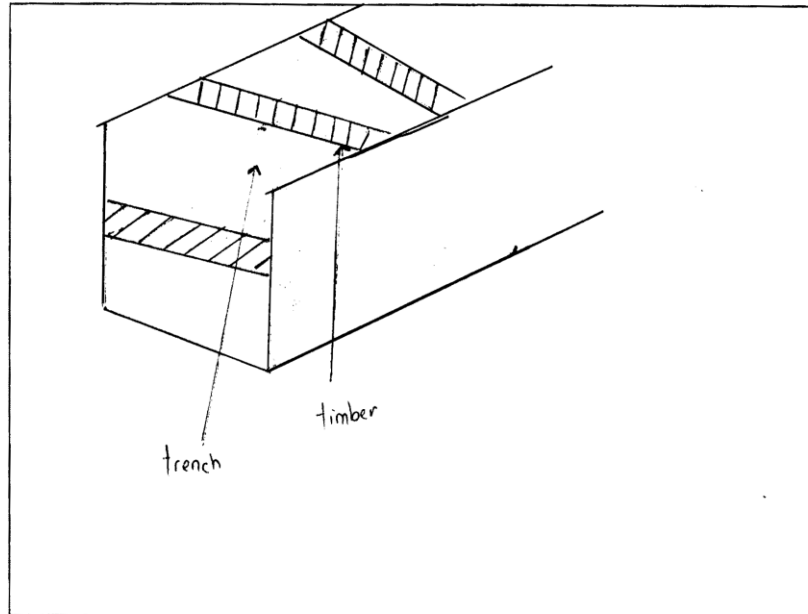
(iii) Using leveling instruments

(b) With the aid of neat and labeled diagram, explain timbering to trenches in the following type of soil:

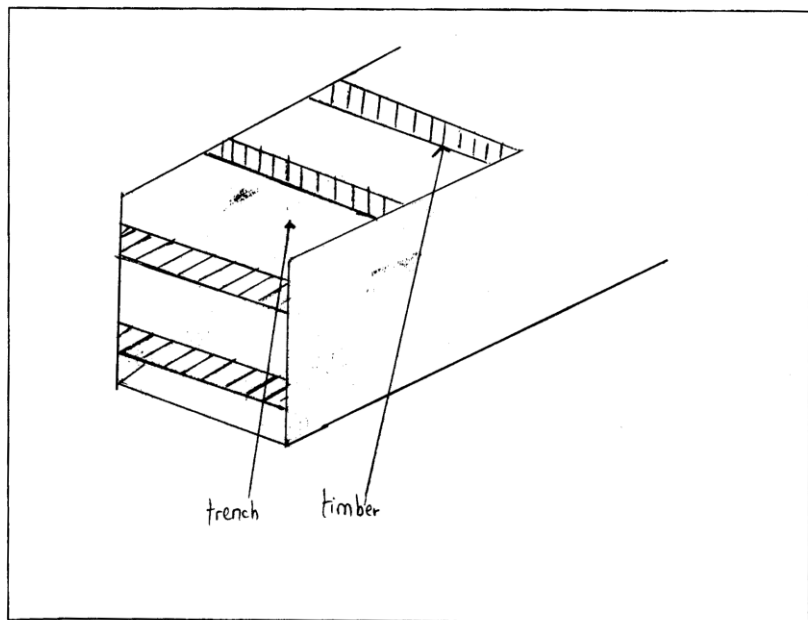
(i) Firm soil



(ii) Moderately firm soil.



(iii) Loose and waterlogged soil.



Extract 9.1: A sample of the students' poor responses to Question 10

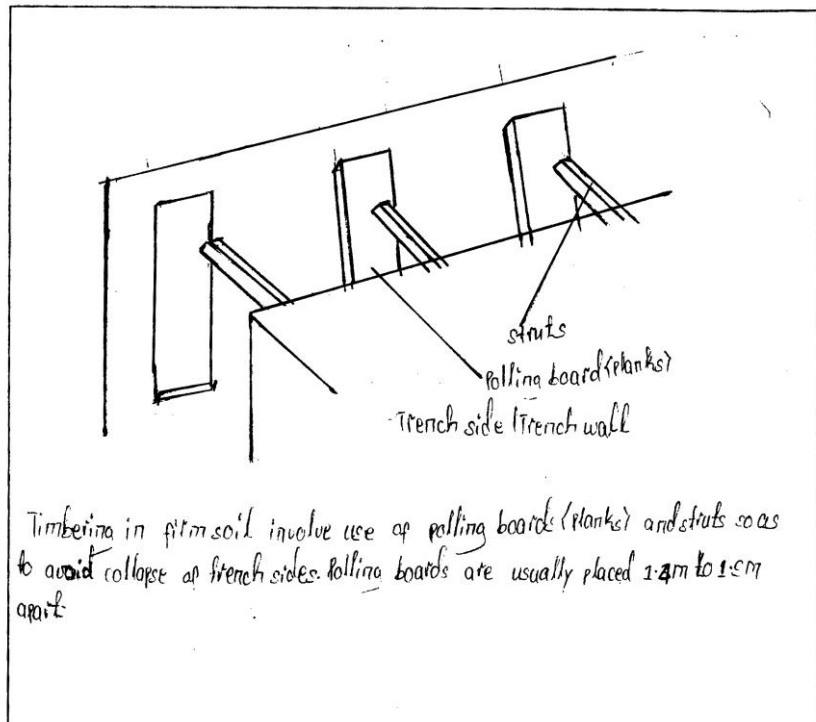
Extract 9.1 is sample responses from the students who responded to the question poorly and scored zero. He/she drew the timber in the trench with no proper arrangement and no details.

Despite this poor performance, some students provided appropriate responses to most parts of this question. They demonstrated adequate practical knowledge of site analysis and setting out. Extract 9.2 is a sample response in which the student responded correctly to the question.

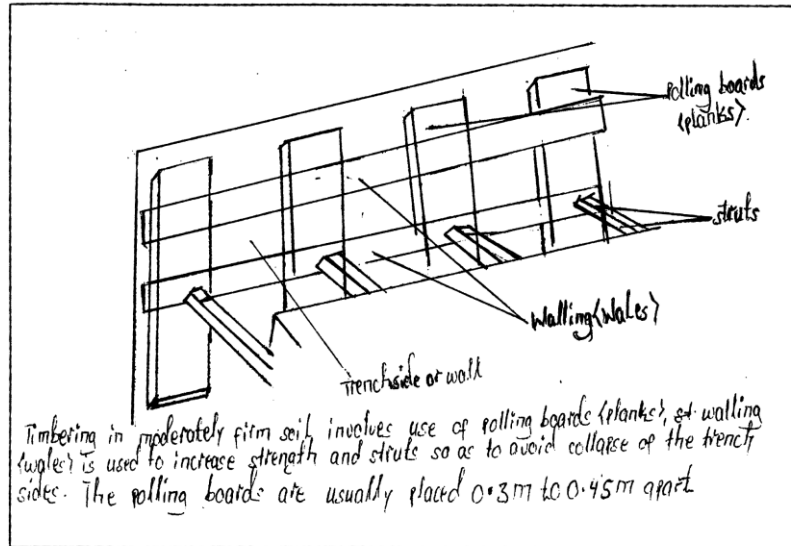
SECTION C (15 Marks)

Answer **all** questions in this section.

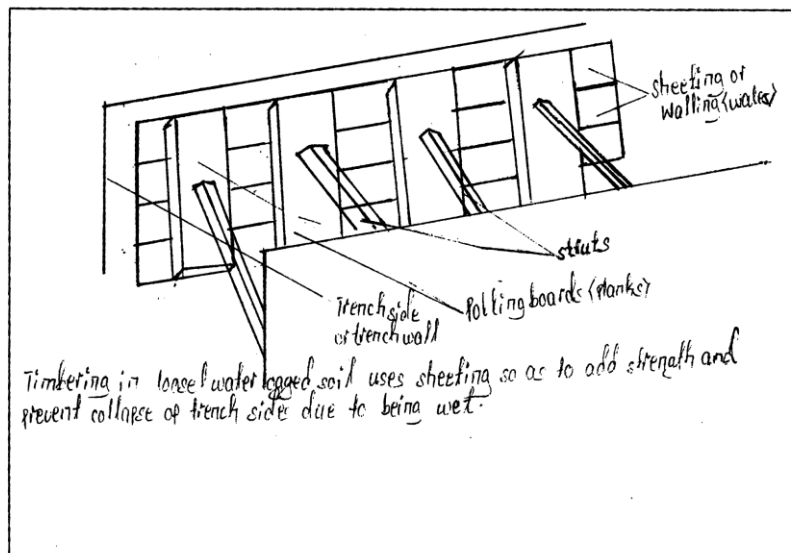
10. (a) What are the three methods that can be adopted while digging foundation trenches in water logged sites?
- ... Sump pump method of dewatering ...
 - ... Electro osmosis method of dewatering ...
 - ... Well point system of dewatering ...
- (b) With the aid of neat and labeled diagram, explain timbering to trenches in the following type of soil:
- Firm soil



(ii) Moderately firm soil.



(iii) Loose and waterlogged soil.



Extract 9.2: A sample of the students' good responses to Question 10

Extract 9.2 displays a sample of good responses given by one of the students who was able to describe the three methods that can be adopted while digging foundation trenches in water logged sites. Also, the students managed to sketch, label and explain timbering to trenches based on the

listed types of soil (i) Firm soil, (ii) Moderately firm soil and (iii) Loose and waterlogged soil.

3.0 ANALYSIS OF THE STUDENTS' PERFORMANCE PER TOPIC

The topics covered in Building Construction for FTNA 2022 were: *Foundation setting out, Building Construction (Site Analysis), Building Materials, Introduction to Building Construction, Building Construction Science and Technology, Workshop Orientation, Temporary Support, Wall and Workshops tool and Equipment.*

The analysis of the students' performance in different topics indicates that students had average performance in seven out of eleven topics that were tested in Building Construction subject. Six out of eleven topics were tested in question one, which consisted of multiple-choice items. At least 87.50 percent of all students scored a pass mark and above.

In the rest of the topics, the performance was 56.60% in *Building materials*, 49.5% in *Wall*, 48.9% in *Workshops tool and Equipment*, 47.15% *Building Construction Science and Technology* and 6.10% in *Foundation setting out*. The students' performance per question and topic wise is summarized in **Appendix A** and **B** respectively.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The summary of the distribution of students' performance in Figure 1 shows that the general performance in Building Construction subject was average, as only 283 (55.49%) students were able to score pass marks and above.

The students' performance in question 1, 2 and 5 was good while the performance in questions 3, 4, 6, 8 and 9 was average. The poorly performed questions were 7 and 10 from the topics of *Walls* (question 7), and *Workshop Practice in Foundation Setting out* (question 10).

The poor performance of the students in those questions was mostly attributed by the failure of the students to comprehend the demands of questions, partial attempt of the questions and insufficient knowledge about

the topics tested. Moreover, they had inadequate skills and practical experience, especially in the topic of Workshop Practice in Foundation Setting out.

4.2 Recommendations

Based on the performance observed in this analysis, the following recommendations are worth noting for students and teachers:

(a) Recommendations for Students

- (i) Students should be encouraged to read carefully the instructions before attempting the questions so as to understand the demand of the questions.
- (ii) Students are encouraged to search and study relevant materials from books or internet sources in order to widen their knowledge. This will help them to grasp relevant and modern concepts and theories applied in the building and construction industry.
- (iii) Students should be involved in practical works (activities) whenever they get any chance to participate. This will lead them to learn by doing.

(b) Recommendations for Teachers

- (i) In order to improve the students' performance, teachers should give enough exercises and tests to their students before they sit for the National Assessment. The exercises and tests given should cover the entire syllabus.
- (ii) Teachers should help students to develop practical skills so as to be able to integrate theories with practical experience, hence acquiring the expected competencies.
- (iii) Participatory and cooperative learning (students centered learning) should be encouraged as it makes them independent learner.

- (iv) Teachers may use interactive projectors during teaching to make learning more active and productive Through this the students can see visual aids, like colorful charts, diagrams and videos which help them to acquire the expected skills of the subject matter.

Appendix A : Analysis of the Students' Performance Per Question

S/N	Topic	Question Number	Percentage of Students who Scored 30% or More	Remarks
1	Foundation, Building Construction (Site Analysis), Materials (Plastics, Metals) Introduction to Building Construction, Building Construction Science and Technology, Workshop Orientation Temporary support (Scaffolding, shoring) and walls.	1	87.50	Good
2	Walls (Bonding)	2	70.20	Good
3	Building Materials (Glass)	5	70.60	Good
4	Wall	6	68.80	Good
5	Building construction, science and technology, (Technical personnel)	3	53.70	Average
6	Workshop tools and equipment	4	45.90	Average
7	Building Materials (Timber)	9	40.60	Average
8	Building construction (Site analysis)	8	40.40	Average
9	Walls (Types of walls)	7	9.40	Weak
10	Foundation (Site analysis) and Temporary support (Timbering to trenches)	10	6.10	Weak

Appendix B : The Students' Performance Per Topic

S/N	Topic	Question Number	Percentage of Students who Scored 30% or More	Remarks
1	Foundation, Building Construction (Site Analysis), Materials (Plastics, Metals) Introduction to Building Construction, Building Construction Science and Technology, Workshop Orientation Temporary support (Scaffolding).	1(Multiple Choice Items)	82.28	Good
2	Building Materials	5& 9	56.6	Average
3	Walls	2 , 6 &7	49.5	Average
4	Workshop Practice Tools and equipment	4	48.9	Average
5	Building construction, science and Technology	3 & 8	47.15	Average
6	Foundation (Site analysis) & Temporary support (Timbering to trenches)	10	6.1	Weak

